Online ISSN : 0975-4172
Print ISSN : 0975-4350
DOI : 10.17406/GJCST

Global Journal

of Computer Science and Technology: G

Interdisciplinary

Foliar Diseases Diagnosis

Artificial Intelligence (AI) Model

Highlights

Control Plane Programmability

Survey: Artificial Intelligence Ethics

Discovering Thoughts, Inventing Future

VOLUME 24 ISSUE 1 VERSION 1.0

Global Journal of Computer Science and Technology: G
Interdisciplinary

Global Journal of Computer Science and Technology: G
Interdisciplinary
Volume 24 Issue 1 (Ver. 1.0)

Open Association of Research Society

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals® Headquarters
945th Concord Streets,
Framingham Massachusetts Pin: 01701,
United States of America
USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Global Journals Incorporated
2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey,
Pin: CR9 2ER, United Kingdom

Packaging & Continental Dispatching

Global Journals Pvt Ltd
E-3130 Sudama Nagar, Near Gopur Square,
Indore, M.P., Pin:452009, India

Find a correspondence nodal officer near you

To find nodal officer of your country, please email us at *local@globaljournals.org*

eContacts

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investors@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

Pricing (Excluding Air Parcel Charges):

Yearly Subscription (Personal & Institutional)
250 USD (B/W) & 350 USD (Color)

Editorial Board

Global Journal of Computer Science and Technology

Dr. Stefano Berretti

Ph.D. in Computer Engineering and Telecommunications, University of Firenze Professor Department of Information Engineering, University of Firenze, Italy

Dr. Abdurrahman Arslanyilmaz

Computer Science & Information Systems Department Youngstown State University Ph.D., Texas A&M University University of Missouri, Columbia Gazi University, Turkey

Dr. Lamri Sayad

Ph.d in Computer science, University of BEJAIA, Algeria

Dr. Tauqeer Ahmad Usmani

Ph.D in Computer Science, Oman

Dr. Hazra Imran

Ph.D in Computer Science (Information Retrieval), Athabasca University, Canada

Dr. Magdy Shayboub Ali

Ph.D in Computer Sciences, MSc in Computer Sciences and Engineering, BSc in Electronic Engineering, Suez Canal University, Egypt

Dr. Nurul Akmar Binti Emran

Ph.D in Computer Science, MSc in Computer Science, Universiti Teknikal Malaysia Melaka, Malaysia

Dr. Asim Sinan Yuksel

Ph.D in Computer Engineering, M.Sc., B.Eng., Suleyman Demirel University, Turkey

Dr. Anis Bey

Dept. of Computer Science, Badji Mokhtar-Annaba University, Annaba, Algeria

Alessandra Lumini

Associate Researcher Department of Computer Science and Engineering University of Bologna Italy

Dr. Rajesh Kumar Rolen

Ph.D in Computer Science, MCA & BCA - IGNOU, MCTS & MCP - MIcrosoft, SCJP - Sun Microsystems, Singhania University, India

Dr. Rajneesh Kumar Gujral

Ph.D in Computer Science and Engineering, M.TECH in Information Technology, B. E. in Computer Science and Engineering, CCNA Certified Network Instructor, Diploma Course in Computer Servicing and Maintenance (DCS), Maharishi Markandeshwar University Mullana, India

Dr. Aziz M. Barbar

Ph.D. IEEE Senior Member Chairperson, Department of Computer Science AUST - American University of Science & Technology Alfred Naccash Avenue Ashrafieh, Lebanon

Dr. Federico Tramarin

Ph.D., Computer Engineering and Networks Group, Institute of Electronics, Italy Department of Information Engineering of the University of Padova, Italy

Dr. Chutisant Kerdvibulvech

Dept. of Inf. & Commun. Technol., Rangsit University Pathum Thani, Thailand Chulalongkorn University Ph.D. Thailand Keio University, Tokyo, Japan

Dr. Roheet Bhatnagar

Ph.D in Computer Science, B.Tech in Computer Science, M.Tech in Remote Sensing, Sikkim Manipal University, India

Contents of the Issue

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Artificial Intelligence (AI) Model Development Framework for the Protection of State Borders, with a Focus on Analyzing Behavioral Patterns

By Amirali Kerimovs

Abstract- This study explores the development and implementation of an artificial intelligence (AI) model designed to predict illegal border crossing locations, thereby enhancing the effectiveness of national border security measures. By integrating and analyzing diverse data sources, - including satellite imagery, social media, and environmental factors, - this AI model aims to identify potential migration patterns and high-risk areas for illegal crossing. This research highlights the model's ability to provide real-time risk assessments, offering a novel approach to border security that surpasses traditional methods in terms of both efficiency and cost-effectiveness. The model's adaptability, continuous learning capabilities, and user-friendly interfaces ensure its relevance in addressing contemporary border-security challenges. This article contributes to the ongoing discourse on the application of AI in national security by proposing a solution that leverages technology for improved coordination among immigration services, government organizations, and international bodies.

Keywords: *artificial intelligence, software engineering, border security, illegal migration, risk assessment, cloud, machine learning, deep learning, data integration, national security.*

GJCST-G Classification: *LCC Code: QA76.76.I58*

Strictly as per the compliance and regulations of:

Artificial Intelligence (AI) Model Development Framework for the Protection of State Borders, with a Focus on Analyzing Behavioral Patterns

Amirali Kerimovs

Abstract- This study explores the development and implementation of an artificial intelligence (AI) model designed to predict illegal border crossing locations, thereby enhancing the effectiveness of national border security measures. By integrating and analyzing diverse data sources, - including satellite imagery, social media, and environmental factors, - this AI model aims to identify potential migration patterns and high-risk areas for illegal crossing. This research highlights the model's ability to provide real-time risk assessments, offering a novel approach to border security that surpasses traditional methods in terms of both efficiency and cost-effectiveness. The model's adaptability, continuous learning capabilities, and user-friendly interfaces ensure its relevance in addressing contemporary border-security challenges. This article contributes to the ongoing discourse on the application of AI in national security by proposing a solution that leverages technology for improved coordination among immigration services, government organizations, and international bodies.

Keywords: artificial intelligence, software engineering, border security, illegal migration, risk assessment, cloud, machine learning, deep learning, data integration, national security.

I. Introduction

The evolution of artificial intelligence (AI) technologies has ushered in a transformative era of global defense mechanisms, particularly in the realm of border security and surveillance. Traditional methods of border control, characterized by physical barriers and human surveillance, are increasingly being augmented or replaced by AI-driven solutions [1]. These innovations offer the potential to enhance the efficiency and effectiveness of border security operations by addressing the multifaceted challenges posed by illegal crossings, smuggling, and other security threats.

AI technologies, including unmanned aerial vehicles (UAVs), smart sensors, facial recognition, and predictive analytics, are at the forefront of this transformation. They offer unprecedented capabilities for monitoring vast and diverse terrains, analyzing massive datasets for pattern recognition, and providing real-time situational awareness [2]. This study explores the current landscape of AI applications in border security, the challenges and limitations of traditional surveillance methods, and the potential of AI to revolutionize border control strategies.

II. Traditional Border Security Challenges

Traditional border security measures, although extensive, have been hampered by several limitations. Physical barriers, such as walls and fences, although useful in certain densely populated regions, have been criticized for their ineffectiveness over extensive border lengths, susceptibility to breaches, and the high costs associated with their construction and maintenance. Surveillance technologies, including drones and cameras, require significant investment in installation and upkeep and can be limited by environmental factors and the need for human operators.

The reliance on human resources for border surveillance presents challenges, including the vast areas to be monitored, the labor-intensive nature of surveillance, and the risks to personnel safety. These methods often result in reactive, rather than proactive, security measures that struggle to adapt to the dynamic nature of border threats.

a) AI-driven Border Security Solution

Traditional approaches, while extensive, often fall short of effectively managing the vast and varied terrains that make up a country's borders. In response to these challenges, this study proposes a novel approach: the development of an artificial intelligence (AI) model designed to predict potential locations of illegal border crossings by analyzing behavioral patterns of migrants and integrating both open and closed data sources [3]. Unlike conventional methods that rely heavily on physical infrastructure and direct surveillance tools, such as drones or cameras, this AI-driven model aims to leverage data analytics and pattern recognition to provide a proactive and cost-effective solution to border security.

This innovative approach seeks to harness the power of AI to sift through and analyze vast amounts of data, from social media posts to government records, and beyond, identifying patterns and signals indicative of potential illegal crossing attempts. By focusing on the predictive capabilities of AI, the model aims to enable border security agencies to allocate their resources

Author: Independent Researcher, Riga, Latvia.
e-mail: amir.academicinquiry@gmail.com

more efficiently by, focusing on high-risk areas identified through the model's analysis. This method represents a significant shift towards a more strategic, data-driven approach to border security, emphasizing the importance of intelligence and foresight in preempting security threats.

The introduction will set the stage for a comprehensive exploration of the current state of border security challenges, the theoretical underpinnings of using AI for predictive analytics in this context, and practical considerations for developing and deploying such a model. Through this discussion, this study aims to contribute to the broader discourse on the role of technology in national security, offering insights into how AI can be utilized to enhance border protection efforts in a rapidly evolving global landscape.

The exploration of AI in border security, as highlighted by various studies and reports, underscores its potential for transforming border surveillance and control. As AI continues to evolve, its role in border security has expanded, offering new opportunities for innovation and collaboration in the face of global security challenges.

III. Literature Review

The integration of Artificial Intelligence (AI) into border security operations represents a pivotal shift in how nations approach the protection of their borders. Recent advancements in AI technologies, including machine - learning algorithms, drone surveillance, and predictive analytics, have opened new avenues for enhancing border security measures.

1. A Novel Approach for Border Security: A Surveillance Drone with Live Intrusion Monitoring by Ekra Bin Syed Mojib et al. (2019) discusses the use of drones equipped with machine learning for efficient border surveillance, potentially replacing human patrols [4].
2. Border Surveillance Monitoring Application by Sanket Darwante et al. (2019) proposes a network of UAVs for efficient border patrolling, demonstrating the use of GPS and machine intelligence for surveillance [5].
3. Monitoring in Near-Real Time for Amateur UAVs Using the AIS by Molina-Padrón et al. (2020) explored using the Automatic Identification System (AIS) to monitor drone activities to enhance privacy and safety [6].
4. Research has delved into how AI technologies can significantly enhance the efficiency and security of border management systems and streamline processes while ensuring rigorous security protocols [7].
5. Smart Border Surveillance System Based on Deep Learning Methods explores the use of deep learning for monitoring activities across borders or nearby red zones to control dangerous situations. YOLOv5 has been highlighted for its speed and accuracy in object detection within images captured by border surveillance cameras [8].
6. Research on the Application of Artificial Emotional Intelligence in the Border: Take iBorderCtrl as an Example by Zhou, Yang, Han, Kuang, and Liao (2022) discusses the iBorderCtrl project, which uses AI for "deception detection" and "risk assessment" in border control, highlighting the potential and challenges of emotion recognition science in this domain [9].
7. Inferring Border Crossing Intentions with Hidden Markov Models approach to infer the intentions of border crossings based on human observations and sensor data, demonstrating the potential of probabilistic modeling in enhancing border security [10].

The existing literature underscores the transformative potential of AI in revolutionizing border security operations. However, it also cautions against the unchecked adoption of these technologies without addressing their associated ethical, legal, and social implications. Future research should aim to refine AI technologies to enhance their effectiveness, while mitigating potential risks and biases.

IV. Presentation of the Main Material

This section meticulously outlines the composite framework that underpins the creation of a state-of-the-art AI model, proposed for the surveillance and protection of state borders. The exposition of this framework reveals a finely -tuned orchestration among data acquisition, algorithmic processing, predictive analytics, and operational deployment, where each component synergistically contributes to the overall objective of preempting unauthorized border crossings.

The architecture of the AI model framework is multifaceted and incorporates various layers of neural networks and machine-learning algorithms. These components were meticulously trained on historical datasets to identify and interpret patterns that suggest the likelihood of illicit activities, as seen in *Figure 1:*

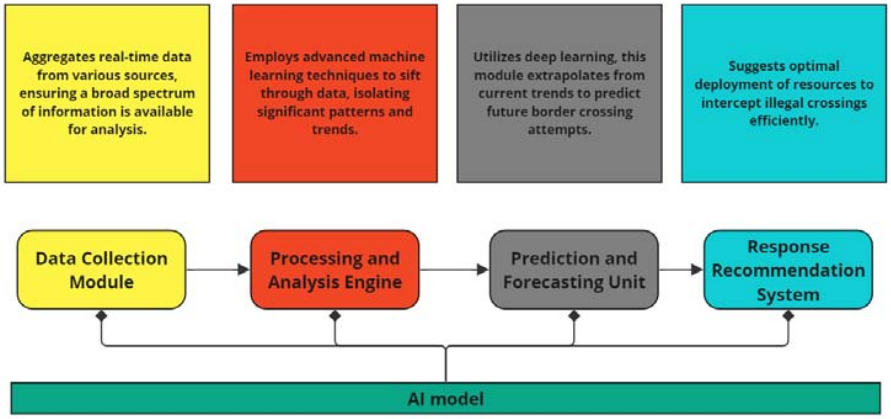


Fig. 1: Key components of the AI model for Border Security

This diagram presents an advanced artificial intelligence (AI) framework aimed at enhancing border security measures. This framework is structured around several core modules, each contributing to an integrated system designed to improve the monitoring and management of border activities. At the forefront of this model is the Data Collection Module, which provides a comprehensive set of real-time data from diverse sources, including satellite imagery, social media activities, and environmental conditions (*Tables 1-8).* This module ensures the availability of a detailed information spectrum for the analysis.

This algorithm consists of a sequence of steps that describe the operation of a neural network to ensure border security. Each step includes specific actions performed by the relevant components of the model, such as CNN and RNN, to process and analyze various types of data to predict and prevent potential threats. Therefore, an algorithm for the operation of a multiple-choice neural network for the proposed scheme can be seen in Figure 2:

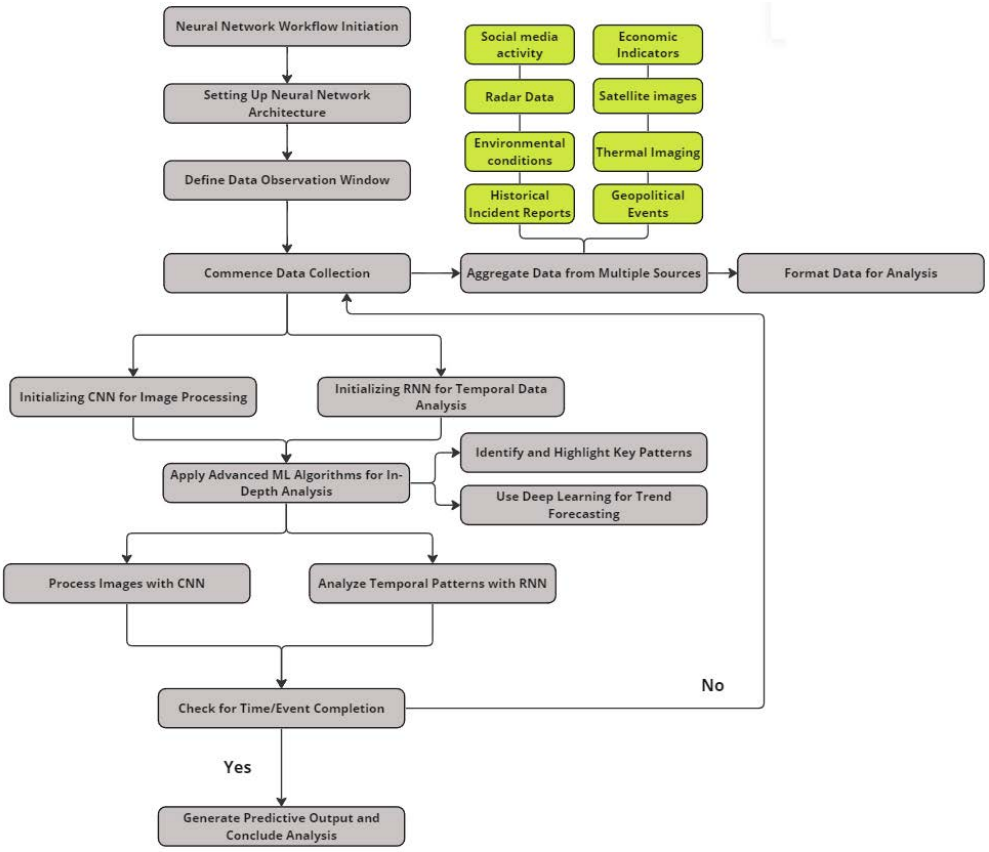


Fig. 2: Algorithm for the key components of the AI model for Border Security

The Processing and Analysis Engine is pivotal in the system, utilizing sophisticated machine learning algorithms to process and dissect the incoming data. This engine identifies significant patterns and trends that may indicate unauthorized border activities. The capability of the model to predict and forecast potential security breaches was encapsulated within the prediction and forecasting units. Deep-learning techniques are employed to analyze current data trends and predict future scenarios, thereby enabling preemptive actions against possible security threats.

The last part of the model's process is realized through the Response Recommendation System. This component integrates insights derived from the analysis to formulate strategic recommendations for the deployment of border security resources. The objective is to allocate attention and resources to areas identified as high-risk, thereby optimizing the operational efficiency and effectiveness of border patrols.

Each module within the AI framework plays a critical role, and it is a collective operation that empowers the model to offer a data-driven approach for border security. This approach not only shifts traditional border security methods towards a more proactive and adaptive strategy but also ensures the model's efficacy through its scalability and adaptability to new data sources and changing migration patterns.

a) Data Amalgamation and Preprocessing

The inception of the model's predictive process is rooted in its comprehensive data-amalgamation framework. High-fidelity satellite imagery provides a near-real-time overview of the geographical nuances of the border areas. These images underwent a series of preprocessing steps, including spectral analysis, feature extraction, and temporal differencing, to isolate changes relevant to human activity.

Table 1: Data Attributes for "Satellite Images" Dataset

Dataset "Satellite Images"
Identifier: Orbital Reference
A specific code that denotes the satellite and camera source of the imagery.
Analysis: Geospatial Interpretation
The examination of imagery to understand geographical features and detect anomalies.
Features: Extraction of Geographical Markers
Identifying natural and man-made features critical for terrain analysis.
Temporal Tracking: Monitoring Over Time
Observing changes in the geographical landscape across a series of images over time.

Table 2: Data Attributes for "Social Media Activity" Dataset

Dataset "Social Media Activity"
Content: User-Generated Data
The aggregation of content created by users, including posts, comments, and shared media.
Analysis: Engagement Metrics
Measuring the level of interaction and engagement each post receives.
Trends: Viral Pattern Detection
Identifying trending topics and viral content that may indicate mass movements or events.

Table 3: Data Attributes for "Economic Indicators" Dataset

Dataset "Economic Indicators"
Identifier: Financial Metric Code
A unique identifier for each economic metric being analyzed.
Analysis: Market Dynamics
The study of economic trends, such as inflation rates, currency valuation, and investment flows.
Predictive Significance: Forecasting Economic Shifts
Using economic indicators to predict potential impacts on migration and border activity.

Table 4: Data Attributes for "Environmental Conditions" Dataset

Dataset "Environmental Conditions"
Identifier: Ecological Event Code
A label for categorizing specific environmental conditions or events.
Monitoring: Habitat and Wildlife Changes
Observing changes in habitats and wildlife migration that could affect human movement.
Analysis: Resource Distribution
Studying the distribution and availability of natural resources, which may attract human activity.

Table 5: Data Attributes for "Radar Data" Dataset

Dataset "Radar Data"
Identifier: Frequency Signature
Unique signatures of radar frequencies used to differentiate between object types.
Analysis: Velocity Mapping
Determining the speed and direction of objects to detect movement patterns.
Features: Material Composition
Using radar data to infer the material composition of objects and surfaces.

Table 6: Data Attributes for "Geopolitical Events" Dataset

Dataset "Geo political Events"
Identifier: Political Event Number
An assigned number to each geopolitical event for tracking and historical reference.
Analysis: Stability Index
A measure of the political stability of a region, which may influence migration patterns.
Impact Study: Cross-Border Implications
An assessment of how geopolitical events affect cross-border relations and security.

Table 7: Data Attributes for "Thermal Imaging" Dataset

Dataset "Thermal Imaging"
Identifier: Thermal Signature ID
A unique identifier for the thermal signature captured in the imagery.
Analysis: Heat Source Localization
Pinpointing the sources of heat to detect living beings or machine operation.
Pattern Recognition: Behavioral Analysis
Identifying patterns in thermal imagery that may indicate clandestine activity

Table 8: Data Attributes for "Historical Incident Reports" Dataset

Dataset "Historical Incident Reports"
Identifier: Incident Archive Number
A unique number for each incident report filed for ease of access and analysis.
Content Assessment: Narrative Evaluation
A detailed examination of the incident reports to understand the context and consequences.
Analysis: Historical Pattern Mapping
Analyzing past incidents to identify patterns that may predict future security breaches.

b) Additional Considerations for Data Contextualization

Concurrently, a continuous stream of data from social media platforms is harvested by, employing natural language processing algorithms to parse and interpret the digital chatter related to migration patterns and sentiment analysis. This is complemented by an array of environmental variables, - such as weather patterns, terrain roughness, and seasonal vegetation changes, - which are critical in anticipating migratory trends and identifying unconventional pathways that may be exploited for crossing.

c) Neural Network Architecture and Machine Learning Algorithms

The architecture of the AI model (Figure 3) is characterized by a stratified neural network hierarchy, meticulously trained on historical data to establish a baseline for normal activity patterns. The first stratum comprises convolutional neural networks (CNNs) adept at image pattern recognition, transforming pixels into a contextual understanding of the physical terrain. Successive layers integrate recurrent neural networks (RNNs), which process temporal data and capture subtle dynamics of migration trends over time.

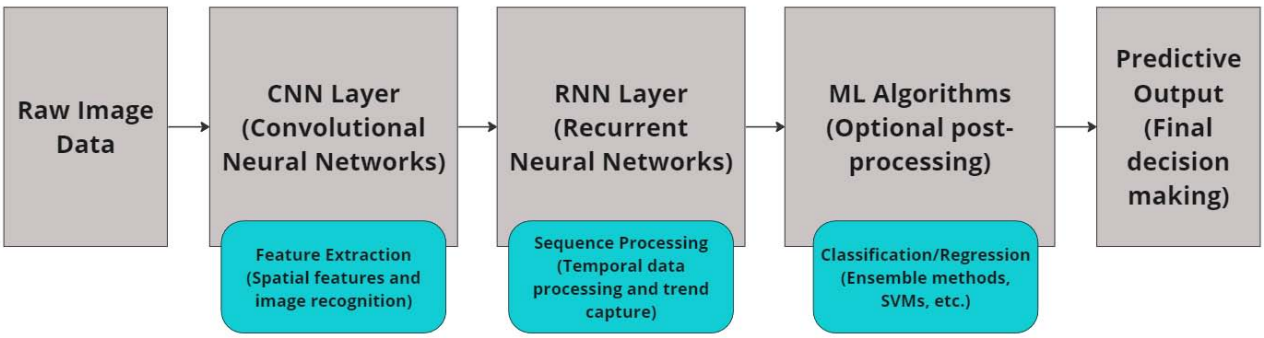


Fig 3: Sequential Data Processing Layers in sNeural Network Architecture

```
class AIModel:
    def __init__(self):
        self.cnn = ConvolutionalNeuralNetworks()
        self.rnn = RecurrentNeuralNetworks()
        # Optional: Additional ML algorithms for example: Random Forests, SVMs, etc.
        self.ml_algorithms=MachineLearningAlgorithms()

    def forward(self, image_data):
        spatial_features = self.cnn(image_data)
        temporal_features = self.rnn(spatial_features)
        prediction=self.ml_algorithms(temporal_features)
        return prediction

# Instantiate the model
model = AIModel()

# Process an input image
raw_image_data = get_image_data()
prediction = model.forward(raw_image_data)
```

This pseudo-code is a high-level representation of how the data would flow through the model, starting with the raw image data, moving through the CNN and RNN layers, and potentially further machine learning algorithms for final prediction generation.

To refine the predictive accuracy, the model employs a series of machine learning algorithms, tailored to different aspects of the dataset. Ensemble methods, such as random forests and gradient boosting machines, provide robustness against overfitting and ensure generalizability across diverse border scenarios. Support vector machines (SVMs) offer high-dimensional pattern recognition, which is pivotal for classifying complex behavioral patterns into risk profiles.

d) Predictive Analytics and Risk Assessment

At the heart of the model is a predictive analytics engine, a sophisticated module in which data-driven insights coalesce into actionable intelligence. This engine utilizes advanced algorithms to extrapolate established patterns, identify anomalies, and forecast potential illegal crossing attempts. Risk assessment protocols are embedded within this engine, quantifying the probability of illicit activities and enabling a prioritized response to high-risk zones.

e) Adaptive Learning and Model Evolution

Ensuring the relevance of the model in an ever-evolving threat landscape is its adaptive learning capability. Through a continuous feedback loop, the model self-refines, assimilate new data, and recalibrates its algorithms in response to the emerging patterns. This iterative learning process is underpinned by reinforcement learning techniques, which allow the

model to evolve with each new dataset, ensuring that its predictions remain both current and reliable.

f) Ethical Framework and Compliance

The AI model operates within a stringent ethical framework that, upholds the highest standards of data privacy and integrity. Anonymization protocols have been rigorously applied, particularly to data sourced from social media, to protect individual identities. The model's decision-making processes are designed to be transparent and auditable, ensuring compliance with international human rights laws, and providing a basis for ethical accountability in AI deployment for border security.

V. Results and its Discussion

This research presents a theoretical framework for the development of an artificial intelligence (AI) model aimed at enhancing the protection of state borders by predicting the potential locations of illegal crossings. The framework integrates a sophisticated combination of data acquisition, algorithmic processing, predictive analytics, and operational deployment, designed to effectively preempt unauthorized border activities.

a) Key Insights

The proposed model leverages a multifaceted approach that incorporates advanced machine learning algorithms and neural network architectures to analyze an extensive collection of data sources, such as geospatial imagery, patterns of social media interaction, and ecological conditions. This comprehensive data amalgamation and preprocessing effort is pivotal in identifying migration patterns and potential illegal crossing attempts, with the model employing convolutional neural networks (CNNs) for image pattern recognition and recurrent neural networks (RNNs) for analyzing the following temporal data:

b) Model Performance Evaluation: Illegal Border Crossing Prediction

The AI model was designed to predict illegal border crossing attempts within predictive time frames based on behavioral analysis and environmental data integration. It employs a blend of satellite imagery analysis, social media monitoring, and pattern recognition for identifying high-risk zones for illegal border activities.

The performance metrics of the model based on the test dataset were as follows.

1. *True positives (TP):* 350 (The number of illegal crossing attempts correctly identified)
2. *False positives (FP):* 150 (The number of false alarms where legal crossings or non-crossings were incorrectly identified as illegal attempts)
3. *True negatives (TN):* 1400 (The instances where non-crossings were correctly identified, maintaining border fluidity and logistic integrity)
4. *False negatives (FN):* 100 (The missed illegal crossing attempts that were not detected by the model)

c) Performance Metrics Formulas and Descriptions

Equation 1: The proportion of true results (both true positives and true negatives) among the total number of events examined, reflecting the model's overall reliability.

$$Accuracy = \frac{(TP+TN)}{(TP+TN+FP+FN)}. \quad (1)$$

Equation 2: Recall (Sensitivity): The model's ability to correctly identify actual illegal border crossing attempts, essential for maintaining national security.

$$Recall = \frac{TP}{(TP+FN)} \quad (2)$$

Equation 3: Specificity (True Negative Rate): The model's ability to correctly identify legitimate border activity, essential for trade and travel continuity.

$$Specificity = \frac{TN}{(TN+FP)} \quad (3)$$

Equation 4: The likelihood that identified potential illegal crossings truly represent unlawful activities, reducing resource wastage on false positives.

$$Precision = \frac{TP}{(TP+FP)} \quad (4)$$

Equation 5: A combined metric of precision and recall, which is critical in border security where the costs of false negatives and the disruption of false positives are both high.

$$F1 - Score = 2 \times \frac{(Precision \times Recall)}{(Precision + Recall)} \quad (5)$$

Using these formulas, we calculate the following performance metrics for the model, as can be seen in Table 9:

Table 9: Predictive Model Performance Metrics

Metric	Value
Accuracy	0.875
Recall	0.778
Specificity	0.903
Precision	0.700
F1-Score	0.737

These values indicate the model's competence in accurately identifying illegal border activities while maintaining operational efficiency. The balance reflected in the F1-Score is particularly crucial in border security applications where it is vital to avoid both false alarms and missed detections.

d) Discussion

This theoretical model underscores the transformative potential of AI in border security operations, shifting from reactive to proactive measures. By focusing on predictive analytics and risk assessment, the framework aims to enhance operational efficiency, allowing strategic resource allocation to high-risk areas. Furthermore, the adaptive learning capability of the model ensures its continuous evolution in response to new data and emerging patterns, maintaining its relevance and effectiveness in a dynamic threat landscape.

Ethical considerations are integral to the model design, with stringent data privacy protocols and transparency measures to ensure compliance with international human rights standards. This ethical framework addresses privacy concerns and establishes a foundation for the responsible deployment of AI in sensitive security operations.

VI. Conclusion

The proposed AI model framework represents a significant advancement in border security technology, offering a novel, data-driven approach to identifying and preempting illegal border crossings. While empirical testing and real-world applications are necessary to validate its effectiveness, this study contributes to the ongoing discourse on leveraging technology for national security, presenting a forward-looking perspective on the integration of AI in border protection efforts.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted independently by the author, who is not affiliated with any institution. Any necessary resources were provided by the author or obtained through personal means.

Ethical Compliance

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflict of Interest declaration

The author declares that they have NO affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

References Références Referencias

1. Bhadwal, N., Madaan, V., Agrawal, P., Shukla, A., & Kakran, A. (2019). Smart Border Surveillance System using Wireless Sensor Network and Computer Vision. 2019 International Conference on Automation, Computational and Technology Management (ICACTM), 183-190. https://doi.org/10.1109/ICACTM.2019.8776749.
2. Woodward, J., & Ruiz, J. (2022). Analytic Review of Using Augmented Reality for Situational Awareness. IEEE Transactions on Visualization and Computer Graphics, PP, 1-1. https://doi.org/10.1109/TVCG.2022.3141585.
3. Khan, A. (2010). Prediction and Display of Delay at Road Border Crossings. The Open Transportation Journal, 4, 9-22. https://doi.org/10.2174/1874478010040100009.
4. E. B. S. Mojib, A. K. M. B. Haque, M. N. Raihan, M. Rahman and F. B. Alam, "A Novel Approach for Border Security; Surveillance Drone with Live Intrusion Monitoring," 2019 IEEE International Conference on Robotics, Automation, Artificial-intelligence and Internet-of-Things (RAAICON), Dhaka, Bangladesh, 2019, pp. 65-68
5. S. Darwante, A. Kadam, H. Talele, O. Ade and A. Bankar, "Border Surveillance Monitoring Application," 2019 5th International Conference On Computing, Communication, Control And Automation (ICCUBEA), Pune, India, 2019, pp. 1-6.
6. S. Darwante, A. Kadam, H. Talele, O. Ade and A. Bankar, "Border Surveillance Monitoring Application," 2019 5th International Conference On Computing, Communication, Control And Automation (ICCUBEA), Pune, India, 2019, pp. 1-6.
7. Artificial Intelligence (AI) and Future Immigration and Border Control - Mohammad Nazmul Alam, Md Shahin Kabir, Easmat Jabin Sumi - IJFMR Volume 5, Issue 5, September-October 2023.
8. C. Nakkach, A. Zrelli and T. Ezzedine, "Smart Border Surveillance System Based on Deep Learning Methods," 2022 International Symposium on Networks, Computers and Communications (ISNCC), Shenzhen, China, 2022, pp. 1-6.
9. Xin Zhou, Zenghui Yang, Wenjun Han, Jie Kuang, Donghua Liao. Research on the application of artificial emotional intelligence in the border: take iBorderCtrl as an example. Third International Conference on Artificial Intelligence and Electrome-chanical Automation (AIEA 2022), 2022, Changsha, China.
10. Singh, G., Mehrotra, K. G., Mohan, C. K., Damarla, T. (2011). Inferring Border Crossing Intentions with Hidden Markov Models. In: Mehrotra, K. G., Mohan, C. K., Oh, J. C., Varshney, P. K., Ali, M. (eds) Modern Approaches in Applied Intelligence. IEA/AIE 2011. Lecture Notes in Computer Science(), vol 6703. Springer, Berlin, Heidelberg.

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Foliar Diseases Diagnosis in Black Gram (Vigna Mungo L.) using Deep Learning Model

By Kalpana Muthuswamy, Senthil Kumar R, Selvanayaki Kolandapalayam Shanmugam, Karthiba Loganathan, Venkatesa Palanichamy Narasimma Bharathi & Muralisankar Perumal

University of Agricultural

Abstract- Crop protection, disease diagnosis, and management are crucial in sustainable crop production. In pulses, rain-fed crops play a predominant role in India's tropical agriculture. However, the disease's development and severity have rapidly changed and caused a severe yield loss before harvest. Some visual diagnoses and confirmations make mild errors in detection and diagnosis for farmers and scientists. Keeping this background, applying deep learning techniques is most helpful in diagnosing plant diseases silently and superiorly. Deep learning techniques were carried out in this study to diagnose black gram diseases. A vast field survey was conducted in the black gram growing Cauvery delta zone of four blocks in Pudukkottai district, Tamil Nadu, India, with 27376 images collected. Furthermore, the advanced inception V3 model has been used for analysis, assessment, and prediction for the diagnosis of diseases. The model was investigated with 20 percent, 40 percent, and 50 percent dropout rates. The result showed that an Inception V3 model, with a 20 percent dropout rate, gave the best performance with an accuracy of 99.22 percent and a loss of 0.0249. The high-performance rate shows automated disease diagnosis, which helps the farmers develop disease management strategies at the preliminary stages of their growth.

Keywords: black gram, disease diagnosis, deep learning, convolution neural Network (CNN), inception V3.

GJCST-G Classification: LCC Code: SB SBN50

Strictly as per the compliance and regulations of:

Foliar Diseases Diagnosis in Black Gram (Vigna Mungo L.) using Deep Learning Model

Kalpana Muthuswamy [α], Senthil Kumar R [σ], Selvanayaki Kolandapalayam Shanmugam [ρ], Karthiba Loganathan [ω], Venkatesa Palanichamy Narasimma Bharathi [¥] & Muralisankar Perumal [§]

Abstract- Crop protection, disease diagnosis, and management are crucial in sustainable crop production. In pulses, rain-fed crops play a predominant role in India's tropical agriculture. However, the disease's development and severity have rapidly changed and caused a severe yield loss before harvest. Some visual diagnoses and confirmations make mild errors in detection and diagnosis for farmers and scientists. Keeping this background, applying deep learning techniques is most helpful in diagnosing plant diseases silently and superiorly. Deep learning techniques were carried out in this study to diagnose black gram diseases. A vast field survey was conducted in the black gram growing Cauvery delta zone of four blocks in Pudukkottai district, Tamil Nadu, India, with 27376 images collected. Furthermore, the advanced inception V3 model has been used for analysis, assessment, and prediction for the diagnosis of diseases. The model was investigated with 20 percent, 40 percent, and 50 percent dropout rates. The result showed that an Inception V3 model, with a 20 percent dropout rate, gave the best performance with an accuracy of 99.22 percent and a loss of 0.0249. The high-performance rate shows automated disease diagnosis, which helps the farmers develop disease management strategies at the preliminary stages of their growth.

Keywords: black gram, disease diagnosis, deep learning, convolution neural Network (CNN), inception V3.

I. Introduction

On time, diagnosis of plant diseases plays a crucial role in crop protection and sustainable agriculture [1]. Developing science in all sectors has advanced during the last ten years, especially in agriculture, such as detecting plant diseases, developing resistant cultivars, and implementing advanced approaches in management [2]. Generally, the diagnosis of plant diseases is categorized by field and laboratory conditions based on prevalence, symptoms, signs (in vivo), culturing, and characterization (in vitro) [3]. Sometimes, early diagnosis under field conditions through visual examinations, collection of samples causing minor defaults or misidentifications due to complex diseases, and manual errors occurred by unskilled ones [4].

Mostly, it has occurred in foliar diseases and uncultured pathogens, causing failures in diagnosis followed by management. Under these circumstances, deep learning techniques can be used in agriculture for its development in all ways [5]. In these techniques, several types of algorithms such as convolutional neural networks (CNNs), extended short-term memory networks (LSTMs), recurrent neural networks (R.N.N.s), generative adversarial networks (GANs), radial basis function networks (RBFNs), multilayer perceptrons (M.L.P.s), self-organizing maps (S.O.M.s), deep belief networks (DBNs), restricted Boltzmann machines (R.B.M.s) and autoencoders [6]. These convolutional neural networks (CNNs) are broadly used in agricultural development on scheduling irrigation, fertigation, monitoring of plant growth developments, drought indications, pests' upsurge, detection and diagnosis of crop diseases, and maturation accompanied harvesting assessments [7, 8].

CNNs (Convolutional Neural Networks) are a unique extended class of artificial neural networks (ANN), generally applied to analyzing visual imagery, which is prominently used to extract the features from the grid-like matrix dataset. It consists of multiple layers such as the input layer (holds the raw image), convolutional layer (extracts the feature from the input dataset by learnable filters or kernels), pooling layer (periodically inserted the images like converts (neuron codes) and computational reduces volume for prevents overfitting by a typical layer of max and average pooling), fully connected layer (computes final classification and regression) and output layer (obtained dataset from the previous layer and provide probability score through tasks of sigmoid or softmax) [9]. These functions are fully architecture by automation except for the insertion of images. Based on these auto-perception and rapid comparison, computational technologies are helpful to the diagnosis of plant diseases at an early stage for better management [10,11].

Nowadays, advanced deep learning techniques (D. L. T. s) have been used better in CNNs by

Author α ¥: Agricultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India. e-mails: kalpusiva@gmail.com, nvpchamy@tnau.ac.in
Author σ ρ: College of Arts and Science, Ashland University, Ashland, 44805, Ohio, United States. Department of Computer Science with Cognitive Systems, Dr. N.G.P Arts and Science College, Coimbatore, Tamil Nadu, India. e-mails: sen07mca@gmail.com, skolanda@ashland.edu,
Author ω: Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore 641003, Tamil Nadu, India. e-mail: karthiba@gmail.com
Author §: Pushkaram College of Agriculture Sciences, Pudukkottai Tamil Nadu, India. e-mail: muralisankar58@gmail.com

implementing different types of architectures or models. Especially, AlexNet, GoogLeNet, ResNet (tomato leaf curl diseases), LeNet (Banana foliar diseases), Alex NetOWTbn, Overfeat, V. G. G., Xception, Squeeze Net, and VGG-Inception models. Among them, VGG-Inception outclassed all the other models. The comparison and superior class were scored between the models by performance metrics of optimization, customization, sensitivity, specificity, and F1- score [12]. This strategy was used to diagnose foliar diseases and disorders of crops in agriculture. In particular, high green-biomass-producing legume crops such as green gram, black gram, cowpea, lentil, pigeon pea, and peas were studied by deep learning techniques for better yield and management of diseases [13,14]. Because their potential ability to yield depends on their vegetative growth, when it is affected, the yield is also reduced [15]. Among these legumes, black gram (Vigna mungo L.) is one of the most essential legume crops predominantly cultivated on rainfed conditions in India with an area of 44.9 lakh ha. and accounting for a production of 26.2 lakh tonnes. In Tamil Nadu, 3.72 lakh hectares with a production of 1,262 lakh metric tonnes are associated with a productivity of 645kg/ha [16]. In particular, its yield has reduced due to fungal and viral diseases like powdery mildew, anthracnose, and yellow mosaic from 9.0 to 50.0% during the vegetative to reproductive stage. The severity of these diseases also depends upon the stage of infection, virulence, genotypes, and environmental factors [17].

Furthermore, by approaching manual diagnosis, these factors cause faults or misleads in diagnosis under field conditions. It encourages the application of deep learning algorithms to diagnose and manage plant diseases [18]. Considering this background, the study was carried out to diagnose foliar diseases in black gram (Vigna mungo L.) using deep learning algorithms.

II. Materials and Methods

In this study, the work was carried out initially with a survey and collection of samples, application of advanced V3 inception model progresses such as pre-processing of images, learning phase and evaluation phase for diagnosis of foliar diseases in black gram.

a) Survey and Collection of Disease Images

During Kharif 2022, a vast survey was conducted on rice fallow black gram cultivated fields in four different blocks, such as Aranthangi, Gandrvakottai, Pudukkottai and Thiruvarankulam of Pudukkottai district in Tamil Nadu (Table 1).

Table 1: Survey and Collection of Disease Images from Rice Fallow Black Gram Cultivated Areas of Tamil Nadu

S. No.	Survey Conducted Villages	Geo Co- ordinates	Name of the Blocks	Name of the District	Cultivars
1.	Vannarapatti	10.52;78.96	Pudukkottai	Pudukkottai	VBN8, VBN10 & VBN11
2.	Vannarapatti	10.52; 78.96	Pudukkottai		
3.	Adanakottai	10.53;78.96	Pudukkottai		
4.	Adanakottai	10.53; 78.97	Pudukkottai		
5.	S.Solagampatti	10.59; 79.02	Gandarvakottai		
6.	S.Solagampatti	10.59; 79.01	Gandarvakottai		
7.	S.Solagampatti	10.59;79.01	Gandarvakottai		
8.	S.Solagampatti	10.59; 79.01	Gandarvakottai		
9.	Puthunagar	10.62; 79.04	Gandarvakottai		
10.	Pudhunagar	10.62; 79.04	Gandarvakottai		
11.	Puthunagar	10.43; 78.98	Gandarvakottai		
12.	Pudhunagar	10.43;78.97	Gandarvakottai		
13.	Puthunagar	10.42; 78.97	Gandarvakottai		
14.	Vellalaviduthi	10.51; 79.07	Gandarvakottai		
15.	Mankkottai	10.35; 78.95	Thiruvarankulam		
16.	Mankkottai	10.35; 78.91	Thiruvarankulam		
17.	Kothakottai	10.34;78.91	Thiruvarankulam		
18.	Dhatchinapuram	10.34; 78.91	Thiruvarankulam		
19.	Pappanpatti	10.37; 78.91	Thiruvarankulam		
20.	NPRC, Vamabn	10.36; 78.92	Thiruvarankulam		
21.	Ambalapuram	10.19; 79.13	Aranthangi		
22.	Sengarai,	10.11; 78.93	Aranthangi		
23.	M. S. K. Veedu	10.22; 78.90	Aranthangi		
24.	Kunnakkurumbi,	10.21; 78.97	Aranthangi		
25.	Ramasamipuram	10.23; 79.13	Aranthangi		
26.	Mangalanadu	10.20; 79.14	Aranthangi		
27.	Kallaakottai	10.50; 79.08	Aranthangi		

The diseases (anthracnose, powdery mildew, leaf crinkle, yellow mosaic) infected and additionally healthy leaf sample images were captured by a camera (SONY Alpha ILCE-6100Y APS-C) in cultivars of VBN8, VBN10, and VBN11 during morning 6.00 to 10.00 am. Totally, 27376 images were collected, which comprised disease images such as anthracnose (4225 Nos.), leaf crinkle (6354 Nos.), powdery mildew (6120 Nos.), yellow mosaic (4211 Nos.) and healthy (6466 Nos.). Furthermore, these images were classified by several training sets and several test sets on each and every disease and accompanied by typical symptoms [19] and were described in Table 2.

Table 2: Classification of Disease Images by Application of Using Sets and Symptomatology

Images Classification (Diseases)	No. of Using Sets of Images		Total No. of using Sets	Typical Symptoms
	Training Set	Test Set		
Anthracnose	3,380	845	4,225	Circular, black, sunken spots with a dark center and bright red-orange margins on leaves [20].
Leaf Crinkle	5,084	1,270	6,354	The youngest leaves as chlorosis around some lateral veins and branches near the margin. The leaves show curling of the margin downwards. Some of the leaves show twisting. The veins show reddish-brown discoloration on the under surface which also extends to the petiole [21].
Powdery Mildew	4,896	1,224	6,120	White powdery patches appear on leaves and other green parts which later become dull-colored. These patches gradually increase in size and become circular covering the lower surface completely [22].
Yellow Mosaic	3,201	1,010	4211	Initially, mild scattered yellow spots appear on young leaves and show irregular yellow and green patches alternating with each other. Spots gradually increase in size and ultimately some leaves turn completely yellow. Infected leaves also show necrotic symptoms [23].
Healthy	4,801	1,665	6466	Uninfected
Total No. of Images Used	21,362	6,014	27,376	

b) Image Pre-Processing

In our experiments, image pre-processing and CNN algorithms, as shown in Figure 1, were implemented using Anaconda 3 (Python 3) and the Keras library. The experimental hardware environment includes a Mac Pro with 1.4 GHz Quad-Core Intel Core i5. The symptoms-based classified images were further used in this pre-processing. The images were pre-processed using Python programming language with image width, height 150×150 with images 256×256 pixels. Images were trained using the inception V3 model. Images were divided into 80% training and 20% testing. In each step, there were different numbers of batches, and each batch contained about 32 images. Data augmentation such as flip, rotation, and zoom were used to create an anomaly dataset for training the model and to detect anomalies. The background noise for images was zoomed out to remove the unnecessary features and to overcome the dropouts. Further, the convolution layers were used to make clarification and diagnosis of diseases with similarity scores and dissimilarities.

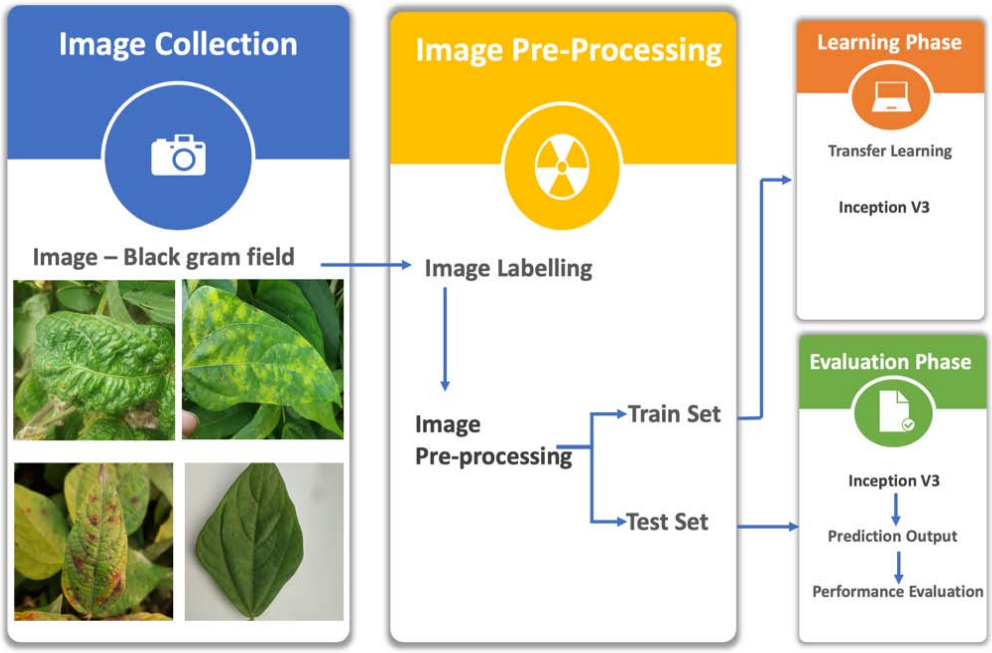


Figure 1: The Diagram to Identify Black Gram Disease

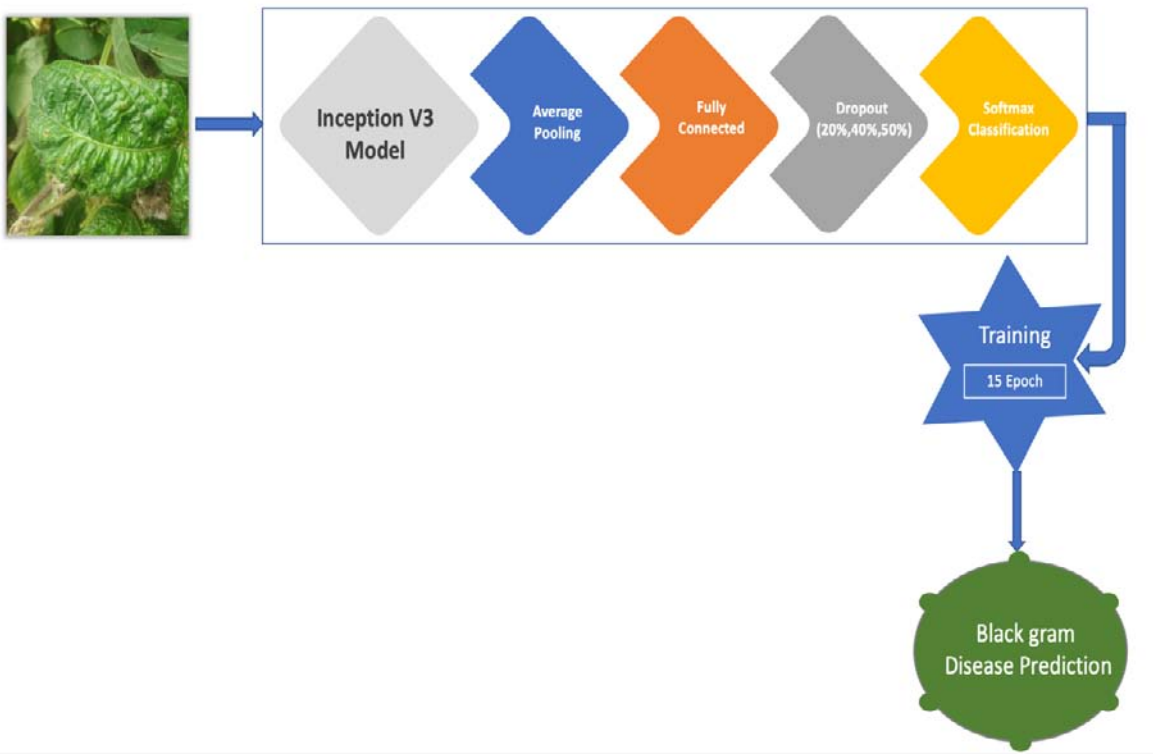


Figure 2: CNN Architecture for the Pre-Trained Model for Black Gram Disease Diagnosis

c) Application of Convolution Layers

In this layer, the filters or kernels were used to extract the features from the black gram images by moving the kernel over the images, and with the features, feature maps were created. Back propagation techniques were used with filters and weights. In this layer, the number of parameters was reduced to maintain the network efficiency.

i. *Batch Normalization Layers*

In this layer data were broken down into mini batches during normalization, to reduce the complexity

of the system. In this layer the speed-up process was initiated for training deep neural network features z is re-measured with the equation

$$z^{(i)}_{norm} = \frac{z^{(i)} - \mu_B}{\sqrt{\sigma_B^2 - \varepsilon}} \quad (1)$$

where

ε = Very Small Positive Number

μ_B = Average of Mini Batch Mean

σ_B^2 = Mini Batch Variance

The value of z in the first layer is calculated according to the equation

$$z = \omega x + b \quad (2)$$

where

x = The Value of Input Features

b = Bias

To scale and shift the normalized input g and b are added, learning using the network parameters through equation

$$\widetilde{z^{(i)}} = \gamma z^{(i)}_{norm} + \beta \quad (3)$$

ii. *Activation Layers*

In this layer, the activation function was used to speed up the arithmetic operation without exploiting the problems. Rectified Linear Unit (ReLU) was used as the basic activation function $\tilde{z}$ using a mathematical model

$$a = \max(0; \tilde{z}) \quad (4)$$

The final activation function was used as the output for the last dense layer. The prediction probabilities were 0, 1, 2, 3, 4 for multiple classifications. The soft Max function was used for the decimal probabilities of each class. It was calculated from output i with the equation

$$a^{(i)} = \frac{e^{z(i)}}{\sum_i^m e^{z(i)}} \quad \text{for i=1,2,3 …m.} \quad (5)$$

where z (i) = the output of the i dimension

a(i) = probability related to i class

m = number of dimensions with respect to the number of classes

The class with the highest probability, while predicting by the method was as described below.

$$\hat{y}_i = \max a^{(i)} \quad (6)$$

$$i\varepsilon\ [l, m]$$

Pooling Layers

In these layers, the dimension of feature maps was reduced, selecting the important features created by the convolution layers. There were two poolings: average and maximum pooling. In our model, average pooling, which takes the average value of each feature map, was used.

iii *Fully Connected Layers*

In these layers, there were neurons and the last layer of the neural network. With the input, the final output of the pooling or convolution layers is turned into a single vector by means of the flattened layer. The prediction was done using weights, and the final probabilities were given by the dense layer. The number of parts in the last dense layer which corresponds to the number of classes.

iv *Dropout Layer*

This layer was used to regularize the neural network and to avoid over fitting by deleting the portion of incoming neurons and their connection.

d) Functions and Optimizations

i. *Loss Function*

This was also called as cost function. The cross-entropy was to find the loss between actual output y and the expected output $\hat{y}$ Cross entropy for multiple classifications was calculated using the equation

$$L_{\text{cross\_entropy}\ (\hat{y},y)} = -\sum_{j=0}^{K} y_j \log(\hat{y}_j) \qquad for\ j = 1,\ 2,\ 3 \ldots k \quad (7)$$

k= Number of Classes

ii. *Optimization Function*

The optimization function was used to reduce the loss function; the Adam optimizer was used in this model. Weights were learned adaptively by Adam Optimizer.

e) Assessment and Evaluation

i. *Application of Inception V3 Models*

In the research paper, Inception V3 was used for pre-training the models. Inception V3 was an additional design for CNN developed by Google. Inception starts with a sparse structure, increases the network depth and width, and clusters the spare data into a dense structure to enhance the model accuracy [26].

Transfer the learning of plant pathology data to the Inception V3 model pre-trained on Image Net data to speed up the training process and to improve the model performance; the Inception V3 model has 94 convolution layers, 14 pooling, and dense layers [25].

Transfer of learning, pre-trained CNN model includes feature extraction and fine-tuning to achieve the best results. In this paper, feature extraction was first used to train the new classifier, and the model was fine-tuned. Inception V3 was trained using training parameters (Table 3).

Table 3: Parameters Value to Build Black Gram Disease Diagnosis for CNN Models

Parameter	Value
Batch Size	32
Dropout	20%, 40%, and 50%
Activation function	ReLU, SoftMax
Optimizer	Adam
CNN Training	
Epoch	15
Epoch Learning Rate	0.001

In the research paper, average pooling, dense layer, and SoftMax were added as the activation function for the last layer. The dropout rate was used to train the model. The next step was determining the learning rate, and Adam was used as an optimizer. The epochs specified were 15 for the training set. The Inception V3 model consists of 21,768,352 trainable parameters during CNN training. The Inception V3 model used to diagnose black gram diseases is summarized in Table 4.

Table 4: Summary of Blackgram Disease Diagnosis using Inception V3 Models

Type of Layer	Output Shape	Parameters
Input	(224, 224, 3)	0
Sequential	(224, 224, 3)	0
Functional (Inception V3)	(5, 5, 192)	393216
Average Pooling	(5, 5, 1280)	0
Dropout	(5, 5, 1280)	0
Dense	(0,3)	512
Total parameters	21,802,784	
Trainable parameters	21,768,352	
Non-trainable parameters	34,432	

CNN has numerous parameters, so there was a possibility of overfitting issues, which can be solved through the dropout procedure. Dropout was a method of randomly disconnecting that can separate connections across different nodes and had a 1-p dropout probability. The dropout layer increases the algorithm's robustness while reducing the number of model parameters. The random inactivation layer enhances the robustness of the network structure and helps to prevent overfitting in the model [26]. Dropout has recently been utilized to reduce overfitting in deep neural networks. Dropout disabled certain neurons in each layer during each epoch, and the remaining neurons were used for forward and backward propagations. As a result, the active neurons were motivated to extract the needed features independently and successfully without the assistance of inactive ones. In this research, dropout rates were 20 percent, 40 percent and 50 percent were studied. Assessment indicators used for the classification of disease diagnosis were accuracy and confusion matrix for comparing models when training and testing the image dataset used. The confusion matrix is a table that shows the classification model performance on the test image set by matching the actual output and expected outputs to identify the correct disease diagnosis. The accuracy is the percentage of valid predictions from the forecast made as per the equation listed below and expressed in percentage.

$$\text{Accuracy} = \frac{\text{Number of correct prediction}}{\text{Total number of prediction}} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}} \quad (8)$$

where TP = True Positive
TN = True Negative
FP = False Positive, and
FN = False Negative

III. Experimental Results

CNN model mentioned in Section 2.5 is trained using the parameters in Table 3 with dropout ratios. The model was compared with accuracy and loss while training and testing, as listed in Table 5. From the table, Inception V3's 20 percent dropout rate was the best model when compared with the 40 percent. The percentage the accuracy of the 20 percent dropout was 99.22 percent, and the loss was 0.0249. The actual and predicted result using CNN is shown in Figure 3. The confusion matrix for the model used by different dropouts is depicted in Figure 4. The changes both in the accuracy and loss of the models used in 20 percent, 40 percent, and 50 percent dropouts were shown in Figure 5. Furthermore, the results suggested that models used in the various study dropouts had an excellent ability to discriminate against black gram diseases. Therefore, based on this empirical analysis, we concluded that the models used in different study dropouts were effective in identifying black gram diseases. This study can be extended for the diagnosis of other plant diseases.

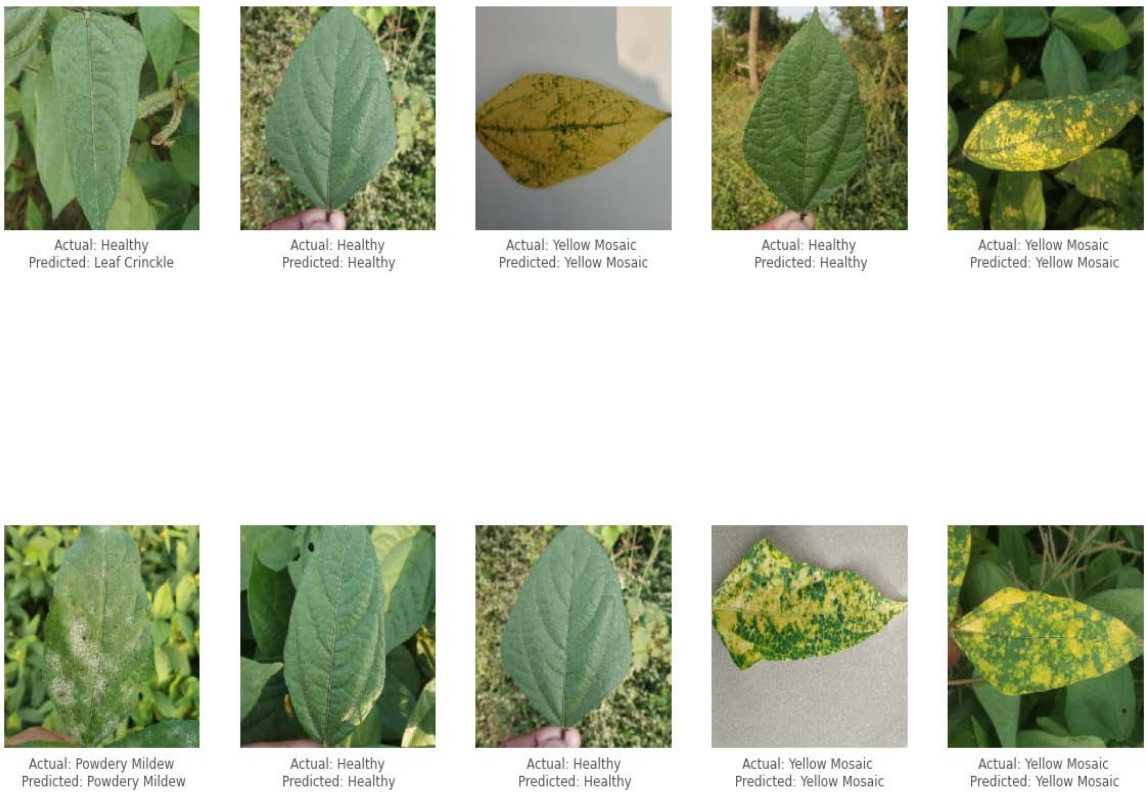
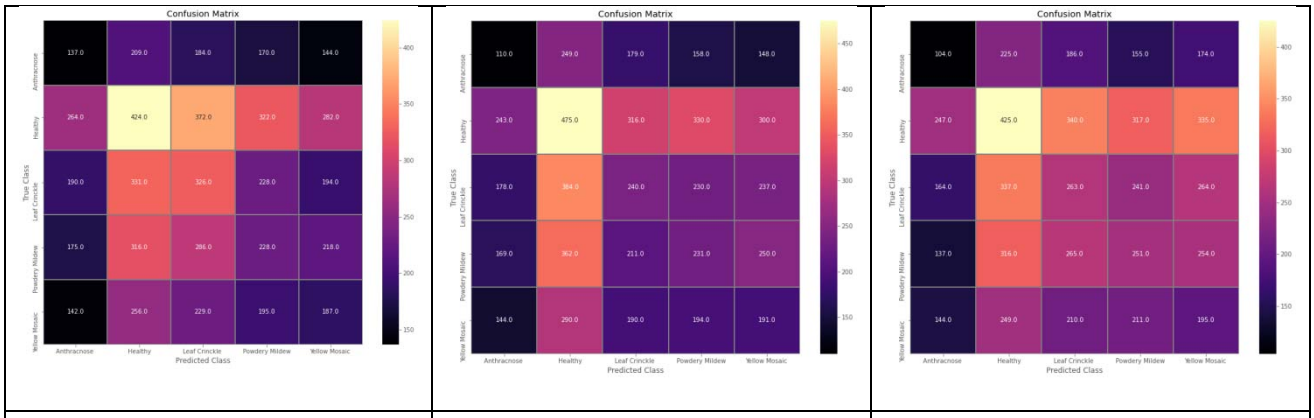


Figure 3: The Actual and Predicted Result using CNN

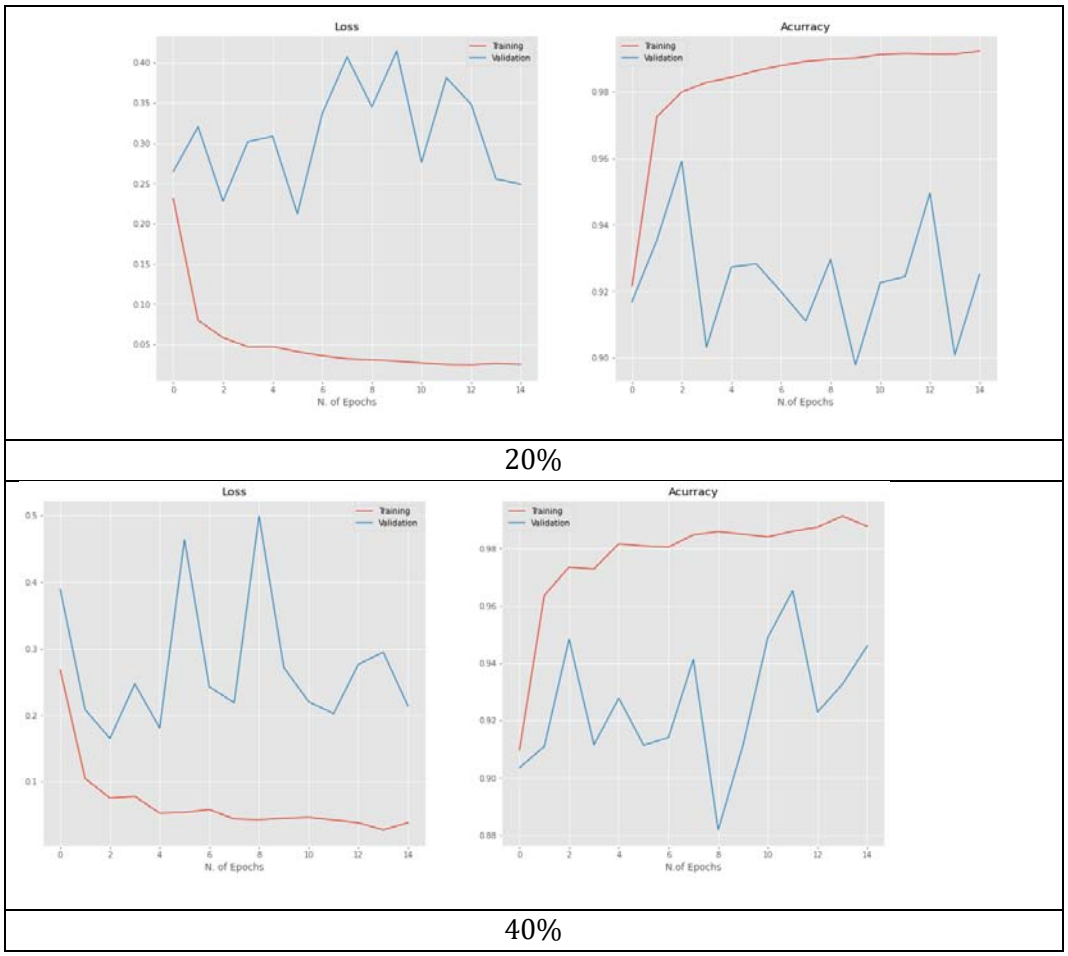
Table 5: Accuracy and Loss for the Training, and testing Phases of the Inception V3 Model

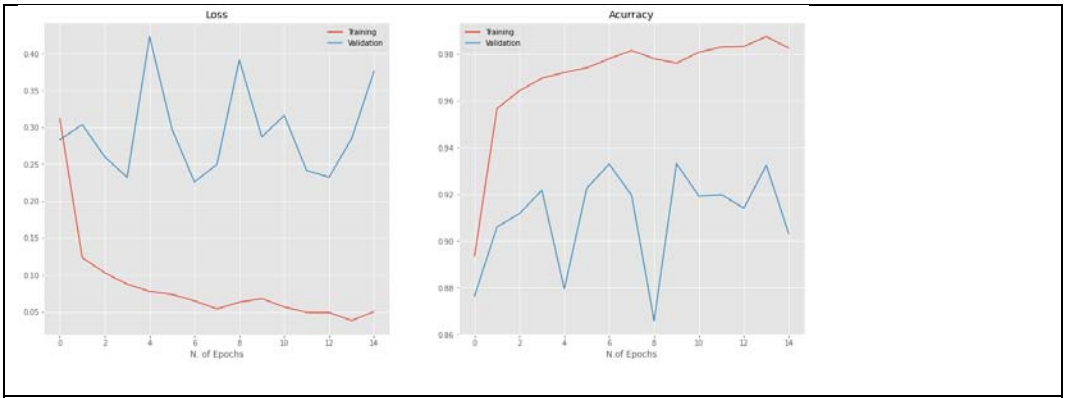
Drop Out (%)	Train		Test	
	Accuracy (%)	Loss	Accuracy (%)	Loss
20	99.22	0.0249	92.51	0.2491
40	98.77	0.0384	94.60	0.2132
50	98.27	0.0506	90.32	0.3762



20%	40%	50%

Figure 4: Confusion Matrix of Black Gram Leaf Disease for Inception V3 Model with 20%, 40%, and 50% Dropout Values





50%

Figure 5: The Relationship between Accuracy and Loss with the Number of Epochs for the Image Dataset for the Inception V3 Model with 20%, 40%, and 50% Dropout Values

IV. Discussion

The Inception V3 model was employed in this study to diagnose foliar diseases in black gram. Relevant literature was reviewed, and the performance of the Inception V3 model was compared with existing methods. The resulting accuracy obtained is highlighted in Table 6. Deep learning models such as DenseNet, ResNet, and GoogleNet were used to detect tomato diseases [29-33]. The results obtained using these models ranged between 91 percent to 97 percent accuracy. From the proposed model, the obtained accuracy was higher at 99.22 percent. Hence, it was evident that this model had significant improvement compared to other models, as shown in Table 6.

Table 6: Performance of the Proposed Model with other Existing Models Employed

S. No.	Author (s)	Method	Image Number	Image Source	Accuracy (%)
1.	Agarwal et al. (2020)[25]	CNN network	17,500	Plant Village	91.20
2.	Prajwala Tm et al.(2018) [26]	LeNet based CNN	18,160	Plant Village	95
3.	Widiyanto et al.(2019) [24]	CNN model	5000	Plant Village	96.60
4.	Keke Zhang et al.(2018)[23]	ResNet	5550	Plant Village	97.28
5.	Proposed model	Inception V3	27376	TNAU field	99.22

V. Conclusions

Detection and diagnosis of plant diseases at their earlier stages play a superior role in disease management in crop protection. Keeping this strategy, this work was framed and carried out using deep learning algorithms to diagnose foliar diseases in black gram. This work entirely depends on deep neural networks and their efficacy in image processing, assessment of accuracy, and evaluation. Inception V3 models were used to retrain the transfer learning. The last layer of the models is removed and replaced with average pooling, fully connected, and softmax, respectively. Different dropout rates were used, such as 20 percent, 40 percent, and 50 percent. The experimental results showed that a high degree of accuracy was obtained in diagnosing diseases in black gram using deep learning algorithms. It was reported that a high degree of accuracy of 99.22 percent and a reported loss of 0.0249 percent were obtained in this study by using deep learning algorithms. Further, the image dataset can be expanded for more accurate and high-end results. Future investigation of this research will focus on diagnosing other plant diseases.

Acknowledgment

I want to express my deepest gratitude to the authors of Saeed, A.; Abdel-Aziz, A. A.; Mossad, A.; Abdelhamid, M. A.; Alkhaled, A.Y.; Mayhoub, M for their valuable research inputs in the paper Smart Detection of Tomato Leaf Diseases Using Transfer Learning-Based Convolutional Neural Networks.

References Références Referencias

1. Buja, I., Sabella, E., Monteduro, A. G., Chiriaco, M. S., De Bellis, L., Luvisi, A.,Maruccio, G.: Advances in plant disease detection and monitoring: from traditional assays to in-field diagnostics. Sensors, 21(6), 2129, (2021) http://doi.org/10.3390/s21062129.
2. Zhang, N., Yang, G., Pan, Y., Yang, X., Chen, L, Zhao, C.: A review of advanced technologies and development for hyperspectral-based plant disease detection in the past three decades. Remote Sensing, 12 (19), 3188, (2020). https://doi.org/10.3390/rs12193188.
3. Rubio, L.; Galipienso, L.; Ferriol, I. Detection of plant viruses and disease management: relevance of

genetic diversity and evolution. Frontiers in Plant Science, 11, 1-23, (2020). https://doi.org/10.3389/fpls.2020.01092.
4. Fang, Yi.; Ramasamy, R. P. Current and prospective methods for plant disease detection. Biosensors, 5 (3), 537–561, (2015). https://doi.org/10.3390/bios5030537.
5. Orchi, H.; Sadik, M.; Khaldoun, M.; Sabir, E. Automation of crop disease detection through conventional machine learning and deep transfer learning approaches. Agriculture,13, 1-35, (2023).
6. Altalak, M.; Ammaduddin, M.; Alajmi, A., Rizg, A. Smart agriculture applications using deep learning technologies: a survey. Applied Sciences, 12 (12), 5919, (2022). https://doi.org/10.3390/app12125919.
7. Anne-Katrin, M. Plant disease detection by imaging sensors-parallels and specific demands for precision agriculture and plant phenotyping. Plant Disease, 100 (2), 241-541, (2016).
8. Mamat, N.; Othman, M. F.; Abdoulgha for, R.; Belhaouari, S. B.; Mamat, N.; Hussein, S. H. F. Advanced technology in agriculture industry by implementing image annotation technique and deep learning approach: a review. Agriculture, *12* (7), 1033, (2022). https://doi.org/10.3390/agriculture12071033.
9. Yamashita, R.; Nishio, M.; Gian Do, R. K.; Togashi, K. Convolutional neural networks: an overview and application in radiology. Insights into Imaging, 9, 611-629, (2018).
10. Boulent, J.; Foucher, S.; Theau, J.; St-Charles, P. Convolutional neural networks for the automatic identification of plant diseases. Frontiers in Plant Science, 10, 1-15, (2019). https://doi.org/10.3389/fpls.2019.00941.
11. Andrew, J.; Eunice, J.; Popescu, D. E.; Kalpana Chowdary, M.; Hemnath, J. Deep learning-based leaf disease detection in crops using images for agricultural applications. Agronomy, *12* (10), 2395, (2022). https://doi.org/10.3390/agronomy12102395.
12. Saleem, M. H.; Potgieter, J. Arif, K. M. Plant disease detection and classification by deep learning. Plants, 8 (11), 468, (2019). http://doi.org/10.3390/plants8110468.
13. Talasila, S.; Rawal, K.; Sethi, G.; Sanjay, M. S. S.; Surya Prakash, R. M. Blackgram plant leaf disease (BPLD) dataset for recognition and classification of diseases using computer-vision algorithms. Data in Brief, 45, 1-10, (2022).
14. Ahmad, A.; Saraswat, D.; El Gamal, A. A survey on using deep learning techniques for plant disease diagnosis and recommendations for development of appropriate tools. Smart Agricultural Technology, 3, 1-13, (2023).
15. Daryanto, S.; Wang, L.; Pierre-Andre, J. Global synthesis of drought effects on food legume production. PLoS One, 10 (6), e0127401, (2015). http://doi.org/10.1371/journal.pone.0127401.
16. Ajaykumar, R.; Prabakaran, P.; Sivasabari, K. Growth and yield performance of blackgram (Vigna mungo L.) under Malabar neem (Melia dubia) plantations in western zone of Tamil Nadu. Legume Research, 45 (2), 182-188, (2022). http://doi.org/10.18805/LR-4658.
17. Nazarov, P. A.; Baleev, D. N.; Ivanova, M. I.; Sokolova, L. M.; Karakozova, M. V. Infectious plant diseases: etiology, current status, problems and prospects in plant protection. Acta Naturae, 12 (3), 46-59, (2020). http://doi.org/10.32607/actanaturae.11026.
18. Punam, B.; Gole, P. Plant disease detection using hybrid model based on convolutional autoencoder and convolutional neural network. Artificial Intelligence in Agriculture, 5, 90-101, (2021).
19. Reshmi, A. M.; Prasidhan, P. Leaf disease detection using CNN. International Journal of Creative Research Thoughts,10 (3), f235-f41, (2022).
20. Aggarwal, S. K.; Mali, B. M.; Rawal, P. Management of anthracnose in black gram caused by Colleto trichum lindemuthianum. Journal of Mycology and Plant Pathology, 45 (3), 263-266, (2015).
21. Karthikeyan, A.; Akilan, M.; Samyuktha, S. M.; AriharaSutharsan, G.; Shobana, V. G.; Veni, K.; Tamilzharasi, M.; Keerthivarman, K.; Sudha, M.; Pandiyan, M.; Senthil, N. Untangling the physio-chemical and transcriptional changes of black gram cultivars after infection with Urdbean leaf crinkle virus. Frontiers in Sustainable Food Systems, 6, 1-11, (2022). https://doi.org/10.3389/fsufs.2022.916795.
22. Jeyasekhar, M.; Ebenezar, E. G. Management of powdery mildew of black gram (Vigna mungo) caused by Erysiphe polygoni. Agricultural Science Digest, 36 (1), 72-74, (2016).
23. Kothandaraman, S.V.; Alice, D.; Malathy, V. G. Seed-borne nature of a begomovirus, mung bean yellow mosaic virus in black gram. Applied Microbiology and Biotechnology, 100, 1925-1933, (2016). http://doi.org/10.1007/s00253-015-7188-7.
24. Darwish, A.; Ezzat, D.; Hassanien, A. E. An optimized model based on convolutional neural networks and orthogonal learning particle swarm optimization algorithm for plant diseases diagnosis. Swarm and Evolutionary Computation., 52, 100616, (2020). https://doi.org/10.1016/j.swevo.2019.100616
25. Chen, J.; Chen, J.; Zhang, D.; Sun, Y.; Nanehkaran, Y. A. Using deep transfer learning for image-based plant disease identification. Computers and Electronics in Agriculture., 173, 105393, (2020). https://doi.org/10.1016/j.compag.2020.105393.
26. Al Husaini M. A. S.;Habaebi, M. H.; Gunawan, T. S.; Islam, M. R., Elsheikh, E. A. A.; Suliman, F. M.

Thermal-based early breast cancer detection using inception V3, inception V4 and modified inception MV4. Neural Computing and Applications., 34, 333–348, (2022). https://doi.org/10.1007/s00521-021-06372-1.

27. Szegedy, C.;Vanhoucke, V.;Ioffe, S.;Shlens, J.;Wojna, Z. Rethinking the inception architecture for computer vision. arXiv., 1512.00567, (2015). https://doi.org/10.48550/arXiv.1512.00567.
28. Munir, N.; Kim, H.-J.; Song, S.-J.; Kang, S.-S. Investigation of deep neural network with drop out for ultrasonic flaw classification in weldments. Journal of Mechanical Science and Technology, 32, 3073–3080, (2018). https://doi.org/10.1007/s12206-018-0610-1
29. Zhang, K.; Wu, Q.; Liu, A.; Meng, X. Can deep learning identify tomato leaf disease? Advances in Multimedia, 6710865, (2018). https://doi.org/10.1155/2018/6710865.
30. Widiyanto, S.; Fitrianto, R.; Wardani, D. T. Implementation of convolutional neural network method for classification of diseases in tomato leaves. In: Proceedings of the 2019 Fourth International Conference on Informatics and Computing (ICIC), Semarang, Indonesia, pp. 1–5, 16–17 October (2019). http://doi.org/ 10.1109/ICIC47613.2019.8985909.
31. Agarwal, M.; Singh, A.; Arjaria, S.; Sinha, A.; Gupta, S. ToLeD: Tomato leaf disease detection using convolution neural network. Procedia Computer Science, 167, 293–301, (2020). https://doi.org/10.1016/j.procs.2020.03.225.
32. Tm, P.; Pranathi, A.; SaiAshritha, K.; Chittaragi, N.B.; Koolagudi, S.G. Tomato leaf disease detection using convolutional neural networks. In: Proceedings of the 2018 Eleventh International Conference on Contemporary Computing (IC3), Noida, India, pp. 1–5, 2–4 August (2018). http://doi.org/10.1109/IC3.2018.8530532.
33. Kalpana, M., Karthiba, L., Senguttuvan, K. and Parimalarangan, R.. Diagnosis of Major Foliar Diseases in Black gram (Vigna mungo L.) using Convolution Neural Network (CNN). Legume Research, (2023). doi:10.18805/LR-5083.

This page is intentionally left blank

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Survey: Artificial Intelligence Ethics

By Shuxi Wang & Zengyan Xia

University of Agricultural

Abstract- Artificial Intelligence Ethics is playing an important role with the development of Artificial Intelligence (AI). It is popular recognized that obeying to Artificial Intelligence Ethics guidelines and principles may resolve so many problems caused by Artificial Intelligence. This paper reviewed the development history of Artificial Intelligence Ethics, listed the main guidelines and principles of Artificial Intelligence Ethics, proposed the methods of Artificial Intelligence Ethics governance, discussed related algorithms to solve Artificial Intelligence Ethics problems.

Keywords: artificial intelligence; artificial intelligence ethics; artificial intelligence ethics guidelines and principles; artificial intelligence ethics algorithms; artificial intelligence ethics governance.

GJCST-G Classification: ACM Code: I.2.11

Strictly as per the compliance and regulations of:

Survey: Artificial Intelligence Ethics

Shuxi Wang [α] & Zengyan Xia [σ]

Abstract- **Artificial Intelligence Ethics is playing an important role with the development of Artificial Intelligence (AI). It is popular recognized that obeying to Artificial Intelligence Ethics guidelines and principles may resolve so many problems caused by Artificial Intelligence. This paper reviewed the development history of Artificial Intelligence Ethics, listed the main guidelines and principles of Artificial Intelligence Ethics, proposed the methods of Artificial Intelligence Ethics governance, discussed related algorithms to solve Artificial Intelligence Ethics problems.**

Keywords: artificial intelligence; artificial intelligence ethics; artificial intelligence ethics guidelines and principles; artificial intelligence ethics algorithms; artificial intelligence ethics governance.

I. Introduction

With the development of Artificial Intelligence, more and more ethical problems are caused by Artificial Intelligence, and Artificial Intelligence Ethics are drawing more and more attention.

To solve Artificial Intelligence Ethics problems, this paper reviewed the development history of Artificial Intelligence Ethics, listed the main guidelines and principles of Artificial Intelligence Ethics, proposed the methods of Artificial Intelligence Ethics governance, discussed related algorithms to solve Artificial Intelligence Ethics problems.

Artificial intelligence ethics is not only a social problem, but also a philosophical problem. This paper has the viewpoint that Artificial intelligence ethics should be computed. This paper attempt to use mathematics and algorithms to solve Artificial intelligence ethics problems. In this paper, one Artificial Intelligence Ethics model will be proposed to solve Artificial intelligence ethics problems.

II. What is Artificial Intelligence Ethics

Artificial intelligence ethics is an academic hotspot. Artificial intelligence ethics mainly include the following aspects: (1) Whether or not Artificial Intelligence should own moral awareness. (2) Whether or not Artificial Intelligence should own the sense of responsibility. (3) Should Artificial Intelligence make moral and ethical judgments regarding decisions related to human life and safety. (4) If Artificial Intelligence can learn and create independently, should Artificial Intelligence own intellectual property rights. (5) Whether or not the application of Artificial Intelligence meets ethical and moral standards. For example, whether the weaponization of artificial intelligence is acceptable.

The debate in the academic community regarding the moral judgment of artificial intelligence requires distinguishing between two issues: first, the moral evaluation of artificial intelligence itself; Secondly, the evaluation of the good and evil consequences of the development and application of artificial intelligence. The key issue of moral judgment on artificial intelligence has not been resolved, that is, the issue of evaluating the good and evil of artificial intelligence itself has not been distinguished from the evaluation of the good and evil of the consequences of the development and application of artificial intelligence. The key to solving the latter problem still lies in humanity itself. However, in order to solve the previous problem, we cannot judge it based on the existing ethical and moral framework, but should critically reflect on traditional technological ethics.

Overall, there are three main positions and viewpoints in the academic community.

a) *The First Optimistic Stance*

Experts and scholars who hold this position believe that artificial intelligence is just a means and tool, and it does not matter whether it is good or bad. The key lies in the human beings who use it. They hold an optimistic attitude towards the future development prospects of artificial intelligence. Overall, the research and widespread application of artificial intelligence have more advantages than disadvantages for human development, and can generate huge economic and social benefits.

Generally speaking, the optimistic stance is mostly upheld by some artificial intelligence professionals who are related to the research and application of artificial intelligence, or consider their own interests, or by scientists who blindly worship science and technology. Its flaw lies in the one-sided and isolated view of the positive aspects of artificial intelligence, such as its ability to generate huge economic and social benefits, reconstruct almost all industries including finance, healthcare, education, transportation, etc., and promote overall changes in human lifestyles. They intentionally or unintentionally ignore or conceal the negative effects of artificial intelligence, such as the emergence of killer robots that will pose a security threat to humanity and the potential

Author α: Faculty of School of Information Technology & Management, University of International Business and Economics Beijing, China.
e-mail: wangshuxi@uibe.edu.cn
Author σ: Faculty of School of Humanities, Beijing University of Posts and Telecommunications Beijing, China.
e-mail: minmin.xia@163.com

degradation of human civilization caused by excessive reliance on artificial intelligence.

b) The Second Type of Neutral Stance

Experts and scholars who hold this position acknowledge that artificial intelligence itself has the potential to "do evil", and its research and application pose a potential threat to humanity and may bring serious consequences. However, for some reasons, they still strongly support the development of artificial intelligence technology.

Artificial intelligence is currently in its early stages of development, and its harm is far from strong enough, so there is no need to worry too much;

For example, Tom Austin, a global leading analyst in the field of artificial intelligence, stated that Hawking's warning that "the complete development of artificial intelligence will lead to the complete destruction of humanity" is "very foolish", citing the reason that "artificial intelligence is still very low-level".

"Artificial things cannot surpass humans";

This viewpoint stems from a certain religious sentiment, which states that "the Creator is always superior to what he has created," so there is no need to worry excessively. It is ironic that the scientists who should have had the most atheistic spirit seek intellectual resources from religious beliefs.

Human beings can set moral standards for artificial intelligence, but there has never been an effective argument that artificial intelligence will inevitably comply with the moral standards set by humans;

Some people believe that as long as moral education is provided to artificial intelligence, it can ensure that they are dedicated to goodness and serve humanity wholeheartedly. However, the question is how moral education can prevent artificial intelligence from developing in an unethical direction.

c) The Third Pessimistic Stance

Experts and scholars who hold this position believe that artificial intelligence is no longer a tool. It has a sense of life and learning ability, and has two moral possibilities of "doing evil": one is that the powerful power of artificial intelligence may trigger "human evil", and the other is that artificial intelligence itself has the ability to "do evil", and humans cannot cope with the "evil" of artificial intelligence, ultimately leading to nothingness and destruction. Therefore, they expressed concerns that artificial intelligence may lose control or harm humanity in the future. In early 2015, Stephen Hawking, Bill Gates, Elon Marks, and others signed an open letter calling for control over artificial intelligence development. Max believes that artificial intelligence can "summon demons", posing a greater threat to humanity than nuclear weapons. Hawking explicitly asserts that the complete development of artificial intelligence may lead to the extinction of humanity. People who hold a pessimistic stance believe that technology is not the path to human liberation. It is "not liberated from nature by controlling it, but rather a destruction of nature and humans themselves. The process of constantly killing living beings will ultimately lead to overall destruction."

In the application of Artificial Intelligence, balancing the development of technology with ethical and moral standards is an important issue. We need to consider technological innovation and development, while also paying attention to the interests and rights of society and humanity. For example, in the field of autonomous driving, it is necessary to consider vehicle safety and pedestrian safety, establish sound safety standards and regulations, and strengthen the supervision and management of artificial intelligence to avoid safety and ethical issues.

Dealing with ethical issues related to Artificial Intelligence requires multifaceted work and measures. Firstly, we need to strengthen research and discussion on ethical issues related to artificial intelligence, and establish ethical and moral standards for artificial intelligence. Secondly, it is necessary to strengthen the supervision and management of artificial intelligence, standardize its application and development, and prevent safety and ethical issues from arising. In addition, it is necessary to strengthen public participation and supervision, establish a sound feedback mechanism, and ensure the safety and ethics of Artificial Intelligence.

Artificial intelligence ethics must conform to human morality: not infringing on privacy, not harming humanity, not influencing the political situation, especially in the field of AI weapons, more caution should be exercised.

In short, the development and application of Artificial Intelligence will inevitably face ethical and moral challenges. We need to strengthen research and discussion on artificial intelligence, establish ethical and moral standards for artificial intelligence, and strengthen supervision and management of artificial intelligence to avoid safety and ethical issues. In the long run, only by achieving a balance between technological development and ethical standards can the sustainable development and application of artificial intelligence technology be achieved.

III. The Principles of Artificial Intelligence Ethics

Artificial intelligence ethics must ensure that AI does not make decisions that contain bias or discrimination, and establish mechanisms to interrogate AI to ensure that they comply with human ethical standards. Serving the interests of humanity and never harming humanity. The principles of Artificial Intelligence Ethics includes:

1. Developing artificial intelligence is for the common benefit of humanity.

2. Artificial intelligence should ensure fairness and be easy to understand.
3. Artificial intelligence should not be used to infringe on people's privacy.
4. All citizens have the right to receive education, enabling them to prosper and develop spiritually, emotionally, and economically alongside artificial intelligence.
5. Artificial intelligence should not be endowed with the autonomy to harm, destroy, or deceive humans.

Artificial intelligence is not without risks, and the formulation of these principles helps to mitigate risks. If there are methods to prevent the misuse of artificial intelligence technology, the public will trust AI more and better apply this technology.

AI will eliminate old jobs and create new ones. During the transition from old to new, the government must do a good job in vocational re-education to ensure that those who have been robbed of their jobs find new jobs.

IV. Specific Artificial Intelligence Ethical Implications

Artificial Intelligence ethics include so many aspects. The following are some specific Artificial Intelligence ethical implications.

Medical Field

With the rapid development of technology, artificial intelligence technology has made breakthrough applications in the medical field. The development of artificial intelligence technologies such as artificial intelligence assisted diagnosis, intelligent drug design, and artificial intelligence assisted surgery has brought unprecedented development opportunities to the medical industry. However, the development of artificial intelligence in the medical field has also brought ethics and challenges. How to ensure that the use of artificial intelligence in the medical field does not cause potential harm to human health has become an urgent issue that needs to be addressed.

The basic principles and applications of artificial intelligence in the medical field.

a) The basic principles of artificial intelligence in the medical field.

Artificial intelligence (AI) technology is the ability to simulate human intelligent activities and achieve certain tasks. Its core is based on algorithms and big data, using techniques such as deep learning and machine learning to enable computers to recognize, analyze, and process large amounts of data, thereby achieving the acquisition, understanding, and application of information.

Harmful effects: exploring the ethics and challenges of artificial intelligence in the medical field.

The application of artificial intelligence in the medical field mainly includes the following aspects:

1. *Auxiliary Diagnosis*

By analyzing a large amount of medical data, artificial intelligence can assist doctors in disease diagnosis and improve the accuracy of diagnosis. For example, artificial intelligence can recognize and analyze medical images through technologies such as depth learning, assist doctors in detection and localization, and reduce surgical risks.

2. *Intelligent Drug Design*

Artificial intelligence can assist scientists in drug development, improving drug efficacy and reducing drug side effects. By deeply mining a large amount of bioinformatics data, artificial intelligence can predict the molecular structure and properties of drugs, providing scientists with targeted directions for drug development.

3. *Artificial Intelligence Assisted Surgery*

Artificial intelligence can assist doctors in surgical simulation and planning, improving the safety and efficiency of surgery. For example, artificial intelligence can provide real-time feedback to doctors by simulating surgical scenarios, assisting them in performing precise operations during the surgical process and reducing surgical risks.

The Ethics and Challenges of Artificial Intelligence in the Medical Field.

b) Privacy Protection

The data in the medical field is highly sensitive and involves patient privacy information. The application of artificial intelligence in the medical field requires strict protection of patient privacy to avoid the leakage of patient personal information.

1. *Data Security*

In the medical field, artificial intelligence needs to process a large amount of data, including sensitive information such as patient medical records, images, genes, etc. The confidentiality and security of these data are crucial, and artificial intelligence enterprises need to take strict security measures to ensure that these data will not be leaked during transmission, storage, and use.

2. *Anonymity*

In the medical field, artificial intelligence needs to process a large amount of anonymous data, such as patient medical records, medication usage records, etc. Although these data do not contain personal identification information, they are still sensitive. Therefore, artificial intelligence enterprises need to adopt strict policies and measures to ensure the security and confidentiality of these anonymous data.

c) Moral Responsibility

The application of artificial intelligence in the medical field has a strong moral responsibility. The

development of artificial intelligence technology requires adherence to ethical standards and respect for human dignity and rights.

1. *Respect Individual Rights*

The application of artificial intelligence in the medical field may have an impact on the personal rights of patients, such as infringement of patient privacy and leakage of genetic information. Therefore, artificial intelligence enterprises need to respect the individual rights of patients, protect their dignity and privacy.

2. *Adhere to ethical standards*

The application of artificial intelligence in the medical field requires adherence to medical ethical standards, respect for medical ethics and professional ethics. For example, artificial intelligence technology needs to ensure that there is no misdiagnosis or missed diagnosis in the detection and positioning process, to avoid unnecessary harm to patients.

d) Publicity

The application of artificial intelligence in the medical field needs to ensure fairness and avoid unfair distribution of medical resources due to factors such as race and gender.

1. *Public Allocation of Medical Resources*

The application of artificial intelligence in the medical field needs to follow the principle of public allocation of medical resources, ensuring that everyone can access public and reasonable medical resources.

2. *Oppose Discrimination*

The application of artificial intelligence in the medical field needs to oppose discrimination and ensure that everyone can receive equal medical treatment.
Harmful effects: exploring the ethics and challenges of artificial intelligence in the medical field.

The use of artificial intelligence in the medical field has great potential and development space. However, in order to ensure that the use of artificial intelligence in the medical field does not cause potential harm to human health, it is necessary to comply with relevant ethical standards and legal regulations. Artificial intelligence enterprises need to shoulder moral responsibilities, protect the privacy and dignity of patients, ensure the allocation of public medical resources, and make positive contributions to human health and the development of the medical industry.

Field of Human Rights

The risks of basic rights include personal data and privacy protection, as well as non-discrimination. The use of artificial intelligence may affect the fundamental values of the European Union and lead to the infringement of fundamental rights, including freedom of speech, freedom of assembly, human dignity, non-discrimination based on gender, race or ethnicity, freedom of religious belief, or non-discrimination based on disability age, sexual orientation (applicable in certain fields), protection of personal data and private life, and the right to effective judicial remedies and fair trials, and consumer protection rights, etc. These risks may be due to flaws in the overall design of artificial intelligence systems (including human supervision), or may be due to possible biases not being corrected when using data (for example, the system only uses or primarily uses data from men for training, resulting in poor results related to women).

Prejudice and discrimination are inherent risks in any social or economic activity. Human decision-making cannot avoid errors and biases. However, when the same bias appears in artificial intelligence, it may have a greater impact, and without social governance mechanisms that control human behavior, it can affect and discriminate against many people. This situation also occurs when artificial intelligence systems are "learning" during operation.

Field of War

For a long time, discussions on the application of artificial intelligence in military have been limited to autonomous weapons and the ethical issues they bring. With the development of technology, attention should now be paid to the impact of artificial intelligence on security and other aspects of the military field.

Artificial intelligence is greatly changing the civilian sector, such as improving efficiency, reducing costs, and automating processes, and the military will also usher in an AI revolution.

At present, all countries must obtain human permission before using weapons, which is also in line with human values. However, what problems will occur when opponents deploy autonomous weapons without human permission needs to be urgently discussed.

There is reason to believe that even countries that have imposed some restrictions on artificial intelligence capabilities will encounter such opponents, which puts the countries that have imposed restrictions at a disadvantage. Therefore, countries must have a comprehensive understanding of what artificial intelligence can do.

Although autonomous weapons have attracted a lot of attention, most conversations about this technology are negative, leading people to overlook the positive applications of artificial intelligence in areas such as military protection and reducing civilian casualties.

The Advantages of Artificial Intelligence

Artificial intelligence has broad application potential in optimizing human-machine collaboration in fields such as command chain communication and logistics, as well as predicting opponent maneuvers. Numerous countries, including the Israeli Defense Force, are conducting corresponding research.

Military commanders will use artificial intelligence to solve the dilemmas of war. Artificial intelligence will enhance the decision-making ability of commanders by providing more accurate battlefield situational awareness and higher responsiveness, thanks to constantly updated sensor data.

Artificial intelligence technology will also help decision-makers and analysts cope with the impact of information overload, better organize and process ever-growing opponent data, and enable troops to make predictions about future events and outcomes, enabling them to better prepare for combat.

Better understanding of opponents is becoming one of the most promising application directions for artificial intelligence. Artificial intelligence will achieve faster and more real-time information collection, detection patterns, communication network drawing, and even better sensing of opponent morale by analyzing their language on social media and other platforms. These new AI features are equivalent to Intelligence Gathering 2.0.

This type of analysis can be extended to the military communication and social media activities of civilians in hostile countries, in order to better understand a country's willingness to war at any time, which is the most critical factor in human warfare and will have a huge impact on decision-makers in both civilian and military fields.

In the field of military logistics and maintenance, artificial intelligence can create revolutionary cost saving efficiency, which is why most military forces prioritize conducting research in this area. Logistics support may lead to the most fundamental changes in the military.

Artificial intelligence systems can also optimize the procurement process and achieve supply chain automation, predict the demand for maintenance equipment and order supplies, while minimizing costs. Artificial intelligence can also be used for personnel allocation, helping the military identify which soldiers are most suitable for which unit. Unlike other aspects of artificial intelligence, these applications are unlikely to raise any significant legal or ethical issues.

Artificial intelligence based technology can also enhance the capabilities of individual soldiers, which should not be seen as an unethical or dangerous way.

What is the Application of Artificial Intelligence in National Defense?

At the strategic level, artificial intelligence can enhance the capabilities of air defense systems. Emerging weapons, such as hypersonic missiles, are difficult to detect by existing defense systems due to their speed, while air defense systems that use artificial intelligence processing capabilities can detect and intercept such missiles.

In addition, in the field of information warfare, artificial intelligence has great potential in quickly verifying information or identifying opponents.

V. Artificial Intelligence Ethics Model and Algorithm

As an architecture system of autonomous intelligent agents, artificial intelligence's subjectivity or subject structure is somewhat similar to how we move certain functions of the human brain (or functions similar to the human brain) into machines. If the biological basis of human subjectivity is "neural", then the subjectivity of artificial intelligence can only be an imitation of human subjectivity. The scientific basis and manifestation of this imitation is the "algorithm". Setting aside the extent to which artificial intelligence agents are similar to human agents, researchers point out that the key element in making artificial intelligence products intelligent agents is the "moral algorithm" - an algorithm that teaches autonomous artificial intelligence devices to act responsibly, embedded in the algorithm system of artificial intelligence.

The subject mode of artificial intelligence faces significant ethical challenges on this issue. Taking autonomous robots in healthcare and the battlefield as an example, how should robots make decisions when facing the dilemma of life and death for human life? When inappropriate decisions lead to avoidable harm, whose responsibility is that? On this issue, although the subject mode of artificial intelligence highlights the importance of moral algorithms, its deeper and more important dependence is undoubtedly the "good law" established by humans for themselves.

Currently, there are roughly three algorithms that endow artificial intelligence with moral abilities.

One is to expand the moral logic through semantic networks, forming the concepts of obligation and permission;

The second is to establish association rules through knowledge graphs to detect moral judgment situations;

The third is to explore relevant relationships through cloud computing, evaluate or predict the consequences of actions.

Moral algorithms are algorithmic programs embedded in the algorithmic system that need to be improved. It itself is constantly changing and developing, rather than a specific existing thing, nor is it an ultimate assumption that can be achieved overnight or once and for all. It, as an artificial construction, is a "manual goodness" that leads to the "purpose goodness" and therefore depends on the human subject pattern. At this scale, algorithms can only promote the evolution of moral algorithms and their embedding in machines in a responsible manner by reflecting or following the "good law" of human subjectivity. This is the basic principle that

moral construction in the era of artificial intelligence should follow, that is, algorithms follow the "good law". In this principle, although the term "good law" is abstract and ambiguous, the scale of human subjectivity it represents may also cause controversy in specific content, but it clearly points to two moral forms on the human scale in form.

The first form of morality is dominated by common human subject patterns and involves all ethical issues that humans may bring when expanding artificial intelligence. Specifically, when people view artificial intelligence as a tool, its moral specificity and importance always call for the return of the moral responsibility of human subjects. This is a simple normative orientation, which means that humans should plan and embrace the advent of the artificial intelligence era in a responsible way. A prudent ethics suggests that the greatest threat that artificial intelligence may face is not from machines, but from humans or their intentions and actions. Considering that the algorithm that endows robots with moral abilities is essentially an algorithm that mimics human morality, how is it possible to present human morality in the form of algorithms in machines if humans cannot obtain clarity on moral issues? The problem paradoxically illustrates the moral construction of artificial intelligence implosion. It responds in some way to James Moore's demand for ethical intelligence subjects to have moral clarity, that is, as autonomy increases, artificial intelligence with autonomous moral abilities must be able to make clear rational decisions when facing moral dilemmas or conflicts of different moral principles. This demand for moral clarity, in turn, constructs or depicts the characteristics of "good law" at the human scale, forcing the human subject model to do everything possible to break out of various moral ambiguity zones that may lead to dark consequences (or even disasters).

The second form of morality is dominated by the "inter subject" mode of interaction between human subjects and artificial intelligence subjects, involving the moral construction of the dependent relationship between human subjects and intelligent subjects. This is a new field. Moral algorithms can only continuously correct biases or errors, further upgrade and improve in the repeated game between human machine interaction subjects. Autonomous robots may make decisions that we believe are morally wrong - such as being authorized not to provide pain relievers to patients, or biased artificial intelligence may self reinforce and harm society. However, this should not be a reason for humans to reject robots, but rather an opportunity for robots or artificial intelligence to improve and enhance their moral form. With the establishment of interdependence between human subjects and artificial intelligence subjects, autonomous robots with self decision-making ability, once they learn to develop decision-making algorithms from a moral perspective in their interaction with human subjects, can become a "good law" of interdependence between humans and machines to avoid harm.

VI. Conclusion and Future Work

This paper has the viewpoint that Artificial intelligence ethics should be computed. This paper attempt to use mathematics and algorithms to solve Artificial intelligence ethics problems. In this paper, one Artificial Intelligence Ethics model will be proposed to solve Artificial intelligence ethics problems. The future work will focus on related algorithms about Artificial intelligence ethics.

References Références Referencias

1. D. L. Medin, “Structural principles in categorization”, in T. J. Tighe & B. E. Shepp (eds.) Perception, Cognition and Development: Interaction Analyses, Hillsdale, N. J.: Lawrence Erlbaum, 1983, p.1469.
2. S. Shanker, Wittgenstein's Remarks on the Foundations of AI, London & New York: Routlege,1998, p.187.
3. Beauchamp, T. L. and Childress, J. F. 2012. Principles of Biomedical Ethics 8th. Oxford University Press, Oxford.
4. Biller-Andorno, N.; Aebi-Mueller, R.; (...); Sedlakova, J.2021. Ineffectiveness and unlikelihood of benefit: Dealing with the concept of futility in medicine. Swiss Academy of Medical SciencesBern.
5. Biller-Andorno, N; Ferrario, A; (...); Krauthammer, M. Mar 2022. Mar 2021 (Early Access). JOURNAL OF MEDICAL ETHICS 48 (3), pp.175-183.
6. Biller-Andorno, N and Biller, A. Oct 10 2019. NEW ENGLAND JOURNAL OF MEDICINE 381 (15), pp.1480-1485.
7. Giubilini, Alberto and Savulescu, Julian. 2018. Philosophy & technology 31 (2) , pp.169-188.
8. Hermann, H; Feuz, M; (...); Biller-Andorno, N. Jun 2020. Apr 2020 (Early Access). MEDICINE HEALTH CARE AND PHILOSOPHY 23 (2) , pp.253-259.
9. Loi, M; Ferrario, A and Viganò, E. Sep 2021. Oct 2020 (Early Access). ETHICS AND INFORMATION TECHNOLOGY 23 (3), pp.253-263.
10. Meier, LJ; Hein, A; (...); Buyx, A. Jul 3 2022. Mar 2022 (Early Access). AMERICAN JOURNAL OF BIOETHICS 22 (7) , pp.4-20.
11. van de Poel, I. Sep 2020 | Sep 2020 (Early Access). MINDS AND MACHINES 30 (3), pp.385-409.
12. Shaw, D; Trachsel, M and Elger, B. Jul 2018. BRITISH JOURNAL OF PSYCHIATRY. 213 (1), pp.393-395.
13. den Hartogh, G. Mar 2016. MEDICINE HEALTH CARE AND PHILOSOPHY. 19 (1) , pp.71-83.
14. Hermann, H; Trachsel, M and Biller-Andorno, N. Sep 2015. JOURNAL OF MEDICAL ETHICS. 41 (9) , pp.739-744.

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Achieving Path Reversal in OTN By Control Plane Programmability

By Vishal Vasant Deshpande & Shripad Prabhakar Mohani

University of Agricultural

Abstract- SDN paradigm has been successfully used in IP networks to bring agility and programmability. Applying SDN to OTN (Optical Transport Networks) has some challenges due to circuit switched nature and physical characteristics of OTN. If SDN and OTN can be modified to adapt to each other, there are immense benefits that can be derived from this combination. This paper presents an innovative design by modifying components in OTN and incorporating SDN concepts along-with it. This design encompasses key SDN concepts such as control plane and data-plane separation, central view of network domain for decision making and software-based programmability. This design uniquely implements the flow-reversal in Optical Ring by programmability that its control plane offers. In traditional OTN, it is not only time consuming but also complex process to obtain this type of flow reversal as it requires hardware configurations. The design presented here manages to rapidly configure the flow using its centralized control-plane programmatically.

Keywords: *OTN (optical transport network), optical control plane, SDON (software defined optical network), optiSystem, openflow, SDN (software defined network).*

GJCST-G Classification: *LCC Code:TK5103.59*

Strictly as per the compliance and regulations of:

Achieving Path Reversal in OTN by Control Plane Programmability

Vishal Vasant Deshpande [α] & Shripad Prabhakar Mohani [σ]

Abstract- SDN paradigm has been successfully used in IP networks to bring agility and programmability. Applying SDN to OTN (Optical Transport Networks) has some challenges due to circuit switched nature and physical characteristics of OTN. If SDN and OTN can be modified to adapt to each other, there are immense benefits that can be derived from this combination. This paper presents an innovative design by modifying components in OTN and incorporating SDN concepts along-with it. This design encompasses key SDN concepts such as control plane and data-plane separation, central view of network domain for decision making and software-based programmability. This design uniquely implements the flow-reversal in Optical Ring by programmability that its control plane offers. In traditional OTN, it is not only time consuming but also complex process to obtain this type of flow reversal as it requires hardware configurations. The design presented here manages to rapidly configure the flow using its centralized control-plane programmatically. The design was implemented and thoroughly tested using simulator tool OptiSystem. The design is generic and does not depend on any specific vendor component. The design is flexible and can co-exist in end-to-end network setup. This design aims to help fellow researchers in their research work related to SDON (Software Defined Optical Network) and can be used as-is or with suitable modifications. This paper is organized into logical sections, starting with Introduction section that gives background and problem description. The next section is Literature Review which covers review of relevant studies and gaps. Then Methodology section briefly covers research methodology used, how results are collected and stored etc. The Design section depicts the solution by explaining high-level design approach, reasons behind design choices and the detailed design. The Result section denotes the observed outcome and confirms that it matches with expected results. Finally, conclusion section summarizes key points, findings, contribution and future scope.

Keywords- OTN (optical transport network), optical control plane, SDON (software defined optical network), optiSystem, openflow, SDN (software defined network)

I. Introduction

Global mobile data traffic forecast by ITU, indicates data traffic to grow at an annual growth rate of around 55% in 2020-2030. Bandwidth demand is rapidly increasing by up-to 4x per year (predominantly between data centres). As per Cisco statistics [9], the fastest growing component of data-centre traffic is Global cloud traffic. It is seen growing by a huge 40% annual growth rate. Today's cloud, mobility and content services offered by service providers have dynamic needs. In order to meet those needs, Telecom operators require more dynamic and programmable network infrastructure with high capacity. It is essential to support rapid service deployment and provide real-time responsiveness to capacity changes.

Optical Transport Networks (OTN) promises the high capacity and reliable bandwidth fulfilment. But they are not flexible to dynamic needs as they are static and mostly manually provisioned. Optical networks are operated with wavelengths fixed in place and not designed to dynamically change. So, they are not capable of adapting to rapid changes to deliver the flexible services like cloud. Modern Network traffic consists of short bursty traffic, as well as very high bandwidth, high-duration data flows that continue for minutes. Common examples of such high bandwidth persistent traffic are VM migrations, data migrations, or Data warehousing function (MapReduce). [10]. On the other hand, OTN is traditionally a circuit switched network and the Path is set at initial design time. Changes to path requires long time and network can't adapt to dynamically to varying traffic conditions mentioned above.

Software Defined Networks (SDN) paradigm promises flexibility and programmability in network operations. SDN was originally conceived for packet-based IP networks. Hence it is difficult to apply SDN to OTN as is. SDN achieves the programmability by decoupling the data plane and the control plane. In most of the OTN these planes are currently vertically integrated and inseparably hosted along-with data-plane. Even if some designs attempt separately hosted optical control plane, it only allows network management software interactions [16]. It does not expose its services to operator directly i.e. no API or interfaces exposed for issuing commands to control plane. Hence optical control planes cannot be programmed dynamically in present OTN.

This paper presents a design that attempts separation of optical control plane from data plane in OTN. The paper also explains the programmability of optical control plane through software instructions or configurations. The design helps control plane to get centralized view that enables it to take decisions at

Author α: Dept. of E & TC, Govt. College of Engg, Jalgaon Jalgaon, Maharashtra. e-mail: vish_d@outlook.com
Author σ: Head of Dept. E &TC, Govt. College of Engg, Jalgaon Jalgaon, Maharashtra. e-mail: shripad.mohani@gcoej.ac.in

network domain level (instead of at network each element level). The uniqueness of design in achieving flow control (path reversal) programmability in OTN ring.

Traditionally, the design approach for IP-plus-Optical network has been, to place all the network functions within the IP layer (routing, signalling, protection). Such design uses static optical trunks interconnecting these IP layer devices. The network controller which controls IP domains does not have capabilities to configure OTN. It treats OTN merely as a fixed pipe carrying data. This paper takes a unique approach in designing OTN Ring to perform flow-control by programming OTN. Moreover, this design ensures adherence to key concepts of SDN (such as control plane separation, centralized view of control plane, software-based programmability etc), it does not mandate OpenFlow or another southbound interface (SBI). OpenFlow is not yet a complete standard, it is still undergoing significant changes [3] to adapt to OTN. Hence it can be incorporated in this design as a future scope.

II. Literature Review

A detailed analysis of multiple articles was carried out in regards to specific architectures or models proposed by other researchers. Abhinava Sadasivarao and others have proposed [1] programmable architecture that tries to integrate with the deployment of SDN within the Data Centres. It abstracts a transport node into a programmable virtual switch and leverages the OpenFlow protocol for control. It can be extended to packet-switched transport architectures including MPLS. But the the time involved in setting up the path using SDN Controller showed a high latency (between 5s to 7s). Also, this architecture has implicit mode where the SDN controller has a view of only the edge nodes.

Cheng, Xu and Zang from China mobile in their paper [2] have explained the requirements for advanced network architecture of Packet Transport Network. It has good focus on fast provisioning, end-to-end multi-domain and multi-layer network view. Although, there is no consideration given to optical transport networks.

S. K. N. Rao in his white-paper [3] has provided a survey of SDN and its use cases explaining benefits and limitations. It explains that a typical SDN architecture has the network intelligence logically centralized in software-based controllers. This enables the control logic to be designed and executed on a global network view. This was a key take away from this whitepaper. But the architecture described in it was just high level block-diagram. Moreover, it only described few options without specific recommendations, hence it was found to be closer to study-paper.

R. Vilalta et. al. in their paper [4] proposed a network control architecture for multidomain and multivendor network which is organized in layers (Refer fig.1) The abstract network layer and the control-specific layer, results in a mesh of generic SDN controllers. This uses generalized multiprotocol label switching (GMPLS) protocols as their east/west interfaces. This architecture was tested for its performance on service provisioning latency and control plane overhead. As a limitation, the authors have clarified that application of this architecture are confined and scoped to a single or reduced number of operators with peering agreements. Verizon [5] has deployed similar hierarchical architecture for moving to 100G Packet-optical transport network.

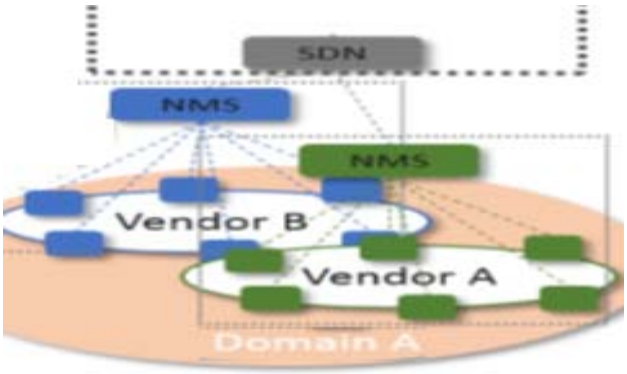


Fig.1: Hierarchical SDN Architecture for OTN

Industry body Open Networking Forum (ONF) has also proposed [6] an architecture with a parent "super" controller. The network orchestrator will abstract the details of the optical transport layer. It also enables end-to-end provisioning of services and provides open interfaces to client SDN applications. It is possible to have multiple technology controllers per domain, with this architecture.

Optical network model based architectures claim to provide open and vendor agnostic management of optical equipment. Thomas Szyrkowiec et. al. have investigated [7] Optical Network Models and their application to SDN Management. They have surveyed and compared important optical network models. They proposed an intent interface for creating virtual topologies which is integrated in the existing model

ecosystem. This is an interesting architectural approach. It makes it easy to achieve software-based control but requires the network topology virtualization. In paper [10], a similar virtual modelling using VOLTHA was described. VOLTHA is emerging as a standard for virtualization of OLT (online termination). The modelling approaches in [7] and [10] has limitations, as assumptions like every cross-connection between input and output ports is possible, does not hold for a realistic optical network model. Also on a physical network level, the analogue nature leads to network constraints, which can't be modelled accurately.

A simplified architecture is proposed and analysed by RK Jha and Burhan NML in their paper [8]. In this architecture, control of ethernet elements (routers) and optical ring is performed by a single SDN controller. Moreover, the architecture includes standardized hardware for OpenFlow switches and standard interface for OpenFlow communication. Communication between ethernet switches and optical network devices is setup using OEO converter. Communication between SDN controller and optical network devices is setup using OpenFlow agents. Hence this architecture will need enhancements before applying to all-optical network. It can also be noted that the optical hardware (ROADM), based on banyan architecture switch, combines the data plane along with switching control inside it.

III. Methodology

The experimental design methodology was used to implement the design, run tests, collect the results and demonstrate outcomes. The type of experimental design chosen was Absolute Experiment. The input was given (in the form of WDM lambdas) and output was observed by changing the control bits (or configurations). The output was recorded in the form of signal graphs and compared with expected result. Controlled variables of this experiment included input signal wavelength, OADM's drop channel setting, selection of Optical cross-connect ports. Factors not controlled include signal characteristics (like attenuation, dispersion, noise) which were not influencing factors.

This experiment was carried out in a high-end Simulator called OptiSystem. (Design section 4.2 gives more information on choice of this simulator tool.) The results were captured in the form of signal graphs shown on optical spectrum analyser (OSA). Multiple runs (iterations) were executed that gave consistent output that matches with expected output. To decide number of test-runs by using same input and to decide the variation of inputs for additional test-runs, techniques similar to sampling techniques were used. E.g. sample size of 5 test-runs with same input is considered. non-probability sampling is used for choice of input lambdas as these are in the least attenuation region (1550nm) wavelength. Judgement sampling is used for deciding add and drop channels for alternate test runs. (Note: Even though the term 'sample' is used here, it actually refers to 'test-run' or simulator iteration).

All the observations collected from these test-runs forms the empirical data collection by experiment. Simple comparison method was used to analyze the test run results. First result was compared with the theoretically expected result of the design. Following results were compared with the first result to check if any deviation. The data storage was done inside the simulator tool using the file system.

IV. Design

Before proceeding to detailed design description, it is imperative to a indicate the high-level design aspects like topology and components. The type of OTN that is considered here is long-haul transport deployment e.g. between major cities. This is a very common deployment of OTN and generalizes other types (e.g. DCN = Data Centre network) also well. Bidirectional Ring topology was considered, since most of the OTN deployments follow Ring topology [18].

The key components in any ring are OADM (Optical Add-Drop multiplexer) and OXC (Optical Cross connect or Optical Switch). Some vertically integrated devices contain OADM, OXC, transponders etc in the same physical chassis. They perform forwarding (data-plane) and switching (control-plane) activities together inseparably. Hence as a design choice, such integrated devices were avoided. When the same signal was to be replicated on other fiber (or other direction), simple fork was utilized. Its possible to replace it with switch if any setup so requires. Since the experimental setup and outcomes are not influenced by physical characteristics like noise, BER, dispersion, there is no specific assumption on type of fiber or repeaters or amplifiers etc. The Ring input is in the form of WDM signal with four channels viz 193.1 THz, 193.2 THz, 193.3 THz and 193.4 THz. The drop and add channels of each OADMs are as shown in Table.1:

Table 1: OADM channel configuration

OADM	Drop Channel	Add Channel
A	193.1 THz	193.7 THz
B	193.2 THz	193.8 THz
C	193.3 THz	193.9 THz
D	193.4 THz	194.0 THz

a) Detailed Design

The key design considerations include.

- Data-plane and control-plane separation: Data plane focuses only on data-forwarding
- Controller having central view instead of one node (and neighbouring nodes): This helps in deciding network domain level functions like path traversed in the ring
- Controller issuing software instructions (configurations or scripted commands) to bring programmability, allowing change of flow dynamically.

To accomplish these key considerations, following layers are envisaged. (Refer Fig. 2) The bottom layer is Data-plane, formed by four OADMs. On top of that resides a Control plane. It consists of OXC (optical switches) which are software-controlled by the controller. Controller has a full network domain view. It issues software commands to switches in control plane and accordingly the switches control the path flown through the data-plane.

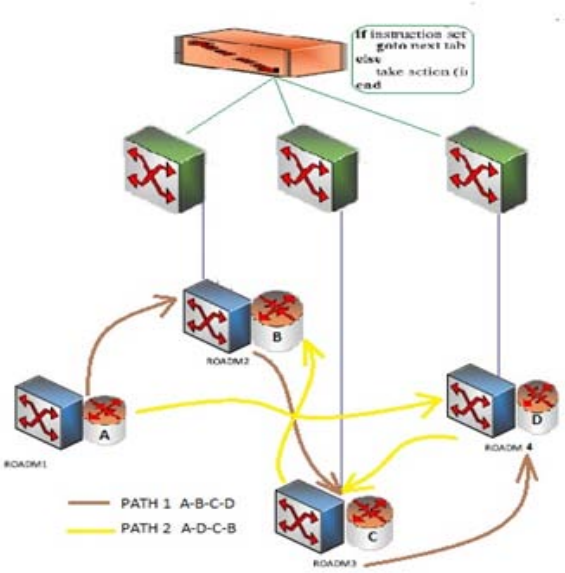


Fig. 2: Design showing control and data planes

The three OXCs are co-located i.e. placed nearby the OADMs B, C and D. But they are not hosted on or tightly couples with OADMs, like in traditional OTN. Based on instruction from controller, the OXC selects different ports and the signal coming from OADM is put onto one of the ports selected. One port allows the flow in one direction (A-B-C-D) while other port enables a reverse flow direction (A-D-C-B).

This allows to change the flow direction dynamically based on controllers input to switches in control-plane. As can be seen, OADM has no participation in flow-control. It just processes (drops a channel and adds new channel) irrespective of flow direction. This design can be used by researchers as a starting point in their SDON (Software Defined Optical Network) research, or for training others about SDN, or for integration testing in larger network setup. This design is implemented and tested using the simulator environment and output graphs are collected.

b) Simulator Selection

Simulation are technology tools and they help with the unreal and real-life entities to be modelled on to the computer and run under certain predefined conditions [11][12] Network simulators are widely used by the research community to evaluate new theories and hypotheses. [13] Selection of simulator can impact the outcomes, hence sufficient analysis is required before selection, especially in optical network research. [14] The author has analysed many simulators and has come up with detailed approach to select simulator for research in OTN. Using a simulator selection tool that the author himself created for ranking the simulators, OptiSystem simulator was ranked highest for implementing this design, testing it and collecting the results/ measurements of test-runs.

OptiSystem is specialized simulator for optical communication systems and includes all layers of Optical Transport Network [15]. It has comprehensive library of components. It offers high model accuracy, wide range of modulation formats, powerful simulation environment and hence good fit for research purpose. It has a truly hierarchical definition of components and systems including Optical sub-system. As per author's self-experience, this tool is quite easy to install and run. The GUI is intuitive and user-friendly and provides ability to quickly design optical Networks.

c) Environment Setup

Latest OptiSystem (v21.0) is used for implementing this design and setting up the test-run.

- The global parameters related to optical characteristics (such as attenuation, insertion loss, power levels) were maintained as default. (as shown in Fig. 3)
- The global parameters related to simulator model are evaluated. Some minor modifications done to bit rate, padding by no of leading/lagging zeros, central frequency (as shown in Fig. 4)
- Execution related parameters are changed as: set iterations to 2 within every run. Accordingly set the signal buffer value same as iterations (=2). Set location to store the results and filename to end with the test-run number, timestamp.

Main | Simulation | Noise | Custom order

Disp	Name	Value	Units	Mode
☑	Frequency	193.1	THz	Normal
☐	Bandwidth	10	GHz	Normal
☐	Insertion loss	0	dB	Normal
☐	Depth	100	dB	Normal

Main | Simulation | **Noise** | Custom order

Disp	Name	Value	Units	Mode
☐	Noise threshold	-100	dB	Normal
☐	Noise dynamic	3	dB	Normal

Figure 3: Global parameters: Optical characteristics

Simulation | Signals | Spatial effects | Noise | Signal tracing

Name	Value	Units
Simulation window	Set bit rate	
Reference bit rate	☑	
Bit rate	2.5e+009	bit/s
Time window	6.399999999999999e-009	s
Sample rate	1.28e+012	Hz
Sequence length	16	Bits
Samples per bit	512	
Guard Bits	0	
Symbol rate	10e+009	symbols/s
Number of samples	8192	
Reference wavelength	193.1	THz

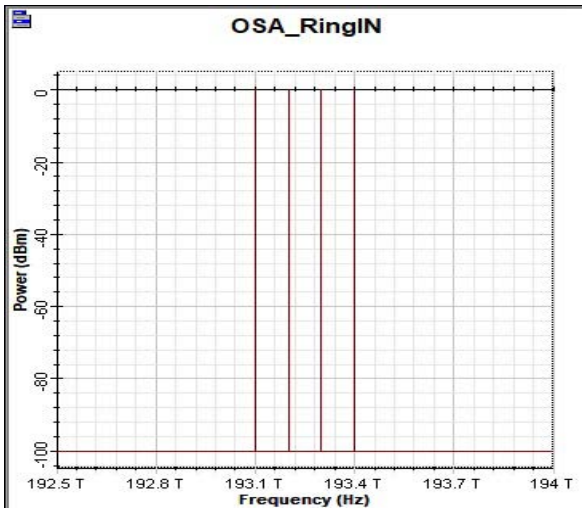
Figure 4: Global parameters: Simulation Model characteristics

V. Results

There are two iterations carried out to test run the two flows: First flow is OADM A-to-B-to-C-to-D and second flow is reverse, OADM A-to-D-to-C-to-B. Both flows worked as designed and successfully showed the designed output.

Results are collected as the graphs from Optical Spectrum Analyzer (OSA). Depending upon the test, the OSA is placed at various points to traverse the flow of signal step-by-step and check the correctness of channels for that step. The resulting graphs at OADM A, B, C and D are shown below for both the test runs. These results are stored in flat file. The file names end with test-run, iteration number, timestamp information. OADM A is a common Ring ingress point for both the flows. In both the test-runs, same input signal (WDM) is given to Ring at OADM-A as shown in fig. 5.

Flow 1 Output: Output taken at OADM-A, B, C and D shows each OADM drops a channel and adds a channel on its input signal. So, at output of D (i.e. Ring output), as expected the original four channels are dropped and new four channels are added, as seen in fig 6 (OADM A & B) and Fig 7 (C & D).



Ring Input (WDM) at OADM-A

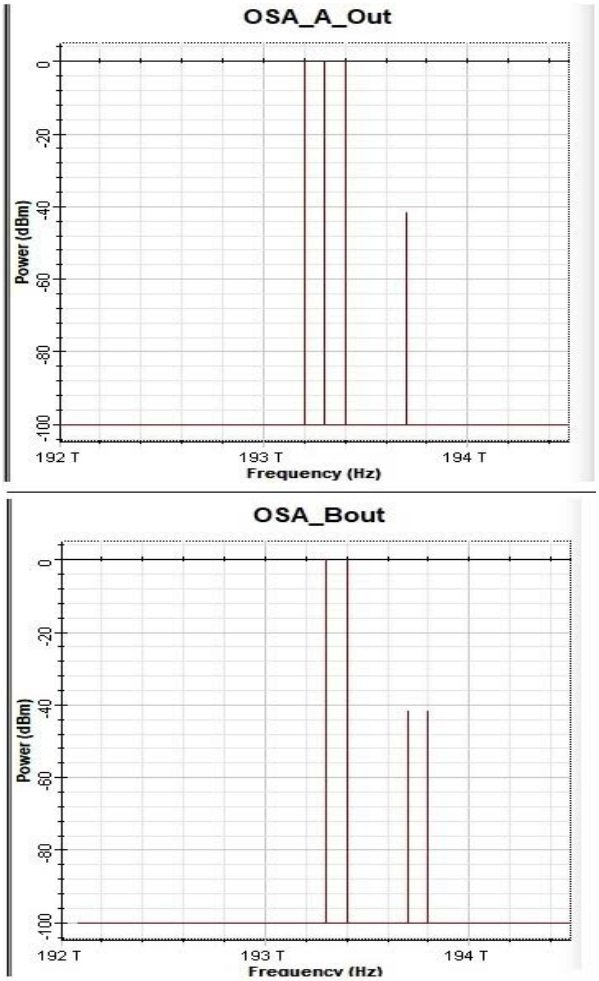


Fig. 5: Output at OADM-A & B for flow 1

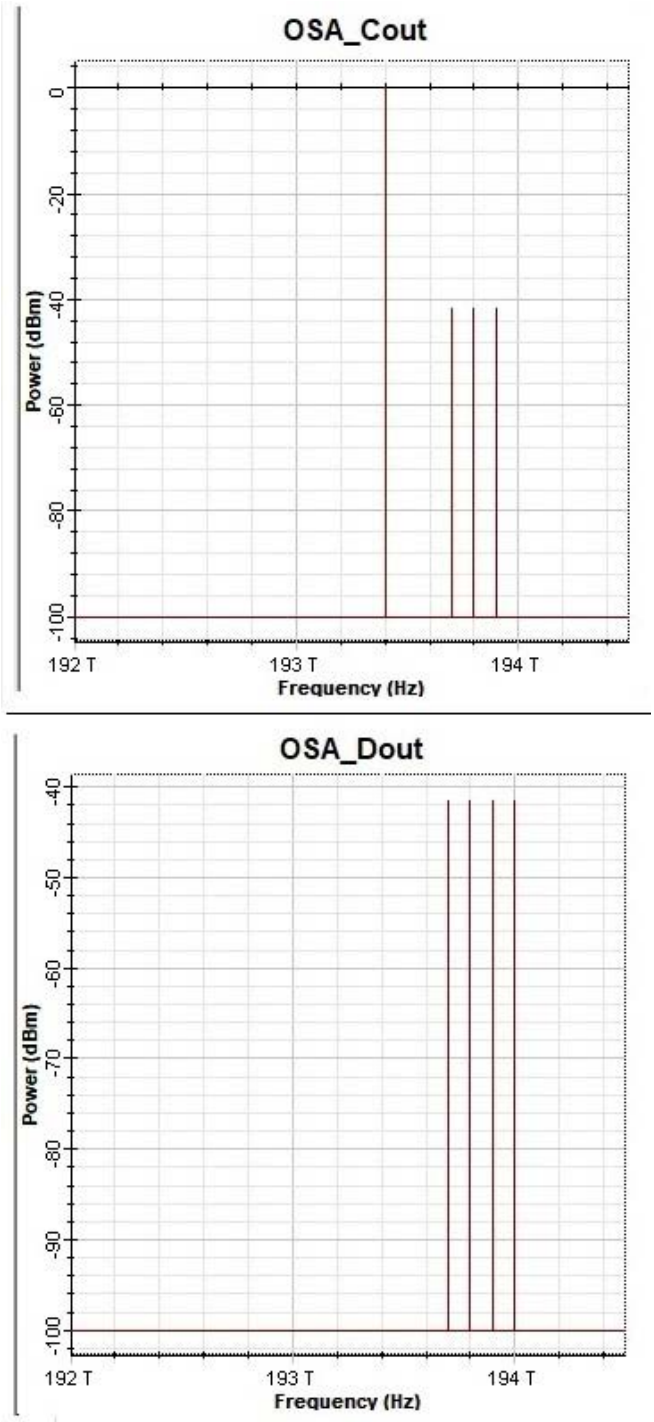
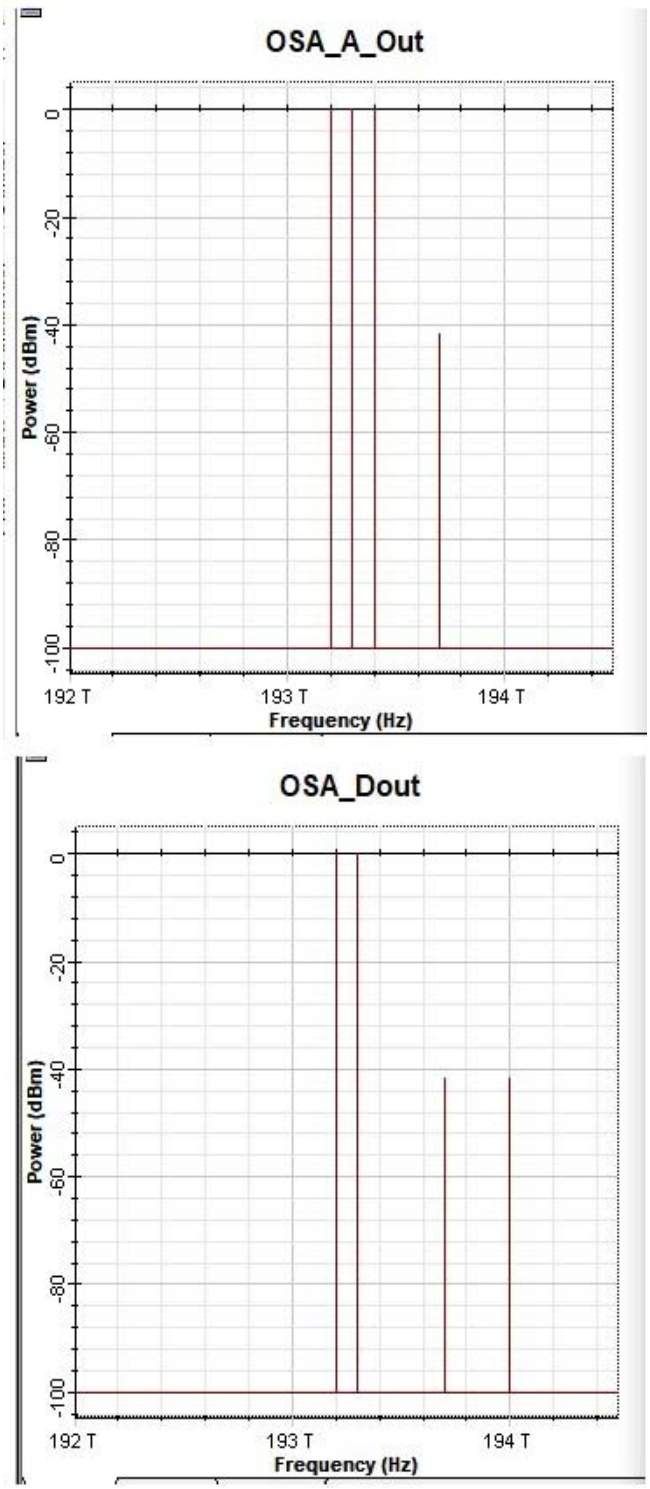


Fig. 6: Output at OADM-C & D for flow 1

In the reverse flow test-run, output of OADM-A is same (as same input is provided). Thereon, there is a difference in flow. Output at B is now Ring output due to flow reversal and B shows only new four channels added (as expected for reverse flow). Output of OADM A, D show in Fig 8 and output of OADM C & B is shown in Fig 9.



Output at OADM-A & D for flow 2

This confirms that flow-reversal design has worked as desired. The controller changes the configurations and sends instruction (bit-sequence) to switches to reverse the flow. This shows that the programmability of flow in the OTN can be achieved by control-plane.

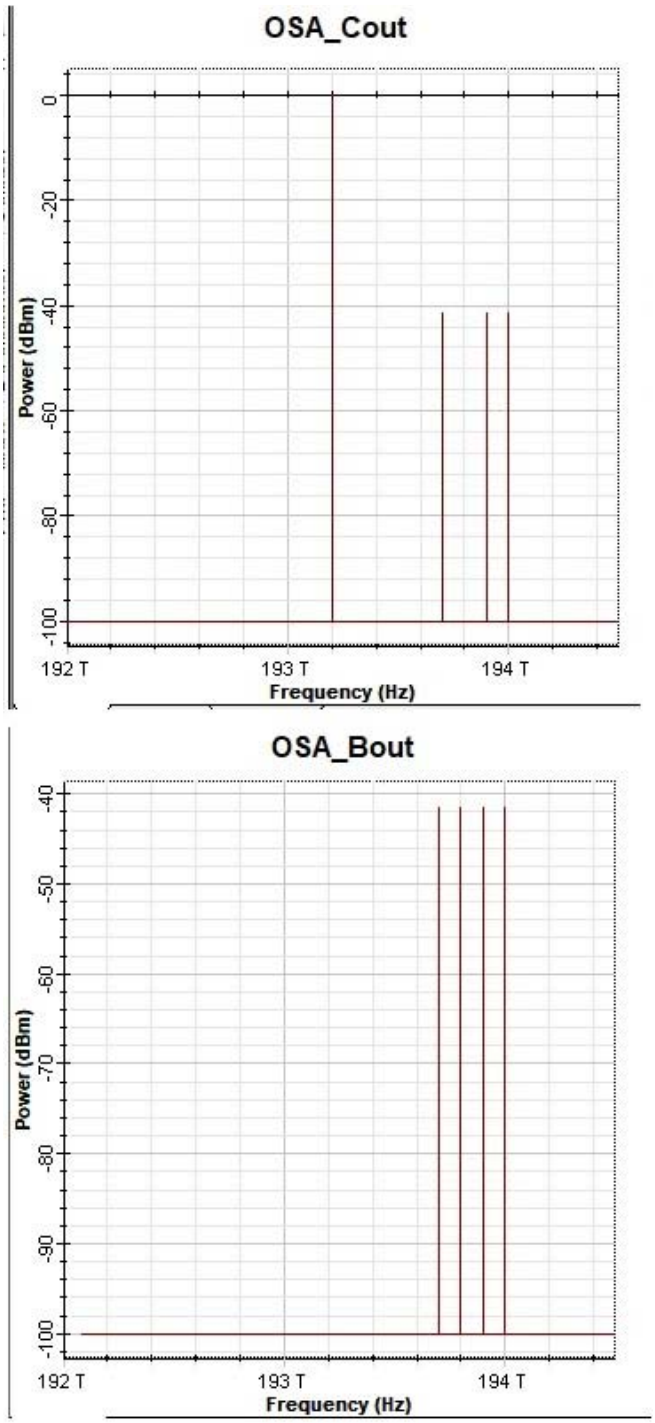


Fig. 7: Output at OADM-C & B for flow 2

VI. Conclusion

It was experimentally shown that the proposed design is capable of achieving flow-control in OTN with the help of programmability offered by its central control plane. The design when implemented works as desired and flow reversal in Ring topology was observed. This unique design follows key concepts in SDN (like control-data plane separation, software-based programmability, central view of network domain etc). Hence it can be inferred that it is possible to apply SDN concepts to OTN, although SDN can't be applied to OTN in the same way it is applied to IP networks. SDN expects optical networks to be modified to adapt to SDN e.g. by clear separation of data-plane and control-plane. This paper presents a design with optical control-plane and data-plane logically separated. Flow control is dynamically achieved by programmability offered by central control-plane that has

full view of optical ring network. Thus, the paper has illustrated SDN-like programmability in OTN using flow-control scenario. Researchers can reuse this design in their SDON research work as-is or by modifying as per their needs, the design is flexible. Academician can use it for training SDON concepts or for integration testing with another network setup. This tested, working and flexible to modify network design acts as a reliable starting point. With it, researchers can make alterations with confidence and refer back to this reliable stratum. It can also be concluded that OptiSystem simulator was suitable choice for implementing and testing this OTN design. As a future work, OpenFlow can be added to this design for SBI (southbound interface)

Acknowledgment

The author wishes to thank OptiWave OptiSystem [15] for allowing temporary access to licensed copy of latest version (v21.0) of OptiSystem Simulator.

References Références Referencias

1. Abhinava Sadasivarao et. al, Bursting Data Between Data Centers: Case for Transport SDN, IEEE 21st Annual Symposium on High-Performance Inter-connects, pp87-90.
2. Weiqiang Cheng, ACTN Use-cases for Packet Transport Network, China Mobile, IETF, Jul 2014.
3. S. K. N. Rao, SDN and its Use-Cases - NV and NFV: A State-of-the-Art survey, presented at NTIL 2014 event.
4. R. Vilalta et. al, Control and Orchestration of Multidomain Optical Networks With GMPLS as Inter-SDN Controller Communication, Journal of Optical Communications and Networking Vol. 7, Issue 11, pp. B46-B54.
5. Verizon readies its metro for next-generation P-OTS, Gazettabyte, June 2014.
6. ONF-TR 538 : Use Cases for Carrier Grade SDN
7. Thomas Szyrkowiec, Achim Autenrieth and Wolfgang Kellerer,Optical Network Models and Their Application to Software-Defined Network Management, International Journal of Optics, Volume 2017.
8. Rakesh Kumar Jha and Burhan Num Mina Llah, SDON: proposed architecture and comparative analysis, Journal of the European Optical Society-Rapid Publications (2019).
9. Cisco Global Cloud Index: Forecast and Methodology, 2015–2020, White Paper.
10. Calient White Paper, "The Software Defined Hybrid Packet Optical Datacenter Network"
11. J. Heidemann, K. Mills, S. Kumar, Expanding Confidence in Network Simulation, IEEE Net-work Magazine, Vol. 15, No. 5, Apr. 2000, pp. 58- 63.
12. Siraj, Saba, A. Gupta, and Rinku Badgujar. Network simulation tools survey, International Journal of Advanced Research in Computer and Communication Engineering Vol. 1, Issue 4, pp. 199-206, 2012.
13. Atta ur Rehman Khana, Sardar M. Bilalb, Mazliza Othmana, A Performance Comparison of Network Simulators for Wireless Networks, IEEE International Conference on Control System, Computing and Engineering, Malaysia, 2012, pp. 34-38.
14. Vedran Miletić, Branko Mikac, Matija Dzanko, Modelling optical network components: A network simulator-based approach, ResearchGate Conference Paper, October 2012.
15. Optisystem product website https://optiwave.com/products/optisystem.
16. Yao Li and D. Kilper, Optical Physical Layer SDN, Journal of Optical Communication Networks, Vol-10, pp110-121.
17. Shu Namiki et. al, Dynamic Optical Path Network, The 12th International Conference on Optical Internet Proceedings.
18. Raimena Viesllari et. al., Scalability Analysis of SDN-controlled Optical Ring MAN with Hybrid Traffic, IEEE ICC 2014 - Optical Networks and Systems, pp3283-3288.

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Business Ethics and Deontology

By Delia Consuegra de Sucre, María Mitre V & Antonio Sucre

Universidad de Panamá

Abstract- This article deals with professional ethics and deontology, important results are reflected based on the conduct of a survey on the ethical behavior of the servers of the University of Panama (UP), specifically in the C. R. U. Los Santos, taking into consideration important key points of the institution such as mission, vision and values that this first house of studies at a higher level has. The survey reflects the level of business ethics that the employees of this first house of studies have in order to know how the different decisions and perceptions are presented in the different situations of the institution in terms of ethics. It is a descriptive type research since it allows us to evaluate globally the degree of development of Corporate Social Responsi-bility (CSR) and present evidence of the knowledge of employees about Ethics in the C. R. U. Los Santos and what they perceive when conducting the survey. The main result of our research showed that the Los Santos Regional University Center is on the right track. Employees care about ethics, but it has several aspects in which it must improve.

Keywords: *deontology, ethics, business, values, responsibility, social.*

GJCST-G Classification: *FOR Code: 1503*

Strictly as per the compliance and regulations of:

Business Ethics and Deontology

Ética Y Deontología Empresarial

Delia Consuegra de Sucre [α], María Mitre V [σ] & Antonio Sucre [ρ]

Abstract: This article deals with professional ethics and deontology, important results are reflected based on the conduct of a survey on the ethical behavior of the servers of the University of Panama (UP), specifically in the C. R. U. Los Santos, taking into consideration important key points of the institution such as mission, vision and values that this first house of studies at a higher level has. The survey reflects the level of business ethics that the employees of this first house of studies have in order to know how the different decisions and perceptions are presented in the different situations of the institution in terms of ethics. It is a descriptive type research since it allows us to evaluate globally the degree of development of Corporate Social Responsi-bility (CSR) and present evidence of the knowledge of employees about Ethics in the C. R. U. Los Santos and what they perceive when conducting the survey. The main result of our research showed that the Los Santos Regional University Center is on the right track. Employees care about ethics, but it has several aspects in which it must improve.

Keywords: deontology, ethics, business, values, responsibility, social.

Resumen: El presente artículo trata sobre la ética y deontología profesional, se plasman resultados importantes basados en la realización de una encuesta sobre el comportamiento Ético de los servidores de la Universidad de Panamá (UP), específicamente en el C. R. U. Los Santos, tomando en consideración puntos claves importantes de la institución tales como, misión, visión y valores con los que cuenta esta primera casa de estudios a nivel superior. La encuesta refleja el nivel de ética empresarial con el que cuentan los colaboradores de esta primera casa de estudios para así conocer cómo se presentan las diferentes decisiones y de percepciones en las distintas situaciones de la institución en cuanto a la ética. Es una investigación tipo descriptiva ya que nos permite evaluar globalmente el grado de desarrollo de la Responsabilidad Social Empresarial (RSE) y presentar evidencias del conocimiento de los colaboradores sobre la Ética en el C. R. U. Los Santos y de lo que perciben a la hora de realizar la encuesta. El principal resultado de nuestra investigación arrojó que el Centro Regional Universitario de Los Santos está en el camino correcto. Los colaboradores se preocupan por la ética, pero tiene varios aspectos en los que debe mejorar.

Author α Universidad de Panamá, CRU Los Santos, Facultad de Informática, Electrónica y Comunicación.
e-mail: delia.consuegra@up.ac.pa
https://orcid.org /0000-0002-4661-6578
Author σ: Universidad de Panamá, CRU Azuero, Facultad de Informática, Electrónica y Comunicación.
e-mail: maria.mitrev@up.ac.pa
https://orcid.org /0009-0000-8154-025x
Author ρ: Universidad de Panamá, CRU Los SantosFacultad de Administración de Empresas y Contabilidad
e-mail: antonio.sucre@up.ac.pa
https://orcid.org/0009-0000-0243-277X

Palabras Dlave: deontología, ética, empresarial, valores, responsabilidad, social.

I. Introducción

A lo largo de los años ha habido muchas discusiones sobre ética, moral y valores desde diferentes perspectivas, pero el mundo ha avanzado radicalmente y ahora somos nosotros quienes hablamos de ética y deontología en las empresas. Es importante utilizar la ética como herramienta preventiva para poder participar de manera estable en la toma de decisiones sobre cuestiones técnicas basadas en valores acordes con el desarrollo social.

Hay actos que atentan contra la dignidad humana. Debemos nutrirnos de una visión ética ya que es vital para el futuro de la sociedad. La formación ética consiste en formar seres humanos para actuar de forma racional y autónoma en relación con nuestro entorno profesional y con base en los principios que dignifican la vida humana en la tierra, esto equivale a desarrollar valores que tenemos que afrontar el dilema que surge del uso inadecuado de la tecnología, ya que algunas prácticas implican principios éticos y morales, por esta razón realizamos este estudio en la Universidad de Panamá- CRU Los Santos, para determinar si estamos en el camino correcto.

La Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (UNESCO, 2008) recomienda que para vivir, aprender y trabajar con éxito en una sociedad cada vez más compleja, rica en información y basada en el conocimiento, que los estudiantes y los docentes deben utilizar la tecnología digital, la virtualización con eficacia. La excelencia profesional se logra cuando la tecnología de información se convierte en un instrumento al servicio de una realidad más humana.

II. Materiales y Métodos

Realizamos un estudio descriptivo, de enero a septiembre de 2023 en el CRU Los Santos, con el Manual de Autoevaluación de la red de organizaciones comprometidas y que promueven la responsabilidad social en el Ecuador (CERES) que permite a la empresa evaluar globalmente el grado de desarrollo de la responsabilidad social empresarial en la misma a través de un Código de ética que nos permite

determinar los valores y principios que rigen el actuar de la organización y quienes la integran sin importar la naturaleza y fines de estos.

La muestra de la población se calcula en el entorno administrativo del CRU Los Santos.

$$n = \frac{N.P.Q}{(N-1)\frac{(B)^2}{4} + P.Q}$$

$$n = \frac{93(0.25)}{(92)\frac{0.01}{4} + 0.25}$$

$$n = \frac{23.25}{(92)(0.0025) + 0.25}$$

$$n = \frac{23.25}{0.23 + 0.25}$$

$$n = \frac{23.25}{0.48}$$

$$n = 48.44$$

La muestra de la población es *48 personas.* Esta encuesta nos permite conocer el nivel de percepción que tenemos como profesionales sobre el comportamiento ético de la empresa o institución donde trabajamos. Para el análisis de la encuesta de ética empresarial, debemos usar los siguientes indicadores:

Tabla N°1: Indicadores para la evaluación encuesta de Ética Profesional

Sí: 1 puntos.
No: 0 puntos.
A veces: 0.5 puntos.
50 puntos o más: Los colaboradores perciben que la empresa en la que trabajan es ética. Se recomienda reforzar los puntos en los que no hubo una buena calificación según esta encuesta.
De 41 a 49 puntos: Su empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.
40 puntos o menos: ¡Cuidado! Su empresa no está dando a la ética la importancia que debería. Esto puede convertirse en un camino de alto riesgo para la empresa. Se recomienda iniciar cuanto antes programas en pro de la ética empresarial.
Nota: CERES cuenta con el Manual de Autoevaluación de RSE que permite a la empresa evaluar globalmente el grado de desarrollo de la RSE en la misma.

Fuente. Manual de Autoevaluación. CERES

III. Resultados y Discusión

a) Estudio De La Ética Al Entorno Laboral

Aplicamos la técnica de encuesta utilizada como procedimiento de investigación ya que permite obtener y ordenar datos de modo rápido y eficaz, este estudio se realiza en el C.R.U. Los Santos para determinar la ética en las áreas de responsabilidad social como lo son: valores y principios éticos, relación con los proveedores de la empresa, relación con el estado, calidad de vida laboral, apoyo a la comunidad, protección el medio ambiente, marketing responsable.

Tabla N°2: Personal del CRU. Los Santos

Personal del Centro Regional de Los Santos hasta el mes de agosto 2023			
Estamento	*Cantidad*	*I-2023*	*II-2023*
Administrativos	93		
Docentes		173	168
Autoridades	3		
Coordinadores	18		
Total	114	173	168

Fuente: Recursos Humanos C.R.U. Los Santos

b) Encuesta: Áreas De Responsabilidad Social

Los indicadores de responsabilidad social empresarial son herramientas que han ayudado grandemente a las empresas en el sentido de permitir que incorporen en su gestión los conceptos y compromisos con el desarrollo sostenible.

Muchas empresas utilizan estos indicadores para medir e identificar el grado de Responsabilidad Social y funcionan en la toma de decisiones en el contexto organizacional.

c) Valores Y Principios Éticos

La Universidad de Panamá adopta el "Código Uniforme de Ética de los Servidores Públicos" para actuar con rectitud y honradez, procurando satisfacer no sólo el interés de la comunidad educativa sino el

general. Este código de ética cuenta con 47 artículos y es de obligatorio cumplimiento para todos los funcionarios o servidores públicos, sin perjuicio de su nivel jerárquico.

La UP también mantiene un convenio de cooperación con el Consejo Nacional de Transparencia contra la Corrupción, para contrarrestar ese flagelo.

Tabla N°3: Sección de valores y transparencia en la empresa

Valores y principios éticos Valores y transparencia de la empresa				
N° Pregunta o situación	Si	No	A veces	No sé o No aplica
1. ¿La empresa cuenta con un Código de Ética?	42	1	3	2
2. ¿La empresa aplica este Código de Ética?	43	1	1	3
3. ¿Los jefes cumplen con la ética? Es decir ¿predican con el ejemplo?	42	1	2	3
4. ¿Existen planes o programas para fomentar la ética en esta empresa?	40	3	2	3
5. ¿Esta empresa no utiliza productos pirateados o falsificaciones?	12	36	2	8
6. ¿Esta empresa no utiliza productos de contrabando o robados?	5	38	1	3
7. Aunque no estén escritos ¿los ejecutivos de la empresa practican valores?	42	2	3	1
8. ¿Se pagan todas las prestaciones laborales que contempla la ley?	41	1	4	2
9. ¿Se pagan todas las horas extras?	41	1	4	2

Fuente: Manual de Autoevaluación. CERES

Fuente: Elaboración propia

Figura N°1: Valores y principios éticos

i. *Análisis De Los Resultados*

En esta gráfica podemos observar el resultado de las 9 preguntas de la sección *valores y principios éticos,* cuando cuestionamos al personal administrativo si la Unidad Académica cuenta con un código de ética, nos percatamos que, seis de nueve preguntas (1, 2, 3, 7, 8 y 9) nos indican que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

En la pregunta que si existen planes o programas para fomentar la ética en la empresa los resultados fueron 41 esto nos indica que el C.RU. Los Santos está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe

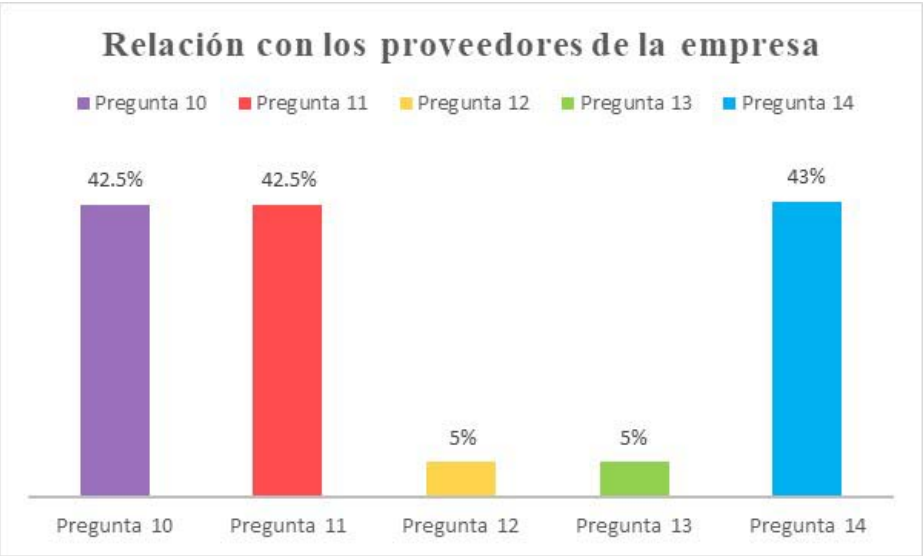
mejorar. En las preguntas 5 y 6 si la empresa no utiliza productos pirateados o falsificados, y si la empresa utiliza productos de contrabando o robados, según el indicador debemos tener ¡Cuidado!, pero en realidad nuestra institución está en el camino correcto, ya que en este punto estamos cumpliendo con la deontología empresarial.

d) Relación Con Los Proveedores De La Empresa

Tabla N°4: Sección de relación con los proveedores de la empresa

Relación con los proveedores de la empresa					
N° Pregunta o situación	Si	No	A veces	No sé o No aplica	Total
1. ¿Esta empresa cumple con los convenios de pago a proveedores?	42	1	1	4	42.5
2. ¿En esta empresa se respeta la libre competencia entre proveedores?	42	1	1	4	42.5
3. ¿Esta empresa NO le da preferencia o hay parcialidad con algún proveedor?	4	40	2	2	5
4. ¿Esta empresa NO le ha dejado de pagar a un proveedor de forma injustificada?	4	40	2	2	5
5. ¿Los proveedores de esta empresa reciben un trato amable y acorde a su dignidad de parte de todos los colaboradores de la empresa?	42	2	2	2	43

Fuente. Manual de Autoevaluación. CERES



Fuente: Elaboración propia

Figura N°2: Relación con los proveedores de la empresa

i. *Análisis De Los Resultados*

En este gráfico observamos el resultado de la pregunta 10 a la 14, podemos ver que en la pregunta 10, 11 y 14 la Unidad Académica cumple con el pago a los proveedores, respeta la libre competencia entre proveedores y los proveedores reciben un trato amable por parte de los colaboradores nos arroja un puntaje de 43.5 y 42 lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar. En la pregunta 12 y 13, arroja un puntaje de 5, esto nos indica que no se le da preferencia a ningún proveedor y que no se le ha dejado de pagar a un proveedor de forma injustificada. En esta parte no podemos evaluar con la tabla que se nos indica, ya que los colaboradores están trabajando con ética en todo el sentido de la palabra.

e) *Relaciones Con El Estado*

Tabla N°5: Sección de relaciones con el Estado

Relaciones con el Estado					
N° Pregunta o situación	Si	No	A veces	No sé o No aplica	TOTAL
1. ¿Esta empresa cumple con todos los requisitos legales de su sector?	42	2	1	3	42.5
2. ¿Esta empresa compite de forma legal con las empresas que se dedican al mismo negocio?	42	2	1	3	42.5
3. ¿Esta empresa paga puntualmente los impuestos que le corresponden?	42	2	1	3	42.5
4. ¿Los dueños o gerentes de la empresa influyen positivamente en la política nacional?	42	2	1	3	42.5
5. ¿Los dueños o gerentes influyen o participan en instancias que aportan en la elaboración de políticas públicas?	42	2	1	3	42.5
6. ¿En esta empresa se toman en cuenta los planes nacionales de país para diseñar sus propias estrategias y políticas?	42	2	1	3	42.5
7. ¿Esta empresa emite facturas por todos los servicios que presta o todos los productos que vende?	42	2	1	3	42.5

Fuente. Manual de Autoevaluación. CERES

Fuente: Elaboración propia

Figura N°3: Relación con el Estado

i. *Análisis De Los Resultados*

Esta gráfica refleja resultados del uso de la Ética basándonos en las relaciones que tiene el C.R.U. Los Santos con el estado. Esta sección consta de 7 preguntas, se enumeran desde la 15 a la 21, podemos observar que en las preguntas 15, 16, la Unidad Académica cumple con todos los requisitos legales en su sector, compite de forma legal con otras empresas que se dedican al mismo negocio, además las respuestas de la pregunta 17, reflejan que la institución paga puntualmente los impuestos que les corresponde. Es importante resaltar que las respuestas 18 y 19, refleja que los dueños o gerentes de la empresa influyen positivamente en la política nacional y participan en instancias que aportan en la elaboración de políticas públicas; dando como resultado respuestas positivas en las preguntas 20 y 21 que indican que esta institución toma en cuenta los planes nacionales de país para diseñar sus propias estrategias y políticas, en donde se emiten facturas por todos los servicios que presta o todos los productos que vende de forma satisfactoria, esto indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

f) Calidad De Vida Laboral

Tabla N°6: Calidad de vida Laboral

N° Pregunta o situación	Si	No	A veces	No sé o No aplica	Total
1. ¿Esta empresa paga puntualmente a sus colaboradores?	41	2	2	3	42
2. ¿Existe buena comunicación entre los directivos y los colaboradores?	43	2	2	1	44
3. Cuando deseo sugerir algún cambio en mi trabajo, ¿hay una persona específica a quien puedo dirigir mis sugerencias?	42	2	3	1	43.5
4. Cuando he sugerido algo razonable y necesario ¿toman en cuenta mi sugerencia?	42	3	1	2	42.5
5. ¿Esta empresa reconoce bien mi esfuerzo en el trabajo?	41	5	2	1	43
6. ¿Se da educación en temas de salud e higiene?	41	3	3	1	42.5
7. ¿Existen programas de capacitación para los colaboradores?	40	4	4	1	42
8. ¿Se favorece por diferentes medios el que los colaboradores continúen sus estudios formales?	40	3	4	1	42
9. ¿Existe un programa de beneficios para la jubilación de los colaboradores?	40	2	5	1	42.5
10. ¿La empresa ofrece flexibilidad de horario para asuntos particulares de sus colaboradores? (eventos de los hijos, emergencias, estudios, etc.)	4	41	1	2	4.5
11. ¿Esta empresa NO ha dejado de contratar a alguien por estar en estado de embarazo?	5	40	1	2	5.5
12. ¿Nunca se ha despedido a alguien por estar en estado de embarazo?	41	2	4	1	43
13. ¿Existe respeto mutuo en las relaciones de trabajo?	41	4	3	1	42.5
14. ¿Existe igualdad de oportunidades, sin importar género, edad, grupo étnico o capacidad física?	40	3	3	2	41.5
15. ¿Existe un clima favorable a la diversidad cultural de los colaboradores?	39	4	5	1	41.5
16. ¿Existen mecanismos para denunciar acciones de la empresa en contra de la ética?	40	5	2	1	41
17. ¿Se protege a quienes denuncian actos en contra de la ética?	37	8	2	1	38
18. ¿Existen los medios para denunciar algún abuso a los colaboradores?	38	3	4	3	40
19. ¿Se les da seguimiento a las denuncias sobre abuso a los colaboradores?	39	3	4	2	41
20. ¿Existen planes de acción en caso de emergencias dentro de la empresa?	40	4	2	2	41

Fuente. Manual de Autoevaluación. CERES

Fuente: Elaboración propia

Figura N°4: Calidad de vida laboral

i. *Análisis De Los Resultados*

La gráfica número 4 emite diferentes resultados que van desde la pregunta 22 a la 41, las mismas tienen que ver con la calidad de vida laboral y de como favorece el uso correcto de la Ética con la posición de cada uno de los funcionarios que trabajan en el C.R.U. Los Santos. Se puede observar desde las preguntas 22 a la 25 que la institución paga puntualmente a sus colaboradores con una buena comunicación entre los directivos, al punto de respetar las sugerencias de sus funcionarios; una vez estos proponen algún ascenso o cambio en su puesto trabajo que los beneficie, siempre y cuando lo sugerido sea razonable y/o necesario, reconociendo bien el esfuerzo de trabajo de sus empleados.

Por otro lado, se dan resultados positivos desde la pregunta 26 a la 29 en donde los colaboradores del C.R.U. Los Santos obtienen información de importancia referente a temas de salud e higiene, a la vez la institución brinda programas de capacitación para los colaboradores favoreciéndolos para que continúen sus estudios formales, lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

Con respecto a la pregunta 29 los colaboradores respondieron que la institución cuenta con programas de jubilación que los benefician, además se obtiene un alto nivel de respuestas en las preguntas 31 y 32 en donde indican que la Universidad no ha dejado de contratar a alguien por estar en estado de embarazo y nunca se ha despedido a nadie en ese estado. Evidenciando esto con las respuestas que van desde la 33 a la 40 en donde se refleja que existe respeto mutuo en las relaciones de trabajo con igualdad de oportunidades, sin importar género, edad, grupo étnico o capacidad física con un clima favorable a la diversidad cultural de los colaboradores en donde se encuentran los mecanismos justos y necesarios para denunciar acciones de la empresa, protegiendo así a quienes denuncian actos en contra de la ética, abriendo los medios para denunciar y dar seguimiento sobre algún abuso a los colaboradores con un eficiente plan de acción en caso de emergencias dentro de la institución, lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

g) *Apoyo A La Comunidad*

Tabla N°7: Apoyo a la Comunidad

Relaciones con la Comunidad					
N° ta o situaPregunción	Si	No	A veces	No sé o No aplica	Total
41. ¿Esta empresa participa en la identificación y discusión de problemas de la población cercana a la empresa?	39	1	5	3	41.5
42. ¿La empresa ha respondido a reclamos de la comunidad sobre el impacto de sus actividades?	40	1	5	2	42.5
43. ¿La empresa trabaja con organizaciones comunitarias y desarrolla proyectos conjuntamente?	41	1	4	2	43

Fuente. Manual de Autoevaluación. CERES

Fuente: Elaboración propia

Figura N°5: Relaciones con la Comunidad

h) *Análisis De Los Resultados*

El análisis de la sección 5 refleja niveles de respuestas positivas desde las preguntas 41 a la 43, referentes al apoyo por parte del C.R.U. Los Santos a la comunidad, puesto que los colaboradores indican que la institución participa en la identificación y discusión de problemas de la población, respondiendo a reclamos de la comunidad sobre el impacto de sus actividades, dejando claro que el C.R.U. Los Santos trabaja con organizaciones comunitarias y desarrolla proyectos conjuntamente en beneficio de la comunidad universitaria, lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

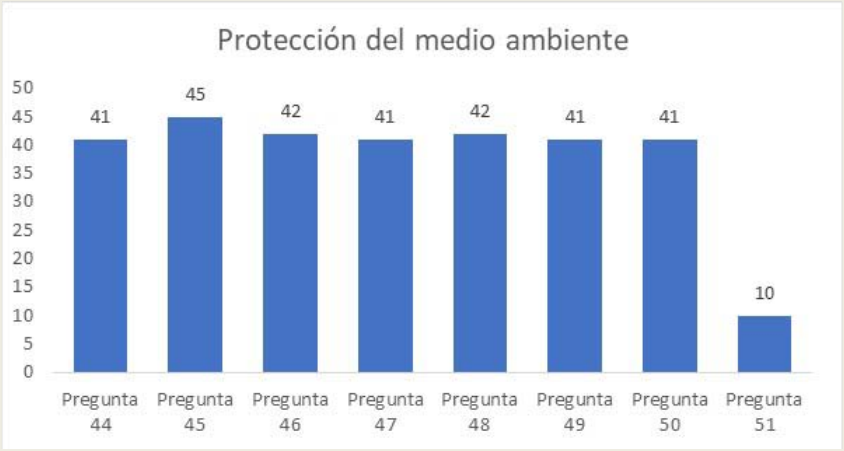
i) *Protección Del Medio Ambiente*

Tabla N°8: Protección del Medio Ambiente

N° Pregunta o situación	Si	No	A veces	No sé o No aplica	Total
44. ¿En esta empresa se informan acerca de las la- bores sociales o de protección al ambiente que se realizan?	38	2	6	2	41
45. ¿Esta empresa promueve reducir el impacto de contaminación al ambiente?	39	2	5	2	4.5
46. ¿Se promueve el ahorro de energía eléctrica?	40	2	4	2	42
47. ¿Se promueve el ahorro o moderación en el uso del agua?	39	3	4	2	41
48. ¿Se promueve el ahorro en el uso de papel y otros materiales de oficina?	40	3	4	1	42

49. ¿Esta empresa promueve reducir los desperdicios o basura?	40	5	2	1	41
50. ¿La empresa tiene proyectos orientados a proteger el ambiente?	40	5	2	1	41
51. ¿Los vehículos de la empresa NO contaminan el medio ambiente?	9	36	2	1	10

Fuente. Manual de Autoevaluación. CERES



Fuente: Elaboración propia

Figura N°6: Protección del medio ambiente

j) Análisis De Los Resultados

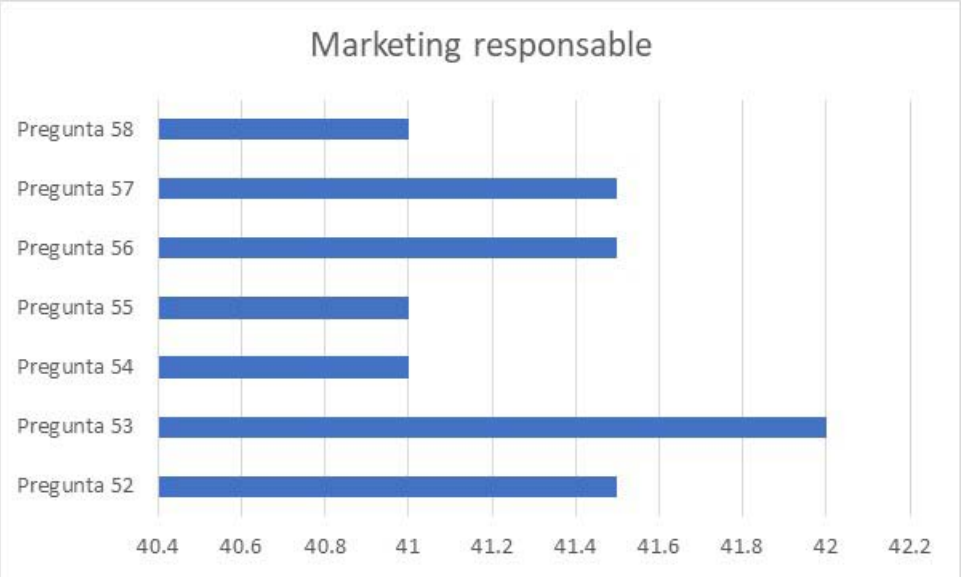
El análisis del gráfico número 6, que va desde las preguntas 44 a 51, refleja que el C.R.U. Los Santos, informa acerca de las labores sociales o de protección al ambiente que se realizan para así reducir el impacto de la contaminación al medio ambiente, concientizando entre sus colaboradores sobre el ahorro de energía eléctrica, ahorro o moderación en el uso del agua, ahorro en el uso de papel y otros materiales de oficina tales como desperdicios o basura, dándose esto en el desarrollo de distintos proyectos orientados a proteger y no contaminar el medio ambiente, lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

k) Marketing Responsable

Tabla N°6: *Relación con los clientes de la empresa*

Marketing Responsable				
N° Pregunta o situación	Si	No	A veces	No sé o No aplica
52. ¿La mayoría de las veces los consumidores reciben productos o servicios con cierta calidad y pocas veces se les entrega algo de menor calidad?	40	1	3	41.5
53. ¿La mayoría de los anuncios publicitarios transmiten un mensaje veraz de los productos o servicios de esta empresa y no engaña a los clientes?	41	1	2	42
54. ¿La empresa atiende los reclamos de los clientes?	39	1	4	41
55. ¿La empresa se hace responsable por defectos o deficiencias del producto o servicio que vende?	39	1	4	41
56. ¿Existe un encargado o un departamento de atención al cliente?	40	1	3	41.5
57. ¿Existen medidas para prevenir y/o corregir daños potenciales a los consumidores de los productos o servicios que brinda la empresa?	40	1	3	41.5
58. ¿Los clientes de esta empresa reciben un trato amable y acorde a su dignidad de parte de todos los colaboradores de la empresa?	39	1	4	41

Fuente. Manual de Autoevaluación. CERES



Fuente: Elaboración propia

Figura N°7: Marketing responsable

i. *Análisis De Los Resultados*

Se consolida en las respuestas de esta gráfica número 7, que el C. R. U. Los Santos utiliza un Marketing responsable, el cual cumple con una elección de calidad en los productos que son utilizados por sus colaboradores, estos indican respuestas positivas en la pregunta 52 en donde muy pocas veces se les entrega algo de menor calidad. Por lo tanto, las respuestas dadas en las preguntas que van desde la 53 a la 58, reflejan que el C. R. U. Los Santos es líder en anuncios publicitarios que transmiten un mensaje veraz de sus productos y servicios, sin la necesidad de engañar a su población estudiantil; ya que la misma atiende a tiempo lo reclamos que se dan ya sea por la parte estudiantil, administrativa o docente, convirtiéndola en una institución responsable en los programas o servicios académicos que ofrece, con un departamento de atención al cliente de calidad que se ocupa de prevenir y/o corregir daños potenciales a los consumidores de los productos o servicios que se brindan en la institución con un trato amable y acorde a su dignidad de parte de todos los colaboradores de la institución, lo que indica que la empresa está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

La Unión profesional de Asturias (2021), hace una distinción entre ética y deontología, expresa que la ética profesional está orientada al bien, a lo bueno, no es normativa, propone motivaciones, es parte de la ética aplicada, no exige, no sanciona, posee una conciencia individual predominante, se preocupa por los máximos, mientras que la deontología está orientada al deber, a las normas y códigos, se ubica entre la moral y el derecho, es exigible a los profesionales, posee mínimos obligatorios y tiene carácter sancionador.

Este estudio mostró según los indicadores de la tabla N°1 para la evaluación de ética profesional que el CRU Los Santos está dentro de 41 a 49 puntos lo que nos demuestra que esta Unidad Académica está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

Según Bedoya (2020), la deontología profesional es la deontología aplicada al estudio de los deberes concretos en el seno del ejercicio de una determinada profesión, de allí surgen los códigos deontológicos, los cuales se utilizan para reglamentar las obligaciones de distintos profesionales.

La deontología es el tratado de los deberes determinados por la ética que, en definitiva, fija íntimamente las obligaciones en relación con la bondad o malicia de las acciones libremente ejecutadas (Rivas, 2005).

IV. Conclusiones

Si observamos los resultados en las diferentes situaciones, que se plantean en cada una de las preguntas podemos percatarnos de que en la Universidad de Panamá – CRU Los Santos, está en el camino correcto. Se preocupa por la ética, pero tiene varios aspectos en los que debe mejorar.

Estos resultados cumplen los estándares referentes al uso correcto de la Ética dentro de la institución, puesto que los mismos evidencian de forma positiva la transformación de una sociedad incluyente y equitativa, enfocada en obtener una sociedad con altos niveles de educación, en donde se forman profesionales de calidad. Esto gracias a que sus

colaboradores cuentan con un alto perfil de compromiso con la institución y viceversa.

Por último, la realización de esta investigación nos permite observar la aceptación con los diferentes estamentos de la institución y así poder visualizar el compromiso de cada uno de los departamentos que forman parte del Centro Regional Universitario de Los Santos en donde se refleja una gran satisfacción por pertenecer como colaboradores a la primera casa de estudios a nivel nacional, la Universidad de Panamá.

References Références Referencias

1. *Bandeira, Mariana y López Parra,* Marcelo. Estructura Manual de RSE CERES (codespa.org) Silvia Loro | Fundación CODESPA diciembre 2012.
2. *Código ético y deontológico de la ingeniería informática* https://ccii.es/CodigoDeontologico#_Toc8895619.
3. *Código de ética de IEEE* https://edu.ieee.org/ec-ups/wp-content/uploads/sites/266/CODIGO_DE_ETICA_IEEE.pdf
4. *Código de Ética y Conducta Profesional de ACM* https://www.acm.org/about-acm/code-of-ethics-in-spanish.
5. *Cumbrera, Santiago* (2006, 20 de abril)Universidad de Panamá adopta código de ética | Panamá América (panamaamerica.com.pa).
6. *Del Castillo Castro, C. I., y Chamán Cabrera, L. I.* (2021). Buenas prácticas en el uso de las TIC para el desarrollo de competencias educativas: revisión bibliográfica. Revista Conrado, 17(82), 164-170.
7. *García, E. V., y de Bedoya, A. M.* (2020). *Ética, deontología y responsabilidad social empresarial*. ESIC Editorial.
8. *González Arencibia, Mario* (Compilador). Selección de lecturas sobre Ética Informática. Material de apoyo a la docencia. Asignatura Ética Informática. Universidad de las Ciencias Informáticas, La Habana enero del 2006.
9. *Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura*. (2008).
10. *Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura*. Recuperado en 22 de septiembre de 2022, de https://es.unesco.org/themes/etica-informacion.
11. *Proyecto de código de ética para la sociedad de la información.* Conferencia: Consejo interguberna mental del programa de Información para Todos, 6th, París, 2010. Documento de programa o reunión. https://unesdoc.unesco.org/ark:/48223/pf0000187196_spa.
12. *Real Academia Española: Diccionario de la lengua española*, 23.ª ed., [versión 23.6 en línea]. <https://dle.rae.es> [2023, 07de septiembre].
13. *Silva, Neif, y Espina, Jane.* (2006). Ética Informática en la Sociedad de la Información. *Revista Venezolana de Gerencia*, *11*(36), 559-580. Recuperado en 22 de septiembre de 2022, de http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1315-99842006000400004&lng=es&tlng=es.
14. *Stamatellos, G.* (2007). Computer ethics: A global perspective.
15. *Tellez Valdés, Julio.* "Los Delitos informáticos. Situación en México", Informática y Derecho Nº 9, 10 y 11, UNED, Centro Regional de Extremadura, Mérida, 1996.
16. *Unión profesional de Asturias.* Recuperado en 22 de septiembre de 2022, de https://upasturias.es/cual-es-la-diferencia-entre-deontologia-profesional-y-etica-profesional/
17. *Vázquez, Jesús y Barroso, Porfirio* (1993) Deontología de la Informática (esquemas). Madrid: Instituto de Sociología Aplicada.

This page is intentionally left blank

Global Journal of Computer Science and Technology: G Interdisciplinary
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

The Reducibility of Modal Syllogisms Based on the Syllogism □EI+O-2

By Long Wei & Xiaojun Zhang

Anhui University

Abstract- Syllogistic reasoning plays a crucial part in natural language information processing. For the purpose of providing a consistent interpretation for Aristotelian modal syllogistic, this paper firstly proves the validity of the syllogism □EI+O-2, and then takes it as the basic axiom to derive the other 38 valid modal syllogisms by taking advantage of some reasoning rules in classical propositional logic, the symmetry of two Aristotelian quantifiers (i.e. some and no), the transformation between any one of Aristotelian quantifiers and its three negative quantifiers, as well as some facts in first order logic.

In other words, there are reducible relations between the modal syllogism □EI+O-2 and the other 38 valid modal syllogisms. There are infinitely many instances in natural language corresponding to any valid modal syllogism. Therefore, this study has theoretical value and practical significance for natural language information processing in computer science.

Keywords: aristotelian syllogisms; aristotelian modal syllogisms; validity; reducible relation.

GJCST-G Classification: LCC: QA75-76

Strictly as per the compliance and regulations of:

The Reducibility of Modal Syllogisms Based on the Syllogism □EI+O-2

Long Wei [α] & Xiaojun Zhang [σ]

Abstract- Syllogistic reasoning plays a crucial part in natural language information processing. For the purpose of providing a consistent interpretation for Aristotelian modal syllogistic, this paper firstly proves the validity of the syllogism □EI+O-2, and then takes it as the basic axiom to derive the other 38 valid modal syllogisms by taking advantage of some reasoning rules in classical propositional logic, the symmetry of two Aristotelian quantifiers (i.e. some and no), the transformation between any one of Aristotelian quantifiers and its three negative quantifiers, as well as some facts in first order logic.

In other words, there are reducible relations between the modal syllogism □EI+O-2 and the other 38 valid modal syllogisms. There are infinitely many instances in natural language corresponding to any valid modal syllogism. Therefore, this study has theoretical value and practical significance for natural language information processing in computer science.

Keywords: aristotelian syllogisms; aristotelian modal syllogisms; validity; reducible relation.

I. Introduction

Syllogistic reasoning plays a crucial part in natural language information processing (Long, 2023). Various common syllogisms have been researched and discussed, including generalized syllogisms (Murinov and Novak, 2012), Aristotelian syllogisms (Hui, 2023), Aristotelian modal syllogisms (Cheng, 2023), and so on. In this paper, we restrict our attention to the reducibility of Aristotelian modal syllogisms (Xiaojun, 2018).

Some scholars such as Łukasiewicz (1957), Triker (1994), Nortmann (1996) and Brennan (1997) believed that it is almost impossible to find consistent formal models for Aristotelian modal syllogistic. Smith (1995) summarized the previous researches and proposed that Aristotelian modal syllogistic is incoherent. This view is still prevailing today. In view of this situation, this article attempts to explore a consistent interpretation for Aristotelian modal syllogistic. Specifically, this paper firstly proves the validity of the syllogism □EI+O-2, and then take this syllogism as the basic axiom to derive the other 38 valid modal syllogisms according to modern modal logic and generalized quantifier theory.

Author α σ: School of Philosophy, Anhui University, Hefei, China.
e-mails: 657703460@qq.com, 591551032@qq.com

II. Preliminaries

In this article, it is convenient to represent the lexical variables by capital letters *P*, *M* and *S*, the universe of lexical variables by *D,* any one of the four Aristotelian quantifiers (i.e. *all*, *no*, *some* and *not all*) by *Q.* For Aristotelian syllogisms, there are four types of sentences including 'All *P* are *M*', 'No *P* are *M*', 'Some *P* are *M*' and 'Not all *P* are *M*'. They are abbreviated as the proposition A, E, I and O respectively. An Aristotelian modal syllogism can be obtained by adding one to three non-overlapping necessary operator (i.e.■) or/and possible operator (i.e.+) to an Aristotelian syllogism.

For example, an Aristotelian modal syllogism can be described as the following.

Major premise: No women are necessarily NBA players.

Minor premise: Some millionaires are NBA players.

Conclusion: Not all millionaires are possibly women.

Let *P* be the set of all the women in the universe, *M* be the set of all the NBA players in the universe, and *S* be the set of all the millionaires in the universe. Therefore, this example can be formalized by ■*no*(*P, M*)→(*some*(*S, M*)→+*not all* (*S, P*)), whose abbreviation is□EI +O-2, similarly to other Aristotelian modal syllogisms.

The following definitions, facts and rules can be obtained from modal logic (Chellas, 1980) and generalized quantifier theory (Peters and Westerståhl, 2006). For the sake of convenience, 'if and only if' is abbreviated as 'iff'.

Definition 1:

1. *All* (*P, M*) is true iff $P \subseteq M$ is true.
2. ■*all* (*P, M*) is true iff $P \subseteq M$ is true in any possible world.
3. +*all* (*P, M*) is true iff $P \subseteq M$ is true in at least one possible world.
4. *No* (*P, M*) is true iff $P \cap M = \emptyset$ is true.
5. ■*no* (*P, M*) is true iff $P \cap M = \emptyset$ is true in any possible world.
6. +*no* (*P, M*) is true iff $P \cap M = \emptyset$ is true in at least one possible world.
7. *some* (*P, M*) is true iff $P \cap M \neq \emptyset$ is true.
8. ■*some* (*P, M*) is true iff $P \cap M \neq \emptyset$ is true in any possible world.

9. $+some\ (P, M)$ is true iff $P\cap M\neq\emptyset$ is true in at least one possible world.
10. $not\ all\ (P, M)$ is true iff $P\nsubseteq M$ is true.
11. $\blacksquare not\ all\ (P, M)$ is true iff $P\nsubseteq M$ is true in any possible world.
12. $+not\ all\ (P, M)$ is true iff $P\nsubseteq M$ is true in at least one possible world.

Definition 2: $Q\neg\ (P, M) =_{def} Q\ (P, D-M)$.

Definition 3: $\neg Q\ (P, M) =_{def}$ It is not that $Q\ (P, M)$.

The following Fact 1 to Fact 4 are the basic knowledge in generalized quantifier theory, so it is reasonable to omit the proofs of them here.

Fact 1: (1) $some\ (P, M)\leftrightarrow some\ (M, P)$;
(2) $no\ (P, M)\leftrightarrow no(M, P)$.

Fact 2: (1) $all\ (P, M)=no\neg(P, M)$;
(2) $no\ (P, M)=all\neg(P, M)$;
(3) $some\ (P, M)=not\ all\neg(P, M)$;
(4) $not\ all\ (P, M)=some\neg(P, M)$.

Fact 3: (1) $\neg all\ (P, M)=not\ all\ (P, M)$;
(2) $\neg no\ (P, M)=some\ (P, M)$;
(3) $\neg some\ (P, M)=no\ (P, M)$;
(4) $\neg not\ all\ (P, M)=all\ (P, M)$.

Fact 4: (1) $\vdash all\ (P, M)\rightarrow some\ (P, M)$;
(2) $\vdash no\ (P, M)\rightarrow not\ all\ (P, M)$.

According to modal logic (Chellas, 1980), $+$ is definable in terms of $\neg$ and $\blacksquare$, that is to say that $\blacksquare Q(P, M)\Box\leftrightarrow\neg+\neg Q(P, M)$ and $+Q(P, M)\leftrightarrow\neg\blacksquare\neg Q(P, M)$ hold at every possible world. The following Fact 5 to Fact 8 can be proved by modal logic (Chagrov and Zakharyaschev, 1997).

Fact 5: (1) $\neg\blacksquare Q\ (P, M)=+\neg Q\ (P, M)$;
(2) $\neg+Q(P, M) =\blacksquare\neg Q\ (P, M)$.

Fact 6: $\vdash\blacksquare Q\ (P, M)\dashv Q\ (P, M)$.

Fact 7: $\vdash Q\ (P, M)\dashv+Q\ (P, M)$.

Fact 8: $\vdash\blacksquare Q\ (P, M)\dashv+Q\ (P, M)$.

The following rules in first order logic can be applied to Aristotelian syllogistic and Aristotelian modal syllogistic, in which p, q, r and s represent propositional variables.

Rule 1: (Subsequent weakening): From $\vdash(p\rightarrow(q\rightarrow r))$ *and* $\vdash(r\rightarrow s)$ infer $\vdash(p\rightarrow(q\rightarrow s))$.

Rule 2: (anti-syllogism): From $\vdash(p\rightarrow(q\rightarrow r))$ infer $\vdash(\neg r\rightarrow(p\rightarrow\neg q))$ or $\vdash(\neg r\rightarrow(q\rightarrow\neg p))$.

III. Reduction Between the Syllogism □EI+O-2 and the Other 38 Modal Syllogisms

Theorem 1 means that the syllogism □EI+O-2 is valid. The following theorems from Theorem 2 to Theorem 9 demonstrate that there are reducible relations between the syllogism □EI +O-2 and the other 38 valid modal syllogisms. For example, '(2.1) □EI+O-2⇒□E■AE- 1' in Theorem 2 means that the validity of syllogism ■E■AE-1 can be derived from the validity of □EI+O-2. This sheds light on the reducibility between the two syllogisms. Other cases are similar.

Theorem 1 (□EI+O-2): $\blacksquare no(P, M)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$ is valid.

Proof: The syllogism □EI +O-2 is the abbreviation of the second figure syllogism $\blacksquare no(P, M)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$. Suppose that $+no(P, M)$ and $some(S, M)$ are true, then $P\cap M=\phi$ is true at any possible world in terms of the clause (5) in Definition 1, and $S\cap M\neq\phi$ is true in terms of the clause (7) in Definition 1. Now it is clear that $S\nsubseteq P$ is true in at least one possible world. Therefore, $+not\ all(S, P)$ is true according to the clause (12) in Definition 1. It indicates the validity of $\blacksquare no(P, M)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$, just as desired.

Theorem 2: The validity of the following two syllogisms can be inferred from □EI+O-2 :

(2.1) □EI+O-2⇒■E■AE-1

(2.2) □EI+O-2⇒I □ A+I-3

Proof: For (2.1). In line with Theorem 1, it follows that □EI+O-2 is valid, and its expansion is that $\blacksquare no(P, M)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$. And then it can be derived that $\neg+not\ all(S, P)\rightarrow(\blacksquare no(P, M)\rightarrow\neg some(S, M))$ in the light of Rule 2. According to Fact 5, what is obtained is that $\blacksquare\neg not\ all(S, P)\rightarrow(\blacksquare no(P, M)\rightarrow\neg some(S, M))$. One can obtain that $\neg not\ all(S, P)=all(S, P)$ and $\neg some(S, M)=no(S, M)$ on the basis of the clause (4) and (3) in Fact 3. Therefore, it can be seen that $\blacksquare all(S, P)\rightarrow(\blacksquare no(P, M)\rightarrow no(S, M))$ is valid. That is to say that ■E■AE-1 can be deduced from □EI +O-2, as desired. The proof of (2.2) is similar to that of (2.1).

Theorem 3: The validity of the following four syllogisms can be inferred from □EI+O-2:

(3.1) □EI+O-2⇒ □ EI+O-1

(3.2) □EI+O-2⇒■E■AE-1⇒■E■AE-2

(3.3) □EI+O-2⇒■E■AE-1⇒■A■EE-4

(3.4) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EE-2

Proof: For (3.1). According to Theorem 1, it follows that □EI+O-2 is valid, and its expansion is that $\blacksquare no(P, M)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$. In line with the clause (2) in Fact 1, it can be seen that $\Box no(P, M)\leftrightarrow\Box no(M, P)$. Therefore, it can be seen that $\Box no(M, P)\rightarrow(some(S, M)\rightarrow+not\ all(S, P))$, i.e.□EI +O-1 can be deduced from □EI+O-2. The proofs of the other cases are along similar lines to that of (3.1).

Theorem 4: The validity of the following four syllogisms can be inferred from □EI+O-2:

(4.1) □EI+O-2⇒■E■AE-1⇒■E■AO-1

(4.2) □EI+O-2⇒■E■AE-1⇒■E■AE-2⇒■E■AO-2

(4.3) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EO-4

(4.4) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EE-2⇒■A■EO-2

Proof: For (4.1). According to (2.1) □EI+O-2⇒■E■AE-1, it follows that ■E■AE-1 is valid, and its expansion is that ■*no*(*P, M*)→(■*all*(*S, P*)→*no*(*S, M*)). It can be seen that ⊢ *no*(*Y*, *X*) →*not all*(*Y*, *X*), using the clause (2) in Fact 4. Hence, ■*no*(*P, M*)→(□*all*(*S, P*)→*not all*(*S, M*)) is valid by means of Rule 1. In other words, ■E■AO-1 can be derived from □EI+O-2. The other cases can be similarly demonstrated.

Theorem 5: The validity of the following two syllogisms can be inferred from □EI+O-2:

(5.1) □EI+O-2⇒ □AO+O-2

(5.2) □EI+O-2⇒■E■AE-1⇒■A■AA-1

Proof: For (5.1). In line with Theorem 1, it follows that □EI+O-2 is valid, and its expansion is that +■*no*(*P, M*)→(*some*(*S, M*)→+*not all*(*S, P*)). It is clear that *no*(*P, M*)=*all*¬(*P, M*) and *some*(*S, M*)=*not all*¬(*S, M*) hold on the basis of the clause (2) and (3) in Fact 2. Then one can infer that□ *all*¬(*P, M*)→(*not all*¬(*S, M*)→+*not all*(*S, P*)). It can be seen that *all*¬(*P, M*)=*all*(*P, D*−*M*) and *not all*¬(*S, M*)=*not all*(*S, D*−*M*) according to Definition 2. Hence, the validity□ of *all*(*P, D-M*)→ (*not all*(*S, D*−*M*)→+*not all*(*S, P*)) is straightforward. That is to say that □AO +O-2 can be deduced fr□□EI +O-2, as desired. The proof of (5.2) is along a similar line to that of (5.1).

Theorem 6: The validity of the following six syllogisms can be inferred from □EI+O-2:

(6.1) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1

(6.2) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■A■AI-4

(6.3) □EI+O-2⇒□EI+O4

(6.4) □EI+O-2⇒I□ A+I-3⇒□ AI+I-3

(6.5) □EI+O-2⇒I□A+I-3⇒ □ AI+I-3 ⇒I□ A+I-4

(6.6) □EI+O-2⇒I□A+I-3 ⇒ □AI+I-3⇒ □ AI+I-1

Proof: For (6.1). In line with (5.2) □EI +O-2⇒■E■AE-1⇒■A■AA-1, it follows that ■A■AA-1 is valid, and its expansion is that ■*all*(*P, M*)→(■*all*(*S, P*)→*all*(*S, M*)). Then, it can be seen that *all*(*S, M*)→*some*(*S, M*) according to the clause (1) in Fact 4. Hence, it can be proved that ■*all*(*P, M*)→(■*all*(*S, P*)→*some*(*S, M*)) is valid. In other words, the syllogism ■A■AI-1 can be derived from □EI+O-2.

For (6.2). According to (6.1) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1, it follows that ■A■AI-1 is valid, and its expansion is that ■*all*(*P, M*)→(■*all*(*S, P*)→*some*(*S, M*)). Then, what is obtained is that ■*some*(*S, M*)↔ ■*some*(*M, S*), using the clause (1) in Fact 1. It is reasonable to say that ■*all*(*P, M*)→(■*all* (*S, P*)→ ■*some*(*M, S*)) is valid. That is to say that the syllogism ■A■AI-4 can be derived from ■A■AI-1. The proofs of other cases are along similar lines to that of (6.2).

Theorem 7: The validity of the following five syllogisms can be inferred from □EI◇O-2:

(7.1) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒O□A+O-3

(7.2) □EI+O-2⇒■E■AE-1⇒■E■AE-2⇒■E■AO-2⇒□AA+ I-3

(7.3) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EO-4⇒□EA+ O-4

(7.4) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■AE+ O-2

(7.5) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■AE+ O-2⇒E■A+O-3

Proof: For (7.1). In line with (5.2) □EI+O-2⇒E■AE-1⇒■A■AA-1, it follows that ■A■AA-1 is valid, whose expansion is that ☑*all*(*P, M*)→(■*all*(*S, P*)→*all*(*S, M*)). And then it can be derived that ¬*all*(*S, M*)→(■*all*(*S, P*)→¬■*all*(*P, M*)) in the light of Rule 2. Thus one can obtain that ¬*all*(*S, M*)→(■*all*(*S, P*)→+¬*all*(*P, M*)) according to Fact 5. It is clear that ¬*all*(*S, M*)=*not all*(*S, M*) and ¬*all*(*P, M*)=*not all*(*P, M*) based on the clause (1) in Fact 3. Therefore, it can be seen that *not all*(*S, M*)→(■*all*(*S, P*)→ +*not all*(*P, M*)) is valid. That is to say that O□A+O-3 can be deduced from □EI+O-2. The proofs of other cases follow the similar pattern as that of (7.1).

Theorem 8: The validity of the following four syllogisms can be inferred from □EI+O-2:

(8.1) □EI+O-2⇒□EI+O-4⇒□EI+O-3

(8.2) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EO-4⇒□EA+ O-4⇒□EA+O-3

(8.3) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■AE+ O-2⇒■AE+O-4

(8.4) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■AE+ O-2⇒E■A+O-3⇒E■A+O-4

Proof: For (8.1). In line with (6.3) □EI+O-2⇒□EI+O-4, it follows that □EI+O-4 is valid, and its expansion is that ■*no*(*P, M*)→(*some*(*M, S*)→ +*not all*(*S, P*)). Then, what is obtained is ■*no*(*P, M*)↔ ■*no*(*M, P*), using the clause (2) in Fact 1. Hence, it can be proved that ■*no*(*M, P*)→(*some*(*M, S*)→ +*not all*(*S, P*)) is valid, i.e. the syllogism □EI+O-3 can be derived from □EI+O-2. The other cases can be similarly proved.

Theorem 9: The validity of the following eleven syllogisms can be inferred from □EI+O-2:

(9.1) □EI+O-2⇒■E■AE-1⇒■E■A+E-1

(9.2) □EI+O-2⇒■E■AE-1⇒■E■AE-2⇒■E■A+E-2

(9.3) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■E+E-4

(9.4) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EE-2⇒■A■E+E-2

(9.5) □EI+O-2⇒■E■AE-1⇒■E■AO-1⇒■E■A+O-1

(9.6) □EI+O-2⇒■E■AE-1⇒■E■AE-2⇒■E■AO-2⇒■E■A+O-2

(9.7) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EO-4⇒■A■E+O-4

(9.8) □EI+O-2⇒■E■AE-1⇒■A■EE-4⇒■A■EE-2⇒■A■E O-2⇒■A■E+O-2

(9.9) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒□A■A+A-1

(9.10) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■A■A+I-1

(9.11) □EI+O-2⇒■E■AE-1⇒■A■AA-1⇒■A■AI-1⇒■A■AI-4⇒■A■A+I-4

Proof: For (9.1). In line with (2.1) □EI+O-2⇒■E■AE-1, it follows that ■E■AE-1 is valid. It is clear that E⇒+E according to Fact 7. Therefore, the validity of ■E■A+E-1 is straightforward. The proofs of other cases follow the same pattern as that of (9.1).

So far, the other 38 valid Aristotelian modal syllogisms have been derived from the validity of the syllogism □EI+O-2 on the basis of modern modal logic and generalized quantifier theory.

IV. Conclusion and Future Work

This paper firstly demonstrates the validity of the syllogism □EI+O-2, and then takes it as the basic axiom to derive the other 38 valid modal syllogisms by taking advantage of some reasoning rules in classical propositional logic, the symmetry of two Aristotelian quantifiers (i.e. *some* and *no*), the transformation between an Aristotelian quantifier and its three negative quantifiers, and some facts in first order logic. In other words, there are reducibility between the syllogism □EI+O-2 and the other 38 valid Aristotelian modal syllogisms. Moreover, the above deductions may provide a consistent interpretation for Aristotelian modal syllogistic. There are infinitely many instances in natural language corresponding to any valid modal syllogism. Therefore, this study has significant theoretical value and practical significance to natural language information processing in computer science.

Can the remaining valid Aristotelian modal syllogisms be derived from a few valid modal syllogisms (such as □E□I□O-2, □E□I◇O-2, □E◇I◇O-2, □E□IO-2, ◇EI◇O-2, E◇I◇O-2, □EI◇O-2, E□I◇O-2, □EIO-2, E□IO-2 and EI◇O-2), and how to construct a coherent formal system for Aristotelian modal syllogistic? These questions need to be explored in depth.

Acknowledgements

This work was supported by the National Social Science Foundation of China under Grant No.22&ZD295.

References Références Referencias

1. Long, W. (2023). Formal System of Categorical Syllogistic Logic Based on the Syllogism AEE-4. *Open Journal of Philosophy, 13,* 97-103.
2. Murinová, P., and Novák, V. (2012). A Formal Theory of Generalized Intermediate Syllogisms. *Fuzzy Sets and Systems, 186,* 47-80.
3. Hui, L. (2023) Reduction between categorical syllogisms based on the syllogism EIO-2. *Applied Science and Innovative Research, 7,* 30-37.
4. Cheng, Z. (2023). How to Deduce the Other 91 Valid Aristotelian Modal Syllogisms from the Syllogism IAI-3. *Applied Science and Innovative Research, 7,* 46-57.
5. Xiaojun Zhang. (2018). Axiomatization of Aristotelian syllogistic logic based on generalized quantifier theory. *Applied and Computational Mathematics, 7(3)*, 167-172.
6. Łukasiewicz, J. (1957). *Aristotle's Syllogistic: From the Standpoint of Modern Formal Logic*. Second edition, Oxford: Clerndon Press.
7. Striker, G. (1994). Assertoric vs. Modal Syllogistic. *Ancient Philosophy, 14,* 39-51.
8. Nortmann, U. (1996). *Modale Syllogismen, mögliche Welten, Essentialismus: Eine Analyse der aristotelischen Modallogik*. De Gruyter.
9. Brennan, T. (1997). Aristotle's Modal Syllogistic. A Discussion of R. Patterson, Aristotle's Modal Logic. *Oxford Studies in Ancient Philosophy, 15,* 207-231.
10. Smith, R. (1995). *The Cambridge Companion to Aristotle*, Cambridge University Press.
11. Chellas, F. (1980). *Modal Logic: an Introduction*. Cambridge University Press.
12. Chagrov, A. and Zakharyaschev, M. (1997). *Modal Logical*. Clarendon Press, Oxford.
13. Peters S., and Westerståhl, D. (2006). *Quantifiers in Language and Logic*. Claredon Press.
14. Xiaojun, Z. (2014). *A Study of Generalized Quantifier Theory*. Xiamen University Press. (in Chinese)

15. Malink, M. (2013). *Aristotle's Modal Syllogistic*, Harvard University Press.
16. Moss, L. S. (2008). Completeness Theorems for Syllogistic Fragments. In F. Hamm, & S. Kepser (Eds.), *Logics for Linguistic Structures*. Mouton de Gruyter.
17. Xiaojun, Z. (2020). Screening out All Valid Aristotelian Modal Syllogisms. *Applied and Computational Mathematics, 8,* 95-104.
18. Johnson, F. (1989). Models for Modal Syllogisms. *Notre Dame Journal of Formal Logic, 30,* 271-284.

Global Journals Guidelines Handbook 2024

www.GlobalJournals.org

Memberships

Fellows/Associates of Computer Science Research Council

FCSRC/ACSRC Memberships

Introduction

FCSRC/ACSRC is the most prestigious membership of Global Journals accredited by Open Association of Research Society, U.S.A (OARS). The credentials of Fellow and Associate designations signify that the researcher has gained the knowledge of the fundamental and high-level concepts, and is a subject matter expert, proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice. The credentials are designated only to the researchers, scientists, and professionals that have been selected by a rigorous process by our Editorial Board and Management Board.

Associates of FCSRC/ACSRC are scientists and researchers from around the world are working on projects/researches that have huge potentials. Members support Global Journals' mission to advance technology for humanity and the profession.

FCSRC

Fellow of Computer Science Research Council

FELLOW OF COMPUTER SCIENCE RESEARCH COUNCIL is the most prestigious membership of Global Journals. It is an award and membership granted to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Fellows are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Fellow Members.

Benefit

To the institution

Get letter of appreciation

Global Journals sends a letter of appreciation of author to the Dean or CEO of the University or Company of which author is a part, signed by editor in chief or chief author.

Exclusive Network

Get access to a closed network

A FCSRC member gets access to a closed network of Tier 1 researchers and scientists with direct communication channel through our website. Fellows can reach out to other members or researchers directly.They should also be open to reaching out by other.

Career | Credibility | Exclusive | Reputation

Certificate

Certificate, LoR and Laser-Momento

Fellows receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

Career | Credibility | Exclusive | Reputation

Designation

Get honored title of membership

Fellows can use the honored title of membership. The “FCSRC” is an honored title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., FCSRC or William Walldroff, M.S., FCSRC.

Career | Credibility | Exclusive | Reputation

Recognition on the Platform

Better visibility and citation

All the Fellow members of FCSRC get a badge of "Leading Member of Global Journals" on the Research Community that distinguishes them from others. Additionally, the profile is also partially maintained by our team for better visibility and citation. All fellows get a dedicated page on the website with their biography.

Career | Credibility | Reputation

Future Work

Get discounts on the future publications

Fellows receive discounts on future publications with Global Journals up to 60%. Through our recommendation programs, members also receive discounts on publications made with OARS affiliated organizations.

Career | Financial

GJ Account

Unlimited forward of Emails

Fellows get secure and fast GJ work emails with unlimited forward of emails that they may use them as their primary email. For example, john [AT] globaljournals [DOT] org.

Career | Credibility | Reputation

Premium Tools

Access to all the premium tools

To take future researches to the zenith, fellows receive access to all the premium tools that Global Journals have to offer along with the partnership with some of the best marketing leading tools out there.

Financial

Conferences & Events

Organize seminar/conference

Fellows are authorized to organize symposium/seminar/conference on behalf of Global Journal Incorporation (USA). They can also participate in the same organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent. Additionally, they get free research conferences (and others) alerts.

Career | Credibility | Financial

Early Invitations

Early invitations to all the symposiums, seminars, conferences

All fellows receive the early invitations to all the symposiums, seminars, conferences and webinars hosted by Global Journals in their subject.

Exclusive

Publishing Articles & Books

Earn 60% of sales proceeds

Fellows can publish articles (limited) without any fees. Also, they can earn up to 70% of sales proceeds from the sale of reference/review books/literature/publishing of research paper. The FCSRC member can decide its price and we can help in making the right decision.

Exclusive | Financial

Reviewers

Get a remuneration of 15% of author fees

Fellow members are eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get a remuneration of 15% of author fees, taken from the author of a respective paper.

Financial

Access to Editorial Board

Become a member of the Editorial Board

Fellows may join as a member of the Editorial Board of Global Journals Incorporation (USA) after successful completion of three years as Fellow and as Peer Reviewer. Additionally, Fellows get a chance to nominate other members for Editorial Board.

Career | Credibility | Exclusive | Reputation

And Much More

Get access to scientific museums and observatories across the globe

All members get access to 5 selected scientific museums and observatories across the globe. All researches published with Global Journals will be kept under deep archival facilities across regions for future protections and disaster recovery. They get 10 GB free secure cloud access for storing research files.

ASSOCIATE OF COMPUTER SCIENCE RESEARCH COUNCIL

ASSOCIATE OF COMPUTER SCIENCE RESEARCH COUNCIL is the membership of Global Journals awarded to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Associate membership can later be promoted to Fellow Membership. Associates are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Associate Members.

Benefit

To the institution

Get letter of appreciation

Global Journals sends a letter of appreciation of author to the Dean or CEO of the University or Company of which author is a part, signed by editor in chief or chief author.

Exclusive Network

Get access to a closed network

A ACSRC member gets access to a closed network of Tier 2 researchers and scientists with direct communication channel through our website. Associates can reach out to other members or researchers directly.They should also be open to reaching out by other.

Career | Credibility | Exclusive | Reputation

Certificate

Certificate, LoR and Laser-Momento

Associates receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

Career | Credibility | Exclusive | Reputation

Designation

Get honored title of membership

Associates can use the honored title of membership. The “ACSRC” is an honored title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., ACSRC or William Walldroff, M.S., ACSRC.

Career | Credibility | Exclusive | Reputation

Recognition on the Platform

Better visibility and citation

All the Associate members of ACSRC get a badge of "Leading Member of Global Journals" on the Research Community that distinguishes them from others. Additionally, the profile is also partially maintained by our team for better visibility and citation.

Career | Credibility | Reputation

Future Work

Get discounts on the future publications

Associates receive discounts on future publications with Global Journals up to 30%. Through our recommendation programs, members also receive discounts on publications made with OARS affiliated organizations.

Career | Financial

GJ Account

Unlimited forward of Emails

Associates get secure and fast GJ work emails with 5GB forward of emails that they may use them as their primary email. For example, john [AT] globaljournals [DOT] org.

Career | Credibility | Reputation

Premium Tools

Access to all the premium tools

To take future researches to the zenith, associates receive access to all the premium tools that Global Journals have to offer along with the partnership with some of the best marketing leading tools out there.

Financial

Conferences & Events

Organize seminar/conference

Associates are authorized to organize symposium/seminar/conference on behalf of Global Journal Incorporation (USA). They can also participate in the same organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent. Additionally, they get free research conferences (and others) alerts.

Career | Credibility | Financial

Early Invitations

Early invitations to all the symposiums, seminars, conferences

All associates receive the early invitations to all the symposiums, seminars, conferences and webinars hosted by Global Journals in their subject.

Exclusive

Publishing Articles & Books

Earn 30-40% of sales proceeds

Associates can publish articles (limited) without any fees. Also, they can earn up to 30-40% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.

Exclusive | Financial

Reviewers

Get a remuneration of 15% of author fees

Associate members are eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get a remuneration of 15% of author fees, taken from the author of a respective paper.

Financial

And Much More

Get access to scientific museums and observatories across the globe

All members get access to 2 selected scientific museums and observatories across the globe. All researches published with Global Journals will be kept under deep archival facilities across regions for future protections and disaster recovery. They get 5 GB free secure cloud access for storing research files.

Associate	Fellow	Research Group	Basic
$4800 **lifetime designation**	$6800 **lifetime designation**	$12500.00 **organizational**	APC **per article**
Certificate, LoR and Momento **2** discounted publishing/year **Gradation** of Research **10** research contacts/day **1 GB** Cloud Storage **GJ** Community Access	**Certificate,** LoR and Momento **Unlimited** discounted publishing/year **Gradation** of Research **Unlimited** research contacts/day **5 GB** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**Certificates,** LoRs and Momentos **Unlimited** free publishing/year **Gradation** of Research **Unlimited** research contacts/day **Unlimited** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**GJ** Community Access

Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

Before and during Submission

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct,* along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

Policy on Plagiarism

Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

- Words (language)
- Ideas
- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

Authorship Policies

Global Journals follows the definition of authorship set up by the Open Association of Research Society, USA. According to its guidelines, authorship criteria must be based on:

1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

Copyright

During submission of the manuscript, the author is confirming an exclusive license agreement with Global Journals which gives Global Journals the authority to reproduce, reuse, and republish authors' research. We also believe in flexible copyright terms where copyright may remain with authors/employers/institutions as well. Contact your editor after acceptance to choose your copyright policy. You may follow this form for copyright transfers.

Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Computer Science Research Paper

Techniques for writing a good quality computer science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of computer science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10.Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

save our planet

Global Journal of Computer Science and Technology

Visit us on the Web at www.GlobalJournals.org | www.ComputerResearch.org
or email us at helpdesk@globaljournals.org

ISSN 9754350