IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Ai-Augmented Rpa For Smart Receipting

[1] Dr. Chandrasekar Vadivelraju, [2] Keren Elisheba S, [3] Chirag K Srinivas, [4] Vikhyath M B

[1] Professor, [2,3,4] Undergraduate Student

[1] School of Computer Science and Engineering

[1] Presidency University, Bengaluru, India

Abstract: The rapid adoption of automation technology has changed how organizations work repetitively and with high performance. This paper presents a new automation approach that combines artificial intelligence (AI) with robotic process automation (RPA). The proposed AI-powered RPA system addresses issues in areas such as insurance avoidance, payment delay prediction, and vulnerability detection, where traditional RPA systems often fall short. Using machine learning models to identify anomalies and predict payment delays, thereby improving the entire decision-making process. Furthermore, the system is designed to efficiently generate receipts, distribute transactions, and plan by combining business-based rules with intelligent measures. This study evaluates the efficiency, accuracy, and scalability of AI-enhanced RPA systems compared to traditional RPA solutions, highlighting the advantages in dynamic environments and data-driven environments. These studies aim to establish guidelines for the technology and lay the groundwork for the future advancement of smart plugs.

Index Terms **– Finance Receipting, Robotic Process Automation**

I. INTRODUCTION

The rapid development of the computer revolution has enabled the organization to support the development of simplifying complex information and business efforts. Among these, Automatic Process Automation (RPA) has emerged as a driving tool to streamline processes and thus reduce operational and operational errors. However, traditional RPA operations often struggle with weak data outside of data, limiting their ability to process inappropriate data or adapt to situations they did not think of. RPA with (AI) and machine learning (ML) holds great promise. This intersection enables informed, flexible, and realistic decisions to be made while performing complex tasks. In the receipt field, where organizations generate and process thousands of receipts every month, using AI-driven RPA can increase efficiency and reduce planning time while maintaining accuracy. RPA takes the work out of preparing the machine. When AI insights are combined with RPA accuracy, planning processes can detect delays, classify exceptions, and identify design inconsistencies. The survey reports on how AI-powered RPA frameworks compare to traditional RPA deployments in terms of performance, accuracy, and flexibility. The goal is to offer a thorough manual for intelligent adoption by connecting technology and intelligence effectively.

II. OBJECTIVE:

The main purpose of this project is to design and analyze an RPA system enhanced with artificial intelligence to get the job done, increase efficiency, and accuracy, and avoid management.

III. PROBLEM STATEMENT:

A customer needs to process a backlog of 25,000 invoices per month. The document is created with predefined terms and conditions. There is a 10% discount on this transaction and paper usage is included. The source data is downloaded from the SAP application from which the data is taken. Customer information is classified as a card or cheque based on the transaction type. Separate user information is provided to the website request. For each receipt number, a template is used to create a receipt and send it to the vendor specified in the document. Each business type has its template that can be used in the data server. Create a solution that will ensure that the above process and email are received by qualified vendors.

IV. PROPOSED SYSTEM:

The proposed system integrates Artificial Intelligence (AI) and Robotic Process Automation (RPA) to enhance receipting workflows by leveraging machine learning models for exception classification, anomaly detection, and payment delay prediction. It automates the generation, classification, and dispatch of receipts while utilizing AI-driven insights to handle dynamic scenarios efficiently.

V. LITERATURE SURVEY:

Gupta and P. Kumar (2020): In their study, "Integrating Machine Learning with Robotic Process Automation," the authors explore the synergy between RPA and AI technologies to address the limitations of traditional rule-based automation. The paper emphasizes the application of machine learning for managing exceptions, detecting anomalies, and enhancing decision-making in automation workflows. The findings indicate a significant improvement in processing speed and accuracy when combining RPA with AI-driven models.

Sharma et al. (2019): The research paper "Anomaly Detection in Financial Transactions Using AI Techniques" examines the application of machine learning algorithms such as Isolation Forest and One-Class SVM to detect anomalies in structured financial data. The authors propose a hybrid model for identifying fraudulent transactions, which is highly relevant to exception handling in receipting workflows. Their approach demonstrates increased precision and recall compared to traditional statistical methods.

M. Patel and R. Joshi (2021): "AI-Powered Process Automation in Back-Office Operations" discusses the role of AI in enhancing the efficiency of RPA systems for back-office processes. The authors highlight the application of NLP in text classification and sentiment analysis, along with supervised learning in predictive analytics. The paper provides evidence that integrating AI models into RPA can significantly reduce exception handling time and improve overall process scalability.

Y.Li and X.Wang (2022): In "Machine Learning for Payment Delay Prediction," the authors present a comprehensive analysis of using regression-based ML models, such as Random Forest and Gradient Boosting, to predict payment delays in financial workflows. The study highlights the impact of incorporating historical payment data and transaction patterns into the models, resulting in more accurate predictions and better workflow planning.

VI. METHODOLOGY:

The proposed AI-powered RPA aims to increase operational efficiency by combining machine learning models with robotic process automation. First, the generated data was extracted and pre-processed using Python-based scripts to ensure clarity and consistency. Cleaning products are classified into business types such as cards and checks using requirements-based requirements used in the RPA framework. Machine learning models are used to define business models, select appropriate models, and predict delays or uncertainties. Automatically email receipts using seamless integration of RPA workflows with SMTP servers. Additionally, the system includes an open AI-powered chatbot to facilitate user interaction, assist with questions, manage exceptions, and manage repeat requests. Provide real-time monitoring and analytics through dashboards that provide insight into system performance, unique pricing, and email delivery policies. This approach enables efficient, scalable, and intelligent automation solutions that take the complexity out of daily operations.

VII. SYSTEM DESIGN:

7.1 System Architecture

This system architecture is designed to use a comprehensive, multi-layered approach for ease of use. As seeing in Figure 1 it starts from the data processing process and is responsible for key tasks such as data collection, cleaning, and processing to ensure data quality and reliability. On top of that, the automation layer is responsible for implementing Robotic Process Automation (RPA) workflows, specifically focusing on generating receipts and scheduling processes. The AI system adds AI to the system using advanced capabilities such as predictive modeling, anomaly detection, and anomaly classification. Finally, the interactive process provides seamless connectivity through intelligent communication to enhance user experience, making user engagement more intuitive and effective throughout the body.

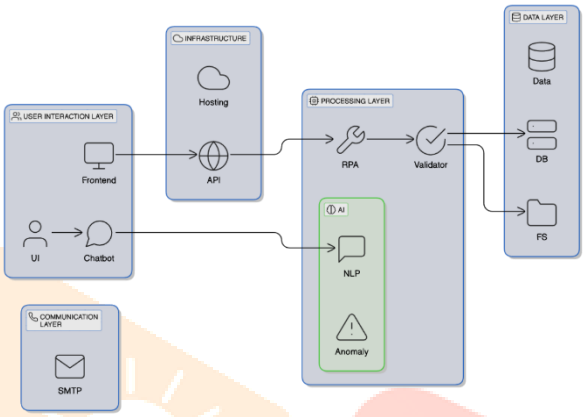

Figure 1

7.2 Class Diagram

The class diagram in Figure 2 represents the architecture of an AI-enabled RPA system, showing the interactions between various components and layers of the system. Here is a description of each category and its relationship to other elements:

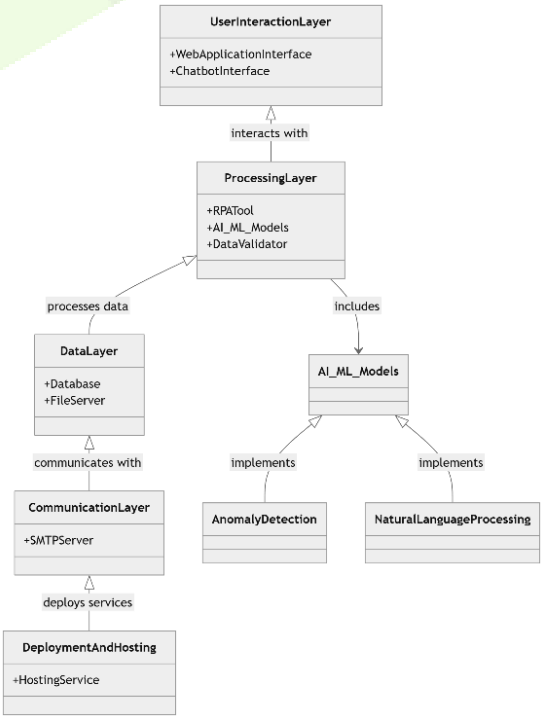

Figure 2

1. UserInteractionLayer
This layer provides the interface for users to interact with the system, either through a WebApplicationInterface or a ChatBotInterface.
Interactions:
-Directly communicates with the ProcessingLayer to initiate workflows or retrieve processed data.
-Allows users to provide inputs or query the system through intuitive interfaces.

2. ProcessingLayer
The core layer of the system is where the main processing and automation occur.
Attributes:
-RPATool: Manages the rule-based automation workflows.
-AI_ML_Models: Integrates advanced AI capabilities like anomaly detection and NLP.
-DataValidator: Ensures the accuracy and consistency of processed data.
Interactions:
-Receives input from the UserInteractionLayer.
-Processes data fetched from the DataLayer.
-Utilizes AI/ML Models for intelligent decision-making.

3. DataLayer
Stores and manages the data required for the system, including databases and file servers.
Attributes:
Database: Stores structured data such as transaction details.
FileServer: Maintains templates and receipt-related files.
Interactions:
Provides data to the ProcessingLayer for segregation, validation, and processing.
Receives and stores processed data for future use.

4. AI_ML_Models
This class encompasses all AI-driven functionalities, which are included as part of the ProcessingLayer.
Components:
AnomalyDetection: Implements fraud and exception detection in real-time.
NaturalLanguageProcessing (NLP): Powers chatbots for user interaction and automates text processing tasks.
Interactions:
Used by the ProcessingLayer to handle complex and dynamic tasks that exceed traditional RPA capabilities.

5. CommunicationLayer
Facilitates the delivery of processed outputs, such as emails or notifications.
Attributes:
SMTPServer: Handles email automation for sending receipts and notifications.
Interactions:
Communicate with the ProcessingLayer to send the finalized output to end-users or vendors.

6. DeploymentAndHosting
Manages the deployment and hosting of the RPA system for scalability and availability.
Attributes:
HostingService: Ensures the system is accessible through a web or cloud platform.
Interactions:
Deploys services for the CommunicationLayer and other components.

7.2.1 Relationships

1. UserInteractionLayer↔ProcessingLayer:
The user interacts with the system through web or chatbot interfaces, which communicate directly with the processing core.

2. ProcessingLayer ↔ DataLayer:
The processing core retrieves and validates data from the database and file server for automation workflows.

3.ProcessingLayer ↔ AI_ML_Models:
AI capabilities augment the RPA processes, providing intelligent anomaly detection and NLP support.

4.ProcessingLayer ↔CommunicationLayer:
Sends automated emails or notifications after processing data.

5. DeploymentAndHosting ↔ CommunicationLayer:
Hosts the communication services to ensure smooth delivery and scalability.

7.3 Flow Chart

The flowchart as shown in Figure 3 appears to outline a transactional process involving user input, validation, anomaly detection, and communication (e.g., emails or chatbot interaction). Here's an explanation of the steps in the flow:

1. **Start:** The process begins.
2. **User Input**: The system receives input from the user.
3. **Validate Data**: The system checks whether the input data is valid.
- If invalid, an Error is generated, and the process ends or requires user correction.
- If valid, the process moves to the next step.
4. **Transaction Segregation**: Valid data is categorized into different transaction types.
5. **Template Selection**: A specific template is chosen based on the transaction type.
6. **Receipt Generation**: A receipt or confirmation is created using the selected template.
7. **Anomaly Detected**: The system checks for anomalies in the process.
   -If yes, the process flags the transaction for Manual Review.
   -If not, the process continues.
8. **Email Dispatch**: The system sends an email.
   If the email is not sent successfully, the system moves to the Retry Dispatch step.
   If the email is sent successfully, the process moves to the next step.
9. **Chatbot Query Interaction:** The system interacts with the user via a chatbot to provide additional information or resolve queries.
10. **End:** The process concludes

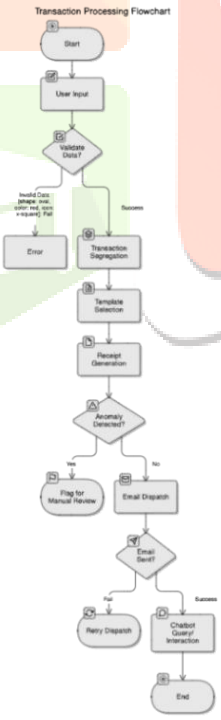

Figure 3

VIII. IMPLEMENTATION:

8.1 Robotic Process Automation (RPA)

Robotic process automation (RPA) is a technology that performs repetitive tasks by legitimately imitating the way humans interact with digital machines. Unlike traditional automation which requires manual labor, RPA uses software robots to interact with applications through a user interface, such as copying and pasting data and extracting data from information or work. RPA has a distinctive capability to seamlessly integrate with current systems without any changes, enabling enhancements in the efficiency, precision, and user-friendliness of business processes. Robotic process automation (RPA) works by using human interaction with digital machines to perform repetitive, systematic tasks. To understand how this works, consider a bot that automates the process of transferring data from an email inbox to an Excel spreadsheet. The process begins with an RPA bot identifying an event, such as the arrival of a new email. It uses predefined rules to identify emails that contain specific content or links that need to be processed. For scanned documents or non-text documents, it uses optical character recognition (OCR) to accurately capture the content. Once the data is extracted, the bot can use it and process it; perform checks to ensure accuracy and compliance, update fields, or use business rules to interact with each other. The bot navigates the application (such as Excel spreadsheets) just like a human operator by copying, pasting, or typing the extracted data into the required field. This allows it to perform tasks without changing the underlying system. Once the job is done, the robot can save the results, making them clear and transparent. It can also initiate subsequent actions, such as sending a confirmation email or updating information in another system. Reduce errors by interacting with various digital tools and applications during work.

8.2 Natural Language Processing (NLP):

Natural language processing (NLP) allows machines to understand, analyze, and reproduce human language by breaking it down into small pieces and using algorithms to extract meaning. The process begins with a pre-read, where the raw data is cleaned and modeled. This includes processes like tokenization (breaking the text into words or phrases) and removing punctuation (removing words that don't add meaning, like "the" or "is"). Additional processes such as stemming and lemmatization reduce words to their base forms (e.g., "running" becomes "run"), while normalization ensures text uniformity through converting everything to lowercase or standardized formats. This step is easy for the reader and makes it easier for machines to work with. Techniques like Bag of Words (BoW) and TF-IDF (Time Frequency-Inverse Document Frequency) represent words according to their frequency and importance in the text. More advanced techniques like Word2Vec or word embeddings like GloVe capture the relationship between individual words and their context, allowing machines to process words in a deeper and more useful way. This includes language modeling and analysis, where algorithms analyze text to extract insights. Early techniques relied on rule-based methods and statistical models, but modern NLP uses machine learning and deep learning. Models like Recurrent Neural Networks (RNN), Transformers (e.g. BERT, GPT), and other neural architectures can process data, understand the context, and capture relationships between long messages. This model has learned a lot of data to recognize patterns, understand the context, and predict meaning. For example, sentiment analysis determines the tone of the text, while entity recognition (NER) identifies entities such as names, dates, or locations. In machine translation, NLP translates text from one language to another, creating human-like content to power chatbots or write long texts. Over time, NLP systems will relearn through feedback and other methods and improve their data performance. Through advanced connections, numerical representations, high-level decision models, and unique functional outcomes, NLP enables efficient machines to interact with human language, encouraging more applications in today's digital world.

8.3 Optical Character Recognition (OCR):

Optical character recognition (OCR) is a machine that converts printed, typed, or scanned text into machine-readable bits. OCR bridges the gap between physical data and digital systems by recognizing and extracting characters from images, scanned documents, or video. Even in complex systems, computer vision systems with the best information structure that can recognize letters, numbers, and symbols play an important role. It is widely used in applications such as digitally printing documents, automating invoice processing, extracting text from ID cards, and conducting research on scanned PDFs. OCR technology simplifies data

management and supports digital transformation across businesses by converting invisible data into structured, editable formats.

8.3.1 Working of OCR

The optical character recognition (OCR) module in the system converts unstructured text in scanned documents or image files into a standard, machine-readable format for seamless data processing. This process begins with preprocessing, where techniques such as denoising, binarization, de-skewing, and image enhancement are used to improve the quality of the input image. This step ensures that the OCR engine can interpret the text correctly, whether the document is good or bad. Search and extract text from images. Recognize symbols, words, and prefixes such as receipt number, vendor name, date, and transaction amount. To process documents with different processing methods, machine learning models can improve the OCR process by identifying the workspace, thus facilitating compliance and standardization. This ensures that the data is in the desired format and eliminates errors such as incorrect readings. Information from specific sources. For example, you can use pattern analysis and natural language processing (NLP) together to create invoices or receipts with different templates to find and interpret content such as payment terms or job types. Multilingual process. Modern OCR engines are capable of recognizing multiple languages, making the system versatile and suitable for international use. With advanced algorithms, we can check the text of the file and change the pattern according to the correct text recognition. OCR bridges the gap between data processing and digital automation, reducing the need for manual intervention, speeding up processing time, and making data more accurate. Integrating OCR into RPA functionality enhances the capabilities of the system, allowing it to process multiple receipts while converting them to different file types and layouts.

8.4 Anomaly Detection

Fault detection plays a key role in improving the intelligence and robustness of an AI-enhanced RPA system for smart buyers. In financial transactions, exceptions often occur as inconsistencies or discrepancies in transaction data, such as missing fields, duplicate items, missing payments, or inconsistent terms from the vendor. If left undetected, these vulnerabilities can disrupt automated processes, cause invoices to be created incorrectly, and potentially disrupt the business. Information changes during receipt processing. By combining machine learning models that learn from historical data, the system can learn the patterns and behaviours of successful businesses. This makes it useful for distinguishing between traditional and unpredictable businesses, even as business models change over time. Improve custom usage. This reduces the burden on human workers due to the inconsistencies expected from big data and ensures accuracy in low-level processes such as sample selection, emailing, etc. By integrating invisible sensing, the system achieves a new level of accuracy, reliability, and efficiency, making it ideal for complex, high-volume application work.

8.4.1 Implementation of Anomaly Detection

In planning an RPA system enhanced with AI, anomaly detection plays an important role in identifying possible fraud and inconsistencies in the received work. These features increase the accuracy, reliability, and security of the system by preventing suspicious or inconsistent work in data transfer. The application will include a combination of machine learning models, statistical methods, and legal analysis to ensure fraud cases are covered.

8.4.2 Step-by-Step Implementation

1. **Data Preprocessing**: The vulnerability detection process begins with removing modified data from the database. Data is pre-processed to ensure consistency, accuracy, and formatting. Missing values will be added or flagged for manual review, and categorical fields (such as business type or vendor ID) will be coded for review.
2. **Feature Engineering:** Extract important features from data that indicate potential fraud. Examples include standard exchange rates, transaction frequency for each supplier, differences from past events, and vendor-specific conditions. Check features such as mean, median, and standard deviation to find the best results.
3. **Model Training**: Utilizes a blend of machine learning algorithms and statistical models. Unsupervised learning methods like cluster forests, autoencoders, or K-Means

4. **Real-Time Anomaly Detection**: During the acquisition process, data changes are fed into the learning model. The model scores each change based on its likelihood of causing a negative outcome. High-risk businesses are reportedly at risk of fraud and are subject to further investigation.
5. **Rule-Based Checks**: Complementing machine learning models, legal review quickly identifies pre-existing fraud scenarios such as duplicate receipts, mistaken identity transactions, or improper currency exchange.
6. **Integration with RPA**: The vulnerability detection system integrates with RPA functionality. Flagged actions lead to automated special handling procedures that may include notifying appropriate personnel, identifying an exception in the dashboard, or escalating the issue to accounting department control.
7. **Visualization and Reporting**: Exceptions are logged and instantly visible in the dashboard. Key metrics such as the number of false positives, compromises, and risk scores are revealed to provide insight and support decision-making.

IX. RESULTS AND DISCUSSIONS

Table 9.1

Component	Accuracy (%)
Robotic Process Automation (RPA)	99%
Optical Character Recognition (OCR)	85%
Natural Language Processing (NLP)	92%
Anomaly Detection	95%

The studies of the automated processes powered by AI demonstrate a significant improvement in comparison to the pure RPA. As seen in the Accuracy Table 9.1 OCR (85%) is a bit of a weak point in the system especially in terms of text extraction, automation was great with RPA gaining 99% accuracy for taking off repetitive operations. Anomalies and NLP were a great hit at 95% and 92% accuracy respectively, which allowed easy communication with users and the ability to identify fraudulent activities. The engine did good for high speed tasks too, handling up to 25000 receipts a month with less error and latency while allowing for movement of less manual controls by the workflows and the mail maintenance. In addition, with NLP support, the chatbots resolved user queries seamlessly and managed exceptions. All these improvements show that the system is able to provide consistent and effective solutions to more complex changes in the business and thus mark significant development in comparison to conventional RPA models.

X. CONCLUSION:

In the world of back-office automation, well-managed large-scale workflows present special challenges, especially in the areas of proprietary processing, fraud, and accurate information management. Traditional robotic process automation (RPA) systems have long been praised for their ability to automate repetitive, policy-driven processes. However, these systems face limitations when dealing with conflicting, fraudulent, or partial information. To overcome these challenges, integrating artificial intelligence (AI) into RPA operations represents a revolution that provides advanced decision-making capabilities for smarter operations. The system is designed to automate and optimize the ingestion process. The planned system incorporates essential AI elements like visual search, optical character recognition (OCR), and natural

language processing (NLP) to enhance conventional RPA functions. An error detection module detects anomalies in data transfers, highlighting fraudulent cases for immediate investigation. OCR technology helps in accurately extracting information from scanned documents or image-based documents to ensure consistency between document creation and semi-processes. NLP-powered chatbots enhance user interaction by enabling dynamic query parsing and exception management in real time. Separate documents accurately and quickly, select a template and send receipts. This is enhanced with standard error detection that analyzes business data to detect inconsistencies or fraudulent patterns. The system uses OCR to extract important information from the document, thereby.

Reducing the amount of manual work required in a traditional setup. In addition, the integration of NLP-enabled chatbots provides a user-friendly interface to query receipt status, manage exceptions, and forward market transactions. The false detection model has high accuracy to provide fraud prevention capability. OCR is checked for data structure and semi-structured data, and NLP provides a good user experience. Together, these components enable the system to handle abnormal situations, minimize operational errors, and minimize human intervention. Insights and changes quickly created new trends in subsequent studies. This combination paves the way for scalable, efficient, and intelligent solutions, demonstrating how AI-powered automation can meet the changing needs of complex operations.

References

[1] Trivedi, D., & Rathod, J. (2023). "Enhancing Fraud Detection Using Anomaly Detection Models in Financial Transactions." International Journal of Artificial Intelligence Research, vol. 12, no. 4, pp. 223–235

[2] Smith, J., & Patel, R. (2022). "OCR in Document Automation: A Case Study of Financial Receipts Processing." Journal of Intelligent Document Systems, vol. 9, no. 3, pp. 45–56.

[3] Lee, C., & Kim, J. (2021). "The Synergy of RPA and AI in Financial Automation." Journal of Emerging Technologies in Business, vol. 8, no. 2, pp. 101–114.

[4] Gupta, A., & Sharma, P. (2023). "Natural Language Processing for Real-Time Exception Management in Financial Automation." Proceedings of the International Conference on Computational Intelligence (ICCI), pp. 67–74.

[5] Kumar, V., & Singh, A. (2023). "A Review of Hybrid Automation Techniques in Back-Office Processes." Advances in Intelligent Systems and Computing, vol. 1337, pp. 293–308.

[6] Yadav, R., & Kulkarni, M. (2022). "Anomaly Detection Techniques for Fraud Prevention in Financial Transactions." Journal of Fraud Detection and Prevention, vol. 15, no. 1, pp. 89–102.

[7] UiPath Academy. "UiPath RPA Training." Available at: https://academy.uipath.com.

[8] Tesseract OCR. (2024). *GitHub Repository*. Available at: https://github.com/tesseract-ocr/tesseract.

[9] Chandola, V., Banerjee, A., & Kumar, V. (2020). "A Survey of Anomaly Detection in IoT." *IEEE Transactions on Knowledge and Data Engineering*, vol. 32, no. 5, pp. 986–1005.

[10] Patel, A., & Patel, S. (2021). "Optical Character Recognition (OCR) with Deep Learning." *International Journal of Artificial Intelligence and Applications*, vol. 12, no. 3, pp. 55–67.