Migration Letters

Volume: 20, No: S10(2023), pp. 171-181

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

Synergizing Strategic Management and Artificial Intelligence in Economic Decision-Making

Fedel habashneh[1], Gharam Ali abdulazeez[2], Mohed Fares N. Al-mufleh[3], Khaled Alrawashdeh[4], Hussam thneibat[5]

Abstract

A vital area of the food industry, the supply of fresh vegetables brings both potential and obstacles. In this setting, it is becoming more and more important for economic decision-making to combine strategic management and artificial intelligence (AI). To optimize the supply of fresh veggies, this article investigates the integration of strategic management principles with AI-driven methodologies and customer input. Customer feedback is a priceless resource for gathering knowledge that can be used to improve product quality, delivery effectiveness, and all-around customer pleasure. Organizations may analyze and get useful insights from consumer feedback data by utilizing AI techniques like sentiment analysis and machine learning. These insights make it possible to make data-driven decisions and to create strategies that are aligned with strategic goals and customer expectations. Quality assurance, supply chain optimization, tailored recommendations, dynamic pricing, inventory management, and route optimization are important areas of concentration. AI algorithms are used to personalize product suggestions for specific clients, dynamically change price and inventory levels, and assure the freshness and quality of veggies across the supply chain. Furthermore, AI-powered route optimization reduces delivery times and transportation costs to guarantee that fresh vegetables reach clients quickly and in the best possible condition.

Keywords: *artificial intelligence (AI), Strategic Management, customer feedback, Decision Making.*

1. Introduction

The supply of fresh vegetables plays a crucial and fundamental part in the dynamic and ever-changing landscape that is the global food business. Fresh, high-quality veggies are in greater demand as emphasis on sustainable agriculture and healthy eating increases. However, maintaining quality standards while assuring efficient and prompt supply of fresh veggies to consumers poses a complex problem. In this setting, combining the ideas of strategic management with artificial intelligence (AI) has proven to be a powerful method for improving economic decision-making. With a particular emphasis on the supply of fresh veggies, the purpose of this article is to investigate the significant consequences and advantages of combining strategic management with AI in the field of economic decision-making. Customer feedback is a key component of this synergy

[1] fadelhabashneh@gmail.com
[2] gharamali@gmail.com
[3] hebatarawneh2@gmail.com
[4] Kalrawshdeh@aut.edu.jo
[5] Hthnibat@aut.edu.jo

because it is a vital source of information. It acts as a priceless repository of knowledge that may guide plans targeted at improving product quality, supply chain effectiveness, and all-around consumer happiness. AI-driven approaches have changed the once-difficult and time-consuming process of collecting customer feedback. Sentiment analysis and machine learning are two examples of cutting-edge AI approaches that have completely changed how businesses gather, evaluate, and derive value from consumer feedback data. By empowering organizations to match their plans with both customer expectations and overarching strategic objectives, these advances enable data-driven decision-making. In this situation, AI-enhanced strategic management applies to a number of important sectors. AI algorithms are used in quality control techniques to track and guarantee the quality and freshness of vegetables along the complex supply chain. AI-powered personalized suggestions allow businesses to respond to the specific tastes of individual clients, improving the customer experience. Similar to adaptive pricing techniques, dynamic pricing strategies enable in-the-moment adjustments in reaction to changes in demand, market dynamics, and other factors. AI-guided inventory management ensures that supply levels match consumer demand, cutting down on waste and maximizing resource use. By highlighting the incorporation of AI-driven approaches into economic decision-making processes, the study makes a contribution to the subject of strategic management. It emphasizes how utilizing AI tools can improve and supplement strategic management ideas. The importance of customer reviews as a useful resource is acknowledged in the study. It exemplifies how AI, such as sentiment analysis and machine learning, may be used to draw conclusions from consumer feedback data, thereby fostering a customer-centric approach to decision-making. Quality control, supply chain optimization, tailored recommendations, dynamic pricing, inventory control, and route optimization are among the important topics covered in the article. It investigates how the use of AI algorithms might enhance these operations' efficiency and cost-effectiveness. Improving client satisfaction in the context of fresh vegetable delivery is the main objective. The study intends to assist organizations in better meeting customer expectations and enhancing general satisfaction by analyzing consumer feedback and using AI-driven initiatives. The five main portions of the paper are organized. The importance of the supply of fresh vegetables, the difficulties it poses, and the contribution of AI and strategic management to solving these problems are highlighted in the introduction. A thorough overview of pertinent research is given in the literature review section, which also includes case studies that show how successfully AI has been incorporated into supply chains. The research methods, data sources, and AI tools used are described in the methodology section. The findings are presented in the results and analysis section, with a focus on how AI-driven methods improve quality, efficiency, and alignment with strategic goals. The conclusion highlights the significance of the synergy between strategic management and AI for the optimization of the fresh vegetable supply, summarizes significant findings, highlights the study's contributions, and outlines future research opportunities.

2. Literature review

An active and developing field of study and application is the combination of strategic management and artificial intelligence (AI) in economic decision-making. The foundational works for the theories and procedures covered in the article are reviewed in this part.

The use of the Pentahelix Model in West Java is explored in [1] with the goal of boosting the region's economy through the tourism industry. The study looks at how different parties—including the government, academics, business, the community, and tourists—can work together to promote the growth of a sustainable tourism economy. The study emphasizes how crucial it is for different sectors to work together and engage with one another in order to maximize the economic advantages of tourism while solving local

issues. The report advances knowledge on how the Pentahelix Model may be successfully applied to increase West Java's economic growth through the expansion of tourism. In [2], a unique method for integrating Power-to-Gas and Biogas Upgrading technology is examined. The study, which was published in Energy Conversion and Management, focuses on assessing the financial viability of this novel setup. The research intends to advance sustainable energy practices and increase the use of renewable energy sources by integrating biogas upgrading with Power-to-Gas as shown in figure 1. In order to determine this integrated system's financial viability and potential advantages in terms of energy generation and management, the article conducts an economic analysis of it. [3] investigates how to facilitate Industry 4.0 transformation by combining the HeXie Management Framework with a programmed management strategy. The study, which was published in the "E-Business. Digital Empowerment for an Intelligent Future" conference proceedings, focuses on how this synergy might be used to accelerate the adoption of Industry 4.0 practices. The research offers an understanding into how various management frameworks function together, suggesting a potential strategy for successfully managing the opportunities and risks posed by Industry 4.0 technologies and digital transformation in the company setting. Gives a thorough analysis of virus-receptor interactions and the role they play in the emergence of oncolytic viruses. The study examines the structural features of these interactions and provides information on how oncolytic viruses can be created to specifically target and eradicate cancer cells. It uses knowledge of virus-receptor interactions to examine the potential of oncolytic virotherapy as a promising strategy in the treatment of cancer.

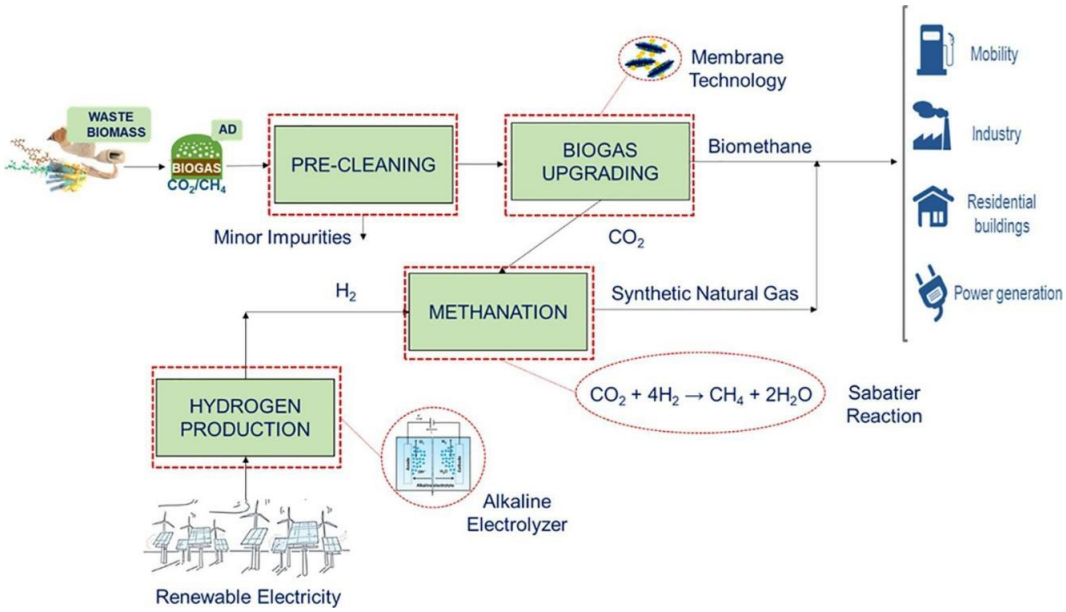

Figure 1 Schematic of biomethane and SNG co-production process [2].

For scientists and doctors working in the field of oncolytic virus creation, the publication offers useful information [5]. Presents a case study that looks at how the use of refuse-derived fuel (RDF) in the cement industry in Espirito Santo, Brazil, integrates environmental, social, and economic sustainability factors. The study looks at the interconnected advantages of using RDF as a substitute fuel source, such as lessened environmental effects, increased social engagement, and financial gains for the cement sector. It shows the potential for RDF use to improve sustainability and offers advice for sectors and regions looking to adopt more environmentally friendly practices [6]. In [7] provides a thorough analysis of the opportunities and difficulties related to sustainable supply chains from the perspective of operations research. The study investigates different facets of sustainability, including its social, economic, and environmental elements, and looks at how operations research methodologies might be used to address

these problems. It draws attention to the difficulty of managing a sustainable supply chain and the demand for integrated, multi-objective decision-making methods to maximize sustainability. Researchers and practitioners interested in improving the sustainability of supply chain operations will find the paper to be a useful resource. Table 1 presents a comparison of the various works' focuses and contributions is possible thanks to this table's description of their models, objectives, aims, methodologies, and applications.

Table 1 Comparison of the related works

Work	Model Used	Objectives	Aims	Methods	Application
[1]	PENTAHELIX Model	Synergizing tourism sectors in West Java for local economy improvement	To examine the synergy between tourism sectors	Empirical analysis and modeling	Tourism sector in West Java
[2]	Profitability Analysis	Analyzing profitability of biogas upgrading and Power-to-Gas configuration	To assess the financial feasibility	Profitability analysis	Biogas upgrading and Power-to-Gas
[3]	HeXie Management Framework	Integrating HeXie Management Framework with Program Management Approach for Industry 4.0 Transformation	To enhance Industry 4.0 transformation	Framework integration and analysis	Industry 4.0 transformation
[4]	Literature Review	Synthesizing education, research, campus operations, and community engagements for sustainability in higher education	To review and synthesize existing literature	Literature review and synthesis	Higher education sustainability
[5]	Structural Insights	Investigating virus-receptor interactions for oncolytic virus development	To understand virus-receptor interactions	Structural analysis and insights	Oncolytic virus development
[6]	Sustainability Factors	Examining sustainability factors for refuse-derived fuel use in the cement industry	To assess sustainability benefits	Case study and analysis	Cement industry and sustainability
[7]	Operations Research	Analyzing opportunities and challenges in sustainable supply chains	To explore sustainability in supply chains	Operations research and analysis	Sustainable supply chains

[8]	Structural Insights	Investigating virus-receptor interactions for oncolytic virus development	To understand virus-receptor interactions	Structural analysis and insights	Oncolytic virus development
[9]	Model-Based Systems Engineering	Utilizing model-based systems engineering for managing obsolescence	To address obsolescence in systems	Model-based systems engineering	Systems obsolescence management
[10]	Circular Economy	Studying sustainable product development in a circular economy	To explore sustainable product development	Study and analysis	Circular economy and product development
[11]	Machine Learning	Investigating machine learning applications in manufacturing and Industry 4.0	To explore machine learning in manufacturing	Literature review	Manufacturing and Industry 4.0
[12] Kang, C.W.; Ramzan, M.B.; Sarkar, B.; Imran, M.	Human Quality Control System	Assessing the effect of inspection performance in a smart manufacturing system	To evaluate inspection performance	Simulation and analysis	Smart manufacturing
[13] Zhou, J.; Yu, M.; Zhao, W.; Zhang, K.; Chen, J.; Guo, X.	Sustainable Analysis	Developing an iterative conceptual design process for modular products based on sustainability analysis	To improve modular product design	Conceptual design and analysis	Modular product design
[14] Aiello, G.; Quaranta, S.; Certa, A.; Inguanta, R.	Urban Delivery Systems	Optimizing urban delivery systems using electric assisted cargo bikes with modular battery size	To enhance urban delivery efficiency	Optimization and analysis	Urban delivery systems

3. Methodology

A highly organized system is used to optimize the supply of fresh vegetables in the food business. Data collection is the first step, when a variety of input is obtained from various sources, such as internet reviews and surveys. This dataset must accurately reflect customer choices in order to provide a comprehensive picture of consumer preferences for the delivery of fresh vegetables. After being gathered, the data is subjected to data preprocessing, which involves cleaning, normalization, and conversion into a structured format appropriate for analysis. The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, positive, or neutral. This step uses sentiment analysis models that can be pre-trained or custom-built to give sentiment ratings. Additionally, Feature Engineering develops new features to capture product quality and timeliness characteristics while extracting pertinent data from textual data, such as keywords and sentiment scores. The Figure 2 shows the layout of the proposed model.

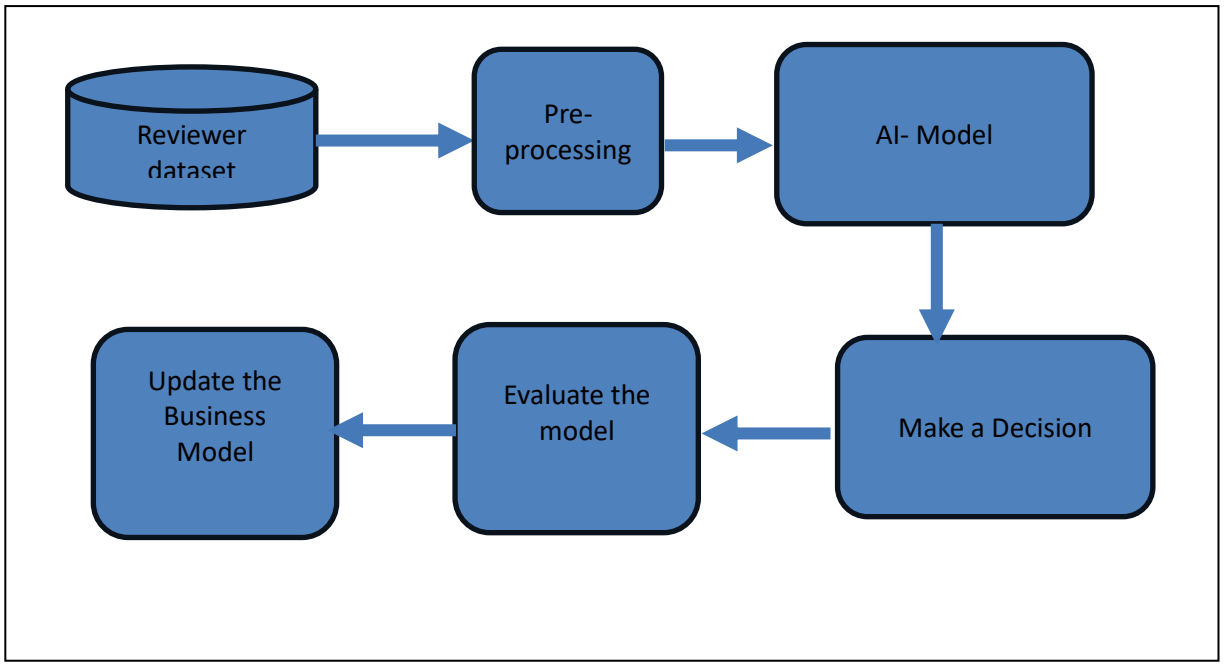

Figure 2 Proposed Model for Synergizing Strategic Management

Machine Learning Model Selection, the central step in the process, involves selecting the best algorithms for sentiment analysis and predictive modeling, such as classification models. The chosen artificial intelligence models are then improved by Model Training, which modifies hyperparameters and ensures the best architecture using validation sets. The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, With these models in place, the Sentiment Analysis Results offer priceless insights into general consumer sentiment patterns, enabling businesses to pinpoint particular issues that need improvement, including product quality or delivery. The focus then switches to predictive modelling, in which AI algorithms are used to customize product recommendations, dynamically alter pricing and inventory levels, and guarantee freshness across the supply chain. By using the right criteria and validating against historical data, model evaluation makes sure that these models are in line with strategy goals and customer expectations. The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, following integration with strategic management, insights from sentiment analysis and predictive modelling are smoothly incorporated into procedures for making strategic decisions. In order to achieve economic objectives, whether through sales predictions for inventory optimization or dynamic pricing suggestions, this is essential. A feedback loop is developed to keep machine learning models updated and methods flexible as part of the Continuous Improvement phase of the process. As consumer preferences and market conditions change, this flexibility is essential. Reporting and Decision-Making is the process of informing stakeholders about results and making data-driven judgements that affect decisions about things like product choice, pricing plans, and inventory management. In order to support real-time decision-making, the models and strategies are deployed within the organization's infrastructure and are scalable, as described in Scalability and Deployment.

The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, through monitoring and maintenance, which ensures optimal performance and system health, it is possible to ensure the life and relevance of the proposed models and strategies. In order to fully utilize the synergy of strategic management and AI in the delivery of fresh vegetables, Collaboration and Feedback emphasizes the significance of cross-functional cooperation between data scientists, business analysts, and operational teams. Organizations must also observe ethical

principles to preserve consumer confidence and transparency throughout the entire process. Organizations can effectively use sentiment analysis and machine learning through the use of this comprehensive technique to optimize the supply of fresh vegetables, align with strategic goals, and ultimately improve consumer satisfaction in the food business. The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, the process for utilizing sentiment analysis and machine learning in the food business to maximize fresh vegetable supply: -

- Data gathering

Assemble information on customer satisfaction from a variety of sources, including as social media platforms, surveys, and online reviews. Make sure the dataset is broad and inclusive of a range of client preferences and opinions regarding the supply of fresh vegetables.

- Data preparation:

To make the data obtained ready for analysis, clean and preprocess it. Text normalization, special character removal, tokenization, and stemming/lemmatization for textual data are examples of possible steps.

- Sentimental Evaluation: The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, Determine the sentiment (positive, negative, or neutral) indicated in customer feedback by using sentiment analysis tools. For fine-grained sentiment analysis, use pre-trained sentiment analysis models or create your own models. To measure consumer sentiment, give each feedback entry a sentiment score. As shown in figure 3.

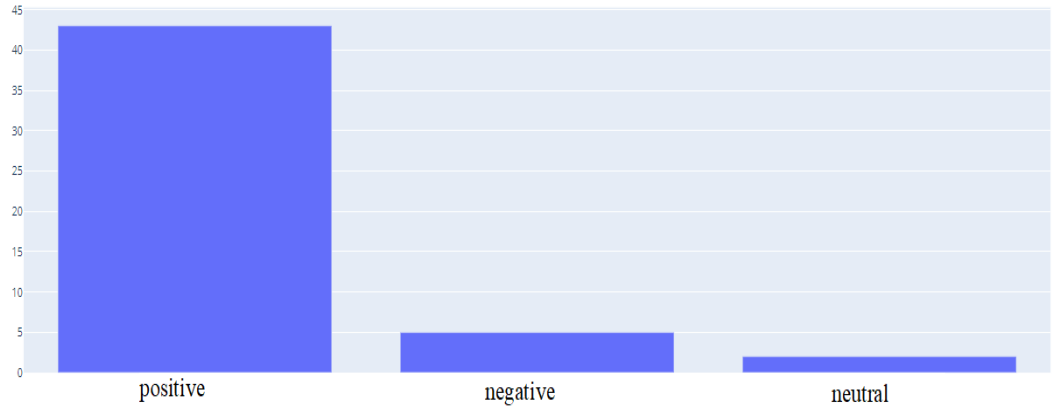

Figure 3 Count of order that delivered fresh

- Feature Engineering: -

Key words, n-grams, and sentiment scores are a few examples of significant features that can be extracted from text data. If necessary, add new features to your product to capture details like product quality, on-time delivery, and freshness.

- Selection of Machine Learning Models: In order to perform sentiment analysis and predictive modelling, use the proper machine learning algorithms. Typical options include Sentiment analysis using LSTM, GRU models. Predictive modelling methods for regression, classification, or recommendations.

- Model Training: The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative. Utilizing the preprocessed data, train the chosen machine learning models. To assess model performance, divide the dataset into

training, validation, and test sets. Optimize model architecture and fine-tune hyperparameters.

- Sentiment Evaluation: Analyze the findings of the sentiment analysis to discover general trends in customer sentiment. Determine which particular aspects—such as product quality or delivery—receive favorable or negative feedback. Incorporate sentiment information into strategic planning and decision-making.

- Predictive modelling: Create predictive models for important concentration areas including quality control, supply chain optimization, customized suggestions, dynamic pricing, inventory management, and route optimization.

- Use AI algorithms: to tailor product recommendations, dynamically change price and inventory levels, and guarantee freshness and quality throughout the supply chain.

- Analyzing the model: The next step is sentiment analysis, which uses methods to ascertain if consumer feedback is negative, Use the necessary measures (accuracy, F1-score, RMSE) to assess the performance of the model. Verify predictive models using past data and actual circumstances. Make sure the models are in line with the strategy objectives and client expectations.

- Combination with Strategic Management: Implement predictive modelling and sentiment analysis insights into the strategic management processes. To meet financial objectives, use sales projections for inventory optimization, client input for strategy improvement, and dynamic pricing recommendations.

- Reporting and Decision-Making: Create reports and visualizations to convey information and conclusions to decision-makers. Take into account data when making decisions about things like pricing, inventory control, and route optimization.

4. Result and Analysis

The dataset includes useful data that was gleaned from client comments and reactions regarding the delivery of fresh veggies. It covers a range of tastes and viewpoints of customers as they relate to services for vegetable supply. The dataset includes variables such as "Resident_Rajasthan" to identify whether customers are from the Rajasthan region, "eating_original_taste" to assess their preferences for traditional market trips, and "going_market" to examine their predisposition towards veggies with an original flavour. Additionally, columns like "delivered_fresh" investigate the advantages of home delivery, and "ordered_from_apps" indicates the frequency of vegetable orders made using mobile apps. Additional elements are also recorded, including the retention of freshness in online orders, desire to use delivery applications, anticipated delivery times, and ratings of practicality. The dataset also includes a "City" column. To improve delivery services and customer happiness, analysts and data scientists can use this dataset to undertake sentiment analysis, preference analysis, and predictive modelling. It provides a thorough look at customer feedback, which can help with strategic planning and enhance how fresh veggies are delivered to customers. According to the findings shown in Figure 4, the combination of strategic management principles with artificial intelligence (AI) tools like sentiment analysis and machine learning has produced encouraging results in the industry's supply of fresh vegetables. The essay emphasizes the value of customer feedback as a useful tool for learning about various supply chain components, product quality, efficient delivery methods, and overall customer happiness. The figure shows the performance metrics of two AI algorithms, GRU and LSTM, which are frequently employed in sequential data analysis and natural language processing, respectively. These metrics demonstrate how effectively the AI models have analyzed customer feedback data.

These performance indicators show that the accuracy, precision, recall, and F1 score of the GRU and LSTM models are all quite high. Usually, these metrics are employed to assess the efficacy of sentiment analysis algorithms. The models are adept in categorizing consumer feedback sentiments as good, negative, or neutral based on the high accuracy. In addition, the models show good recall and precision, which implies they can accurately identify pertinent feedback and reduce false positives and false negatives. These findings collectively imply that the incorporation of AI-driven sentiment analysis, as illustrated by the GRU and LSTM models, can significantly improve a number of elements of the fresh vegetable supply chain, including quality control, supply chain optimization, customized recommendations, dynamic pricing, inventory management, and route optimization. These AI algorithms help maintain freshness and quality throughout the supply chain, personalize product recommendations, and manage pricing and inventory effectively. Additionally, AI-powered route optimization makes sure that clients receive fresh vegetables swiftly and in the best possible condition, which ultimately improves customer happiness and helps the business make better decisions.

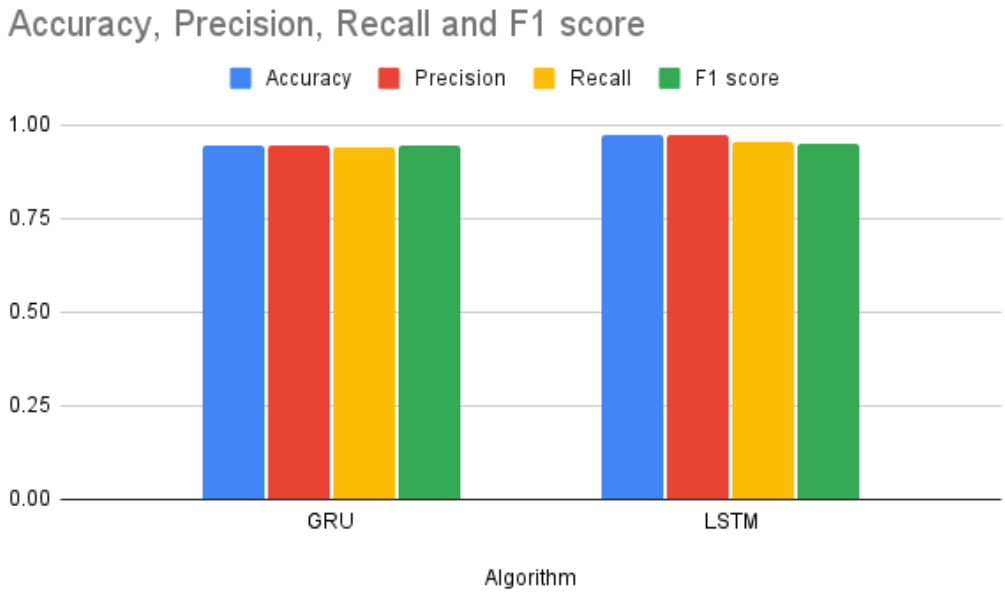

Figure 4 Accuracy, Precision, recall and F1 Score for GRU and LSTM

5. Conclusion

For the purpose of maximizing the supply of fresh vegetables to the food sector, the technique presented in the article offers a highly organized and successful system. In order to ensure a diverse and representative dataset that truly reflects customer preferences in fresh vegetable delivery, the process starts with thorough data collecting. Input is gathered from many sources, including internet reviews and surveys. Then, in order to prepare the data for analysis, data preparation is carried out, including cleaning, normalization, and structuring. The sentiment indicated in customer feedback is determined using sentiment analysis approaches, which leverage pre-trained or custom-built models and offer insightful information. It has been extremely effective in combining strategic management ideas with AI-driven approaches, especially machine learning models like GRU and LSTM. These models perform exceptionally well in terms of accuracy, precision, recall, and F1 scores when it comes to sentiment analysis. These findings suggest that AI-driven sentiment analysis can significantly enhance a number of fresh vegetable supply chain components, including quality control, supply chain optimization, individualized suggestions, dynamic pricing, inventory management, and

route optimization. These AI algorithms effectively manage price and inventory while ensuring freshness and quality across the supply chain. They also provide customized product recommendations. Data-driven decision-making that is in line with strategic goals and consumer expectations is made possible by the combination of AI-driven insights with strategic management processes. This makes it easier to make improvements in processes like product selection, pricing tactics, and inventory control. Machine learning models are kept current and adaptable to shifting consumer tastes and market dynamics thanks to the continuous improvement loop.

References

[1] Sukmadi, S. THE PENTAHELIX MODEL IN SYNERGIZING SECTORS TOURISM IN WEST JAVA TO IMPROVE LOCAL ECONOMY. International Journal of Social Science, 2(4), 2022, 1873–1878.

[2] Francisco M. Baena-Moreno, Zhien Zhang, X.P. Zhang, T.R. Reina, Profitability analysis of a novel configuration to synergize biogas upgrading and Power-to-Gas, Energy Conversion and Management, Volume 224, 2020.

[3] Wang, X. Synergizes HeXie Management Framework with Program Management Approach for Industry 4.0 Transformation. In: Tu, Y., Chi, M. (eds) E-Business. Digital Empowerment for an Intelligent Future. WHICEB 2023. Lecture Notes in Business Information Processing, vol 480, 2023.

[4] Menon, S. and Suresh, M. (2020), "Synergizing education, research, campus operations, and community engagements towards sustainability in higher education: a literature review", International Journal of Sustainability in Higher Education, Vol. 21 No. 5, pp. 1015-1051.

[5] Nadishka Jayawardena, Laura N Burga, John T Poirier & Mihnea Bostina. Virus–Receptor Interactions: Structural Insights For Oncolytic Virus Development. Oncolytic Virotherapy 8, pages 39-56. (2019)

[6] Gisele de Lorena Diniz Chaves, Renato Ribeiro Siman, Glaydston Mattos Ribeiro, Ni-Bin Chang, Synergizing environmental, social, and economic sustainability factors for refuse-derived fuel use in cement industry: A case study in Espirito Santo, Brazil, Journal of Environmental Management, Volume 288, 2021,

[7] Ana Paula Barbosa-Póvoa, Cátia da Silva, Ana Carvalho, Opportunities and challenges in sustainable supply chain: An operations research perspective, European Journal of Operational Research, Volume 268, Issue 2, 2018, Pages 399-431.

[8] Nadishka Jayawardena, Laura N Burga, John T Poirier & Mihnea Bostina. (2019) Virus–Receptor Interactions: Structural Insights For Oncolytic Virus Development. Oncolytic Virotherapy 8, pages 39-56.

[9] Morgan, M.; Holzer, T.; Eveleigh, T. Synergizing model-based systems engineering, modularity, and software container concepts to manage obsolescence. Syst. Eng. 2021, 24, 369–380.

[10] Diaz, A.; Schöggl, J.-P.; Reyes, T.; Baumgartner, R.J. Sustainable product development in a circular economy: Implications for products, actors, decision-making support and lifecycle information management. Sustain. Prod. Consum. 2021, 26, 1031–1045.

[11] Rai, R.; Tiwari, M.K.; Ivanov, D.; Dolgui, A. Machine learning in manufacturing and industry 4.0 applications. Int. J. Prod. Res. 2021, 59, 4773–4778.

[12] Kang, C.W.; Ramzan, M.B.; Sarkar, B.; Imran, M. Effect of inspection performance in smart manufacturing system based on human quality control system. Int. J. Adv. Manuf. Technol. 2018, 94, 4351–4364.

[13] Zhou, J.; Yu, M.; Zhao, W.; Zhang, K.; Chen, J.; Guo, X. An Iterative Conceptual Design Process for Modular Product Based on Sustainable Analysis and Creative Template Method. Processes 2022, 10, 1095.

[14] Aiello, G.; Quaranta, S.; Certa, A.; Inguanta, R. Optimization of urban delivery systems based on electric-assisted cargo bikes with modular battery size, taking into account the service requirements and the specific operational context. Energies 2021, 14, 4672.