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MARKET SENTIMENT WITH ARTIFICIAL INTELLIGENCE: A REVOLUTION IN THE DIGITAL ECONOMY

Lucky Mahesa Yahya *[1]
Universitas Andalas
luckymahesayahya@eb.unand.ac.id

Silvia Ekasari
STIE Manajemen Bisnis Indonesia
silvia.ekasari@stiembi.ac.id

Haryanto
Universitas Dharma AUB Surakarta
haryanto@stmik-aub.ac.id

Abstract

The digital age has brought about a massive transformation in many sectors, including market sentiment analysis. The existence of big data from the internet, especially social media and online reviews, requires advanced technology to process and analyze it. Artificial Intelligence (AI) with Natural Language Processing (NLP) and machine learning capabilities are key in this revolution, especially in identifying and interpreting public sentiment towards products, services, or brands. The research method used is literature by looking for references that are in accordance with the research context. The research findings show that the integration of AI in market sentiment analysis has significant potential in improving the understanding of consumer sentiment. AI not only accelerates the process of analyzing vast data, but also increases the accuracy in interpreting sentiments and emotions. In particular, the use of machine learning models has enabled the adaptation and continuous improvement of sentiment analysis performance, providing deeper and more predictive insights into market trends.

Keywords: Market Sentiment, Artificial Intelligence, Revolution, Digital Economy.

[1] Correspondence author.

Introduction

In today's digital economy, market dynamics are not only influenced by conventional economic factors such as unemployment, inflation, and GDP growth, but also heavily influenced by market sentiment (Cherian et al., 2024). Market sentiment relates to the perceptions, views, and attitudes of investors and consumers that can change rapidly and drastically through information distributed on the internet, particularly through social media, online forums, and digital news. Such sentiment has a significant impact on price fluctuations, market demand, and investment decisions (Duanmu, 2023).

Traditionally, market sentiment analysis relies on survey methods and manual interpretation, which is not only time-consuming but also prone to subjective bias. However, developments in the field of artificial intelligence (AI) offer revolutionary opportunities to overcome these challenges (Fu & Li, 2024). Artificial intelligence, through natural language processing (NLP) and machine learning technologies, can automate the collection and analysis of large volumes of sentiment data at high speed, resulting in faster, more accurate and objective insights (Cao et al., 2023).

Market sentiment analysis has become an important component in formulating business and financial strategies. Market sentiment reflects the collective perceptions, opinions, and attitudes of market participants and consumers towards products, services, brands, or even the economy as a whole (Jyothsna et al., 2023). This information is valuable because it has the ability to influence market behavior quickly and significantly; for example, positive sentiment towards a product can stimulate demand, while negative sentiment can cause a sharp drop in sales or stock value (Zitianellis, 2023). With social media and online platforms enabling instant and widespread information dissemination, market sentiment analysis is more relevant than ever, allowing companies and investors to make more timely and data-driven decisions (Sharma et al., 2024).

At the same time, artificial intelligence (AI) has emerged as a highly effective tool in understanding these complex market dynamics. Through natural language processing techniques and big data analysis, artificial intelligence can identify, classify, and analyze sentiment from text at a scale that cannot be handled manually (Tunca et al., 2023). Not only can AI capture sentiment variations more accurately and in large volumes but it can also do so in real time, providing valuable insights that allow companies and investors to quickly adapt to market changes. It is this capability that makes artificial intelligence key in translating widespread sentiment data into actionable analysis, thus optimizing decision-making in dynamic and ever-changing market conditions (Li & Thamrun, 2024).

However, the implementation of artificial intelligence in market sentiment analysis faces its own challenges. First, the complexity of human language, including irony, jargon, and dialect, makes sentiment interpretation not simple. Second, the rapid

changes in trends and discussion topics on the internet demand AI algorithms that are adaptive and can learn in real-time. Third, issues of data privacy and ethics are becoming a major concern, in line with the growing number of regulations on the use of personal data (Li, 2023); (Jeba & Kurup, 2024).

Given the importance of market sentiment analysis in the digital economy and the challenges presented by traditional methods and AI implementation, there is an urgent need for further research in this area. This research aims to explore the capabilities of artificial intelligence in identifying, analyzing, and understanding market sentiment with the ultimate goal of supporting better decision-making in the world of economics and finance.

Research Methods

The study in this research uses a literature review. The literature review method is an approach to research that involves collecting, reviewing, and analyzing scientific publications-such as journals, books, conferences, and other published sources-to gain an in-depth understanding of a particular topic or problem. This method is very useful in identifying, evaluating and synthesizing existing knowledge, as well as in identifying research gaps that can form the basis for further studies (Lange, 2023); (Haaland et al., 2023).

Literature research requires high analytical skills and objectivity in evaluating and synthesizing information. The aim is to provide a solid scientific basis for further research, as well as to contribute to existing knowledge in the field (Verhoogen, 2023).

Results and Discussion

Digital Economy

The digital economy refers to the segment of the economy that runs through information and communication technology, particularly the internet. It includes all forms of business activities conducted through digital networks-from e-commerce, online financial services, to the sharing and beyond economy (Jyothsna et al., 2023). A distinctive feature of the digital economy is its intensive use of data as a key asset and business driver. Innovations in AI, big data, cloud computing, and IoT (Internet of Things) not only change the way companies operate and generate value but also affect market structures and consumption patterns globally. In the digital economy, geographical boundaries are becoming increasingly irrelevant, allowing products and services to reach global scale quickly and efficiently (Zitianellis, 2023).

The relevance of today's digital economy cannot be underestimated given its crucial role in global economic growth and social transformation. The transformation to a digitally-driven economy has provided new opportunities for business growth, innovation and skills development. On the other hand, challenges such as data privacy, cybersecurity and the digital divide demand careful attention and regulation from all

stakeholders (Sharma et al., 2024). In addition, the digital economy also provides a boost to social and economic inclusion by facilitating access to financial, education and health services through technology. In a post-pandemic world, where adaptation to new conditions is key, the digital economy has served as one of the key drivers of global economic recovery and resilience, proving its relevance not only as a dynamic economic sector but also as a catalyst for broader socioeconomic transformation (Tunca et al., 2023).

Over time, the development of the digital economy has displayed a dual impact. On the one hand, it creates opportunities for small and medium-sized enterprises (SMEs) to participate in the global market without the need for large initial investments in physical infrastructure. Online platforms and marketplaces allow them to reach customers around the world, which was previously impossible to reach (Jeba & Kurup, 2024). In addition, the technologies underlying the digital economy, such as digital payment and logistics platforms, have optimized supply chains and payment processes, reducing transaction costs and increasing efficiency. The digital economy has also created new types of jobs and changed the skills required in the labor market, promoting lifelong education and training to keep workers' skills relevant (Dan, 2023).

On the other hand, the transition to a digital economy also brings significant challenges. The disparity in access to technology between urban and rural areas, as well as between developing and developed countries, raises the issue of the "digital divide" that could widen economic and social inequality if not properly addressed. In addition, the rapid growth of the digital economy demands regulatory and policy changes that accommodate data security, privacy, copyright, and work ethics in a highly digitized environment (Jones & Wynn, 2023). Governments, the private sector and civil society need to work together to ensure that the benefits of the digital economy can be enjoyed by all levels of society, while mitigating any negative impacts that may arise (Liu, 2023).

In the global context, the digital economy has become a spearhead for inclusive and sustainable growth. Global and collaborative initiatives between countries are important to build strong digital infrastructure, create policies that support cross-border data exchange, and develop common standards to facilitate digital trade (Shoenbill et al., 2023). These efforts will not only promote growth and competitiveness but will also ensure that economic growth goes hand in hand with social progress. The involvement of all parties in building a resilient digital ecosystem is key to realizing the digital economy not only as an economic driving force but also as a medium for creating a more open, connected and inclusive society (Ukhalkar et al., 2023).

Market Sentiment

Market sentiment is the general attitude or emotional tendency of investors toward a particular financial market or economic asset at a given time. It is a psychological indicator defined by market optimism or pessimism, which is often

thought to influence price dynamics beyond fundamental data and technical analysis (Zhong et al., 2023). Market sentiment can vary from positive extremes, known as "bullish," to negative extremes, called "bearish." These market sentiment measurements can come from a variety of sources, including investor surveys, trading volume, news, social media, and market indices. The importance of market sentiment in economic decision-making lies in its ability to influence market behavior as well as indicate possible future market movements (MU, 2023).

In economic decision-making, an understanding of market sentiment is crucial as it can provide insight into potential investor behavior. Analysts and investors use market sentiment as one of the tools in their investment strategies and other decision-making because it often paints a broader picture of market expectations (Lee, 2023). Investors' evolving perceptions of the current economic situation, monetary policy, political conditions, and other events can give rise to mass market movements that cause price fluctuations. Understanding this sentiment can help investors to identify when the market may be moving irrationally and when a correction is likely, allowing them to take more informed positions before major changes occur (Butt, 2024). Market sentiment is therefore an important component of market analysis to anticipate trend changes and optimize investment strategies or other economic decisions.

Market sentiment analysis is often used to look for timing in the purchase or sale of assets, looking to go against the grain ('contrarian investing') or follow the trend ('trend following'). A contrarian investor, for example, might look for excessively bullish signs as an indicator that the market may already be overvalued and conversely, look for excessively bearish indications to find buying opportunities in undervalued markets (Ugavekar & Gulwani, 2023). On the other hand, trend-following investors will probably utilize strong market sentiment as confirmation to maintain positions or to avoid certain markets that display serious negative compounds. However, while market sentiment can be useful, it is not a perfect tool. Markets can remain irrational for longer than an investor's ability to maintain a position and can be affected by external factors that are not always predictable (Sreelakshmi & Anoop, 2023).

As such, market sentiment is an important aspect of economic decision-making as it provides context for how investors currently view the market and the assets within it, which can provide insight into where the market is headed next. While this information is valuable, it is important to remember that market sentiment is just one of many tools that should be considered alongside fundamental and technical analysis in order to make smart and informed investment decisions. Successful investors will consider sentiment along with a variety of other factors when evaluating market opportunities, managing risk, and striking a strategic balance between pursuing gains and limiting losses.

Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science that focuses on creating systems that can mimic or surpass human intelligence. AI involves creating algorithms and models that are capable of performing tasks that typically require human intelligence, such as learning from experience, understanding language, recognizing patterns, and making decisions (Sun, 2023). Since its initial development in the 1950s, AI has undergone various cycles of progress and challenges. Initially, AI concentrated on specific problem solving and strategy games such as chess, but advances in computing and algorithms, especially through machine learning and deep learning, have significantly widened the potential applications of AI (Guan & Wang, 2024).

The application of AI in big data analytics has changed the way we collect, process, and analyze large volumes of data with great speed and precision. With the ability to learn and adapt from the data being analyzed, AI amplifies analysis capabilities to be faster and more accurate, opening up new potential in the discovery of insights and patterns that cannot be achieved with traditional methods (Singha & Singha, 2023). In a business context, this means smarter, data-driven decision-making, from personalizing customer experience, to supply chain optimization, to identifying market trends before competition. In the healthcare sector, AI is being used for more accurate diagnosis and personalization of care. Meanwhile, in finance, AI drives advanced trading algorithms and fraud detection. Through big data analysis, AI is able to identify complex patterns invisible to the human eye, heralding a new era in research, operational optimization, and product innovation (Alaverdyan et al., 2023).

The adoption of AI in big data analysis not only enables improved operational efficiency but also enriches decision-making with deeper insights and more accurate predictions. For example, in the retail industry, AI is used to recommend products to customers based on their purchase history and observed preferences, optimize inventory management based on predicted sales trends, and segment customers for more focused marketing campaigns. Moreover, artificial intelligence strengthens cybersecurity with the ability to detect patterns and anomalies that indicate security threats or suspicious activity, enabling faster response to cyberattacks (Krarup & Horst, 2023).

Challenges faced in integrating AI with big data analytics include issues such as privacy and ethics, where the use of personal data requires caution and strict regulation to ensure that privacy and individual rights are protected (Krarup & Horst, 2023). There are also challenges related to understanding and interpreting AI outputs, which can sometimes be a "black box" due to the complexity of the algorithms, making them difficult to interpret or account for. As technology and artificial intelligence evolve, it is important to continue the development of standards, best practices, and regulatory

frameworks that accommodate these advancements while safeguarding the security, privacy, and interests of Society (Mao, 2023).

Despite the challenges, the potential for AI to transform the way we collect, analyze, and utilize big data is tremendous. From increased accuracy in predictions to personalization of services, AI is playing a role in shaping the future of many industry sectors. With continuous advancements in technology and data science, we can expect that the integration of AI in big data analysis will continue to grow, opening up new opportunities and bringing innovative solutions to complex challenges in the world today and in the future (Knapton, 2023).

Artificial Intelligence Solutions to Offer Solutions in traditional market sentiment analysis

Artificial Intelligence (AI) has played a significant role in transforming traditional market sentiment analysis, bringing a much more powerful analytics capacity and providing actionable insights for business strategies. Market sentiment, traditionally collected through surveys or focus groups, can now be analyzed in real-time using advanced AI algorithms that process and analyze data from various sources such as social media, online forums, news, and product reviews (Mao, 2023). By applying natural language processing (NLP), machine learning, and text analysis techniques, AI is able to understand the nuances of human language, capture emotions and opinions, and distill relevant information from large and diverse data. This enables organizations to monitor market sentiment more accurately and responsively, capturing changes in customer mood and trends more quickly, ultimately allowing businesses to make strategic decisions based on actual data rather than assumptions (Obaid, 2023).

In addition, AI can offer dynamic and adaptive sentiment analysis solutions. These AI models can continuously learn and adapt to evolving contexts, perspectives, and changing slang in digital communications, giving different weights to data sources based on their credibility and relevance. Machine learning algorithms can be given feedback on the accuracy of their sentiment predictions, allowing them to improve their performance over time (Niu & Chen, 2023). Artificial intelligence also opens up the possibility of more detailed target market segmentation, identifying groups of customers with similar attitudes or needs for more personalized marketing and strategic interventions. In short, AI in sentiment analysis offers not only speed and accuracy, but also deep insights and continuous adaptation to ever-changing market dynamics, giving businesses the competitive edge needed to survive and thrive in the digital economy (Adithya & Arulmoli, 2024).

Given the rapid changes in consumer preferences and market conditions, AI not only enables trend detection at an early stage, but also prediction of future trends based on historical and real-time data-models. This is especially important in highly competitive markets, where a deep understanding of consumer sentiment and behavior

can determine the success or failure of new products (Jasmine & Mangayarkarasi, 2024). Furthermore, with the intuitive capabilities offered by AI, companies can proactively address potential problems in campaigns or market reactions to products before they become crises, minimizing risk and maximizing customer satisfaction (Vijayalakshmi, 2024).

Thus, AI has brought about a revolution in market sentiment analysis that allows companies to navigate and exploit the changing market landscape with unprecedented speed and precision. By utilizing advanced machine learning algorithms and natural language processing technologies, companies can unearth valuable insights from large data sets, gain a deeper understanding of consumer sentiment, and respond dynamically to changing market trends. AI not only eliminates the biases and errors that traditional methods can bring, but also provides the ability to predict and respond to market changes in a way that supports sustainable growth and innovation. This creates a solid foundation for companies to increase customer engagement, strengthen brand loyalty, and secure their competitive position in the global market.

Conclusion

Key findings from literature research on the utilization of artificial intelligence (AI) in market sentiment analysis show that AI significantly improves the accuracy and speed in identifying and analyzing consumer sentiment. Using techniques such as Natural Language Processing (NLP) and machine learning algorithms, AI is able to interpret the nuances of language and emotions in big data coming from various digital sources such as social media, forums, and product reviews. This enables companies to understand more deeply and respond dynamically to changing market trends and expectations, which traditionally could not be done at the same speed and scale.

Moreover, the application of AI in market sentiment analysis helps companies in making more accurate predictions about future market trends and consumer behavior. AI not only facilitates early trend detection but also provides preventive insights that can help companies avoid potential crises and capitalize on market opportunities. With the ability to adapt and learn from new data, AI continuously improves the quality of insights provided, enabling organizations to optimize marketing and operational strategies, and improve overall customer satisfaction and loyalty.

References

Adithya, K., & Arulmoli, R. (2024). Healthcare in Your Hands: Sentiment Analysis on Indian Telemedicine in the Era of Global Pandemic. *Human Machine Interaction in the Digital Era, Query date: 2024-05-23 08:20:46*, 301–306. https://doi.org/10.1201/9781003428466-47

Alaverdyan, Y., Poghosyan, S., & Poghosyans, V. (2023). Edge Computing: Data Sharing and Intelligence. *Natural Language Processing and Machine Learning*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.5121/csit.2023.130811

Butt, Z. A. (2024). Big data and artificial intelligence for pandemic preparedness. *Artificial Intelligence, Big Data, Blockchain and 5G for the Digital Transformation of the Healthcare Industry*, *Query date: 2024-05-23 08:20:46*, 403–418. https://doi.org/10.1016/b978-0-443-21598-8.00005-1

Cao, T., Liu, N., & Bai, S. (2023). A Multi-Dimensional Text Sentiment Analysis Method Based on Joint Network. *Frontiers in Artificial Intelligence and Applications*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.3233/faia230888

Cherian, T. V., Paulraj, G. J. L., Princess, J. B., & Jebadurai, I. J. (2024). A comparative analysis of machine learning and deep learning techniques for aspect-based sentiment analysis. *Computational Intelligence Methods for Sentiment Analysis in Natural Language Processing Applications*, *Query date: 2024-05-23 08:20:46*, 23–37. https://doi.org/10.1016/b978-0-443-22009-8.00006-9

Dan, L. (2023). Analysis of Machine Learning Based Big Data Mining System for Enterprise Businesses. *2023 5th International Conference on Machine Learning, Big Data and Business Intelligence (MLBDBI)*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.1109/mlbdbi60823.2023.10481971

Duanmu, B. (2023). A Comparative Study of Machine Learning Interpretability Methods in Computer Vision. *Frontiers in Artificial Intelligence and Applications*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.3233/faia230919

Fu, S., & Li, A. (2024). A Machine Arm to Assist in Trash Sorting using machine Learning and Object Detection. *Artificial Intelligence and Big Data*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.5121/csit.2024.140428

Guan, S., & Wang, G. (2024). Drug discovery and development in the era of artificial intelligence: From machine learning to large language models. *Artificial Intelligence Chemistry*, *2*(1), 100070–100070. https://doi.org/10.1016/j.aichem.2024.100070

Haaland, I., Roth, C., & Wohlfart, J. (2023). Designing information provision experiments. *Journal of Economic Literature*, *Query date: 2024-05-19 10:12:33*. https://www.aeaweb.org/articles?id=10.1257/jel.20211658

Jasmine, J. A., & Mangayarkarasi, S. (2024). Heart Disease Prediction and Analysis Using Ensemble Classifier in Machine Learning Techniques. *Human Machine Interaction in the Digital Era*, *Query date: 2024-05-23 08:20:46*, 99–105. https://doi.org/10.1201/9781003428466-17

Jeba, S. V. A., & Kurup, P. S. (2024). Analysis and Result Prediction for Indian Premier League Using Machine Learning Algorithms. *Advances in Digital Marketing in the Era of Artificial Intelligence*, *Query date: 2024-05-23 08:20:46*, 79–93. https://doi.org/10.1201/9781003450443-6

Jones, P., & Wynn, M. (2023). Artificial Intelligence and Corporate Digital Responsibility. *Journal of Artificial Intelligence, Machine Learning and Data Science*, *1*(2), 50–58. https://doi.org/10.51219/jaimld/martin-wynn/07

Jyothsna, R., Rohini, V., & Joy, P. (2023). A Novel Auto Encoder-Network-Based Ensemble Technique for Sentiment Analysis Using Tweets on COVID-19 Data.

Machine Intelligence, *Query date: 2024-05-23 08:20:46*, 257–272. https://doi.org/10.1201/9781003424550-14

Knapton, K. (2023). Exploring Mid-Market Strategies for Big Data Governance. *Advances in Artificial Intelligence and Machine Learning*, *3*(1), 816–838. https://doi.org/10.54364/aaiml.2023.1151

Krarup, T., & Horst, M. (2023). European artificial intelligence policy as digital single market making. *Big Data & Society*, *10*(1), 2147483647–2147483647. https://doi.org/10.1177/20539517231153811

Lange, F. (2023). Behavioral paradigms for studying pro-environmental behavior: A systematic review. *Behavior Research Methods*, *Query date: 2024-05-19 10:12:33*. https://doi.org/10.3758/s13428-022-01825-4

Lee, S. J. (2023). *Beyond Sentiment Analysis: Developing Eflective Methods for Specific Emotion Analysis in Marketing Using Machine Learning and Big Data*. *Query date: 2024-05-23 08:20:46*. https://doi.org/10.52843/cassyni.x8xyp7

Li, X. (2023). Analysis and Research on Big Data Storage Technology Based on Machine Learning. *Atlantis Highlights in Intelligent Systems*, *Query date: 2024-05-23 08:20:46*, 106–114. https://doi.org/10.2991/978-94-6463-222-4_10

Li, X., & Thamrun, J. (2024). An Intelligent DDoS Detection System to recognize and Prevent DDoS Attacks using Artificial Intelligence and Machine Learning. *Artificial Intelligence and Big Data*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.5121/csit.2024.140412

Liu, Y. (2023). Artificial Intelligence-based Image and Data Analysis in the Industrial Internet in Digital Economy Era. *2023 5th International Conference on Artificial Intelligence and Computer Applications (ICAICA)*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.1109/icaica58456.2023.10405589

Mao, X. (2023). *Forecasting Housing Output with Artificial-Intelligence-Based Big Data Analytics: An Application of Natural Language Processing and Google Trends Analytics*. *Query date: 2024-05-23 08:20:46*. https://doi.org/10.2139/ssrn.4360127

MU, C. (2023). Based on natural language processing, human-computer dialogue, image recognition, and machine learning analysis whether artificial intelligence will surpass the human brain. *Applied and Computational Engineering*, *5*(1), 40–47. https://doi.org/10.54254/2755-2721/5/20230526

Niu, H., & Chen, Y. (2023). Why Do Big Data and Machine Learning Entail the Fractional Dynamics? *Smart Big Data in Digital Agriculture Applications*, *Query date: 2024-05-23 08:20:46*, 15–53. https://doi.org/10.1007/978-3-031-52645-9_2

Obaid, O. I. (2023). From Machine Learning to Artificial General Intelligence: A Roadmap and Implications. *Mesopotamian Journal of Big Data*, *Query date: 2024-05-23 08:20:46*, 81–91. https://doi.org/10.58496/mjbd/2023/012

Sharma, D., Gupta, V., & Singh, V. K. (2024). Abusive comment detection in Tamil using deep learning. *Computational Intelligence Methods for Sentiment Analysis in Natural Language Processing Applications*, *Query date: 2024-05-23 08:20:46*, 207–226. https://doi.org/10.1016/b978-0-443-22009-8.00001-x

Shoenbill, K. A., Kasturi, S. N., & Mendonca, E. A. (2023). Artificial Intelligence, Machine Learning, and Natural Language Processing. *Chronic Illness Care*, *Query date: 2024-05-23 08:20:46*, 469–479. https://doi.org/10.1007/978-3-031-29171-5_36

Singha, R., & Singha, S. (2023). Economic Sustainability, Mindfulness, and Diversity in the Age of Artificial Intelligence and Machine Learning. *Machine Intelligence*, *Query date: 2024-05-23 08:20:46*, 273–285. https://doi.org/10.1201/9781003424550-15

Sreelakshmi, S., & Anoop, V. S. (2023). Cognitive Computing and Big Data for Digital Health. *Era of Artificial Intelligence*, *Query date: 2024-05-23 08:20:46*, 55–66. https://doi.org/10.1201/9781003300472-5

Sun, C. (2023). Company Bankruptcy Prediction with Machine Learning Techniques. *Frontiers in Artificial Intelligence and Applications*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.3233/faia230838

Tunca, S., Sezen, B., & Wilk, V. (2023). An exploratory content and sentiment analysis of the guardian metaverse articles using leximancer and natural language processing. *Journal of Big Data*, *10*(1). https://doi.org/10.1186/s40537-023-00773-w

Ugavekar, N., & Gulwani, R. (2023). ChatGPT Tweets Sentiment Analysis Using Machine Learning. *2023 1st DMIHER International Conference on Artificial Intelligence in Education and Industry 4.0 (IDICAIEI)*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.1109/idicaiei58380.2023.10406587

Ukhalkar, P., Bhate, M., & Hingane, S. (2023). Artificial Intelligence, Machine Learning, and Natural Language Processing Capabilities in Modern Business Intelligence. *2023 7th International Conference On Computing, Communication, Control And Automation (ICCUBEA)*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.1109/iccubea58933.2023.10391953

Verhoogen, E. (2023). Firm-level upgrading in developing countries. *Journal of Economic Literature*, *Query date: 2024-05-19 10:12:33*. https://www.aeaweb.org/articles?id=10.1257/jel.20221633

Vijayalakshmi, V. (2024). Implementation of sentiment analysis in stock market prediction using variants of GARCH models. *Computational Intelligence Methods for Sentiment Analysis in Natural Language Processing Applications*, *Query date: 2024-05-23 08:20:46*, 227–249. https://doi.org/10.1016/b978-0-443-22009-8.00002-1

Zhong, L., Han, X., Li, Z., Wang, C., & Chen, B. (2023). Aspect-level sentiment analysis incorporating multidimensional feature. *2023 5th International Conference on Machine Learning, Big Data and Business Intelligence (MLBDBI)*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.1109/mlbdbi60823.2023.10482270

Zitianellis, J. (2023). A Quantitative Analysis of Big Data Analytics Capabilities and Supply Chain Management. *Artificial Intelligence*, *Query date: 2024-05-23 08:20:46*. https://doi.org/10.5772/intechopen.111473