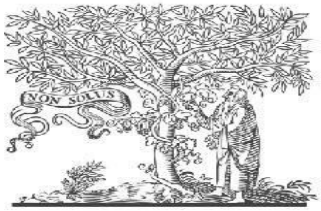
International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

COPY RIGHT



ELSEVIER SSRN

IJIEMR Transactions, online available on 05th Apr 2023. Link :http://www.ijiemr.org/downloads.php?vol=Volume-12&issue=Issue 04

10.48047/IJIEMR/V12/ISSUE 04/03

Title THE IMPACT OF ARTIFICIAL INTELLIGENCE ON LOGISTICS AND THE SUPPLY CHAIN

Volume 12, ISSUE 04, Pages: 15-20

Paper Authors
Mrs P.Chaitanya , Mr Y. Siva Koteswara Rao

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

The Impact of Artificial Intelligence on Logistics and the Supply Chain

Mrs P.Chaitanya[1] , Mr Y. Siva Koteswara Rao[2]
[1]Assistant Professor, Department of Computer Science and Engineering, Sir C R Reddy College of Engineering, ELURU
[2]Assistant Professor, Department of Information Technology, Sir C R Reddy College of Engineering, ELURU

ABSTRACT: In the management of the supply chain and global logistics, artificial intelligence is crucial. In addition to providing competitive advantages over other competitors, it opens up chances for cost reduction in demand forecasting, purchasing requirement planning, production planning, inventory, packaging, transportation, warehousing, and distribution planning. Through its extraordinary capacities, artificial intelligence has tremendous promise for improving efficiency and making smarter decisions. The goal of artificial intelligence (AI) is to build "thinking machines" that can duplicate, replace, and learn from human intelligence. Due to its capacity to recognize business patterns, learn business phenomena, seek information, and intelligently analyze data, AI has demonstrated considerable promise in enhancing human decision-making processes and the ensuing productivity in a variety of business undertakings since the late 1970s. Although being widely accepted as a tool to aid in decision-making, supply chain management has very seldom used AI (SCM). This article investigates several AI sub-fields that are best suited for resolving real-world SCM-related issues in order to fully realise the potential benefits of AI for SCM.

KEYWORDS: Artificial Intelligence, ARMA Model, Logistics, Supply Chain (SC).

INTRODUCTION

In the late 1970s, artificial intelligence (AI) was first developed. Its main objective is to experiment with and develop "thinking robots" that can mimic, comprehend, solve problems, and resemble human brains. Its other objectives are learning, reasoning, and perception. It is divided into three categories: theory of mind, limited memory, and reactive machines. The term "logistics" refers to the full resource management process, which includes resource acquisition, storage, warehousing, inter- and intra-transportation to the desired destination. Identification of possible suppliers, wholesalers, retailers, and distributors is part of logistics management, along with evaluation of their efficiency and accessibility. The synchronization of conventional manufacturing activities and strategies across various operations is known as supply chain (SC) and is organized and planned. operations within and between departments as well as across process units in the supply chain with the goal of improving business operations for the various units and for the supply chain as a whole. In order to significantly support the business units, logistics and SC encourage making sure that necessary goods arrive at the destination in the desired condition, at the stipulated time, and at the stated location. The industries' web-like structure offers a suitable foundation for implementing and scaling artificial intelligence as well as enhancing the components of SC independent of manual interference in the international supply chains. Also, there is a significant chance that the firms will eventually become obsolete as other organizations that employ SC tactics become more successful on a daily basis. Every day, artificial intelligence improves and helps many businesses and departments. The majority of the equipment utilized in industries is multi-disciplinary. They are built with mathematical, linguistic, psychological, information technology, and other elements. Artificial intelligence's fundamental components are flows and algorithms. Several levels of difficulty apply to simple, medium, and complicated applications. AI is crucial to the supply chain's digitalization. Logistics benefit from the use of artificial intelligence since the entire process is made transparent. The supply chain generates a significant amount of data each day. This data, which is both structured and occasionally not structured, is by far the most underutilized. Artificial intelligence facilitates a digital transformation by moving away from old ERPS and towards analytics, which helps digitalize logistics firms and their supply chain.

RELATED WORK

In[1] Concepts, Techniques, and Internet of Things Solutions Timothy Chou, author Readers are

introduced to the fundamentals of the industrial Internet of Things in Timothy Chow's book Principles, Processes, and Solutions for the Internet of Things (IoT). A framework that is vendor-neutral and free of abbreviations is introduced in the first section, Precision: Principles and Practices. The core principles of the framework and how these ideas are applied are then covered by Dr. Chou. The second section, Precision: Solutions, applies Dr. Chou's IoT paradigm by outlining 14 practical solutions for manufacturers who are creating precision equipment and businesses using these technologies to achieve precision-enhanced business outcomes.

In[2] Theories and applications of artificial intelligence in supply chain management Hokey Min. The goal of artificial intelligence (AI) is to build "thinking machines" that can duplicate, replace, and learn from human intelligence. Due to its capacity to identify patterns in business, learn about business phenomena, find information, and intelligently evaluate data, AI has demonstrated considerable promise in enhancing human decision-making processes and the ensuing productivity in a variety of business undertakings since the late 1970s. Although being widely accepted as a tool to aid in decision-making, supply chain management has very seldom used AI (SCM). This article investigates several AI sub-fields that are best suited for resolving real-world SCM-related issues in order to fully realize the potential benefits of AI for SCM. In doing so, this study examines the track record of AI applications to SCM success and pinpoints the most advantageous SCM domains for AI application.

In[3] Uses of multiagent systems in logistics and transportation Maria Ines Fae and Mark Tarver- In this study, a cutting-edge programming technique is used to analyze a recently developed technology with potential applications in a number of scientific domains. This technique simulates intelligent agents that represent social systems using computers. This article presents an overview of research on agents and multiagent systems applied to transport and logistics, based on the incomplete understanding of the transport demands for which agent solutions are appropriate. Additionally, it offers a multiagent method for modeling War drop's Principle using non-communicating cognitive agents. Despite the agents' ability to handle dynamic, distributed, and real-time challenges, a wider component of transport, such as problems with demand and supply, and incident management, has not yet been addressed. Our goal is to present the areas where little to no research has been conducted thus far, including simulation, management systems for traffic accidents, and demand modeling.

In[4] Mohamed-lliasse Mahraz, Loubna Benabbou, and Abdelaziz Berrado are the authors of Machine Learning in Supply Chain Management.- The digitalization of business and trade has created a significant dynamic that is currently beneficial to the supply chain ecosystem. This represents a significant advance for all parties involved, and machine learning is the driving force behind this transformation. Technology has fundamentally transformed businesses in a variety of ways, including how communication has changed, how many procedures have been automated, how important information systems have become, etc. Supply chain management is increasingly becoming a source of profit at the strategic, tactical, and operational levels as a result of declining margins and more demanding customers. Machine learning methodologies and techniques have a wide range of practical applications for supply chain decision making in this context and environment of abundant data. Companies today are forced to use machine learning technologies in nearly every aspect of their operations. Technology has become so established in business strategy that the majority of them now significantly rely on it for all activities, including product development, quality assurance, and public relations.

In[5] Supply chain management challenges for manufacturers: H.G. Shah and Vishal Parmar- The term "supply chain" first appeared in the middle of the 1980s and has since been widely used by academic researchers and business professionals. It is still a developing idea. Using supply chain management (SCM) gives a manufacturing company a competitive edge and a strategic fit over other manufacturing companies. A supply chain (SC) is made up of all the operations, facilities, and flows that take products and gadgets from the manufacturing stage to the consumer. Although the SCM contributes to inventory reduction, reliable information exchange, and the growth of trust among SC partners, organizations still face a challenge that prevents them from implementing the supply chain in an efficient manner. These obstacles are referred to as SCM obstacles. They exist in the manufacturing organization's internal and external environments. Some of the barriers that exist within manufacturing organizations include short-term decision-making perspectives, a lack of information technology, a poor ICT structure and training for employee and supplier employees, a lack of necessary tools and management skills, and a lack of motivation and

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

employee involvement. Supply chain management is a crucial and essential component of every business that wants to make more money. A significant strategy for maintaining a competitive edge and enhancing organizational performance is effective supply chain management.

AUTOREGRESSIVE MOVING AVERAGE (ARMA)

ARMA is a forecasting model that uses well-behaved time-series data to apply the methods of moving average (MA) and auto regression analysis (AR) analysis. In ARMA, it is presupposed that the time series is stationary and that any fluctuations occur uniformly at specific times of day. The least squares approach can be used to estimate the model parameters if the input sequence "u(n)" and the output sequence "a(n)" of the model can be measured. Due to the fact that this estimation is linear, the model parameters may be adequate. The only sequence of the model that can be retrieved in several spectral estimations is the output, or x(n). Because the parameter estimation is non-linear at this time, getting an accurate estimate of the ARMA model parameters is challenging. Theoretically, certain approaches for estimating the best values of the ARMA model parameters are introduced; nevertheless, they suffer from high computing complexity and the inability to ensure convergence. In engineering, the estimated AR and MA parameters method, which is unsatisfactory, is therefore suggested. To considerably reduce the amount of calculation, the AR and MA parameters are not evaluated simultaneously as in the optimal parameter estimation.

Basics of the ARMA model

Over time, the prediction index creates a data sequence known as a random sequence. Its interdependence illustrates the temporal continuity of the original data. The law of change is on one side and the effect of influencing variables is on the other. This is under the presumption that the regression analysis' affecting elements are x1, x2,... xk.

AR Model

In order to estimate the present spectrum, the AR model is frequently utilized. The usage process for this model is as follows. Choosing the AR model, and if the input is an impulse function or white noise, equalizing the output of the model to match the signal under study. It ought to at the very least represent the signal fairly accurately. Using the data or known autocorrelation function, find the model's parameters. Calculating the signal's power spectrum using the model parameters that were generated.

MA Model

In addition to being one of the techniques for model parametric spectrum analysis, it is a widely used model in contemporary spectrum estimation. The following steps should be taken to estimate the signal spectrum of the MA model. When the input is an impulse function or white noise, choosing the MA model and then adjusting the output to match the study signal are the best options. The signal should at the very least be reasonably approximated. utilizing the well-known autocorrelation function to determine the model's parameters. calculating the model parameters from the signal's power spectrum. The AR parameters are calculated first, and the MA parameters are estimated based on these AR parameters in the calculation of the ARMA parameter spectrum.

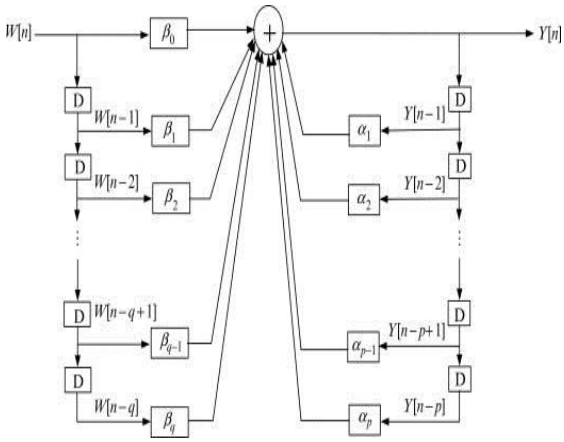


Figure 1: ARMA Model

The ARMA process of order (p, q) is obtained by combining an MA(q) process and an AR(p) processes. That is, it contains p AR terms and q MA terms and is given by

$$r_t = \mu + \sum_{\ell=1}^{p} \phi_\ell r_{t-\ell} + \sum_{\ell=1}^{q} \theta_\ell e_{t-\ell} + e_t.$$

ARMA is a forecasting model that uses well-behaved time-series data to apply the methods of moving average (MA) and auto regression analysis (AR) analysis. In ARMA, it is presupposed that the time series is stationary and that any fluctuations occur uniformly at specific times of day.

METHODOLOGY

Analytics and computer support have been used in logistics and supply chain for decades. Many enterprise resource planning (ERP) systems

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

automate the choice of when and how much to order, while warehouse and transportation management systems optimize storage and transportation activities. As an example, supply chain planners use software tools that process historical data to forecast demand. Each of these supply chain support solutions can be used independently or combined with other business processes like supplier relationship management or financial accounting.

Disadvantages

1) Realizing its full potential requires time.
2) The systems could be challenging to utilize

A proposed system that makes use of machine learning techniques like ARMA has been created to alleviate the shortcomings of existing systems. Artificial intelligence in logistics and the supply chain enables network optimization over long and short distances. This initiative assists in generating money that cannot totally be achieved through human decision-making. It aids the logistics sector in redefining current operations, making wise decisions, planning (such as demand and seasonal forecasting), processing (by substituting human participation with automation), and changing traditional procedures to customized ones.

Benefits: 1) The information system's incorporation of artificial intelligence keeps the information flow rich.
2) Real-time pricing is a common application of it.
3) Artificial intelligence techniques are used to construct profiles of diverse in-sources and out-sources.
4) Systems based on rules could aid in contract decision-making and the outsourcing of logistics.
5) Location, assessment, and assortment concerns of various providers could be investigated using machine learning via artificial intelligence.

ARCHITECTURE

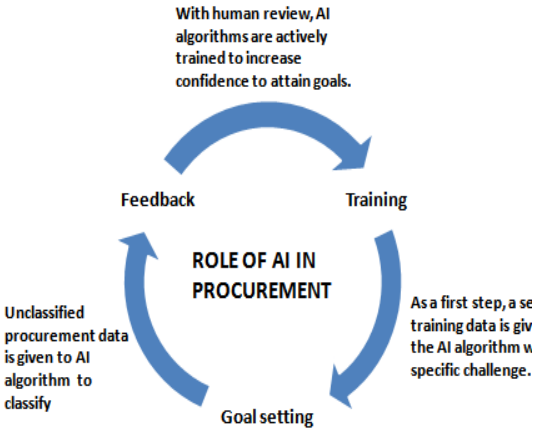


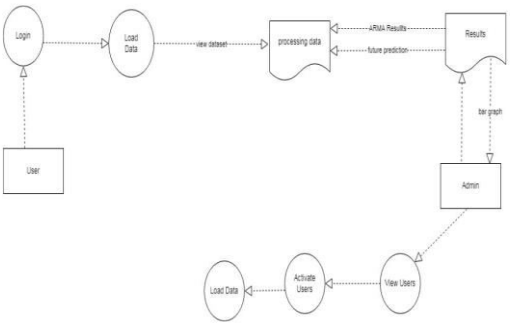
Figure 2: Role of Artificial Intelligence in procurement

DATA PREPROCESSING

An assortment of data objects, also known as records, points, vectors, patterns, occurrences, instances, samples, observations, or entities, can be thought of as a dataset. The essential qualities of an object, like as the mass of a physical object or the moment at which an event occurred, etc., are captured by a variety of features that characterize data objects. The terms variables, characteristics, fields, attributes, or dimensions are frequently used to refer to features. This forecast's data preprocessing makes use of methods like removing noise from the data, eliminating missing data, changing default values when appropriate, and combining attributes for prediction at different levels.

ARTIFICIAL INTELLIGENCE

Based on the split criterion, the cleansed data is split into 60% training and 40% test, then the dataset is subjected to six machine learning classifiers such as Perception, Auto Regressive Moving Average (ARMA) with that we have future prediction graph based on ARMA Algorithm. The future prediction of the classifiers was calculated and displayed in my results. The classifier which bags up the highest future prediction could be determined as the best classifier.



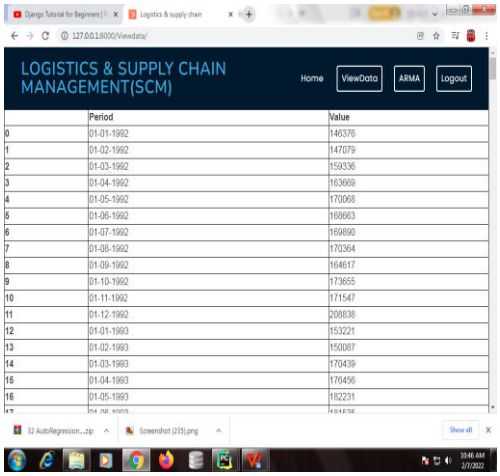
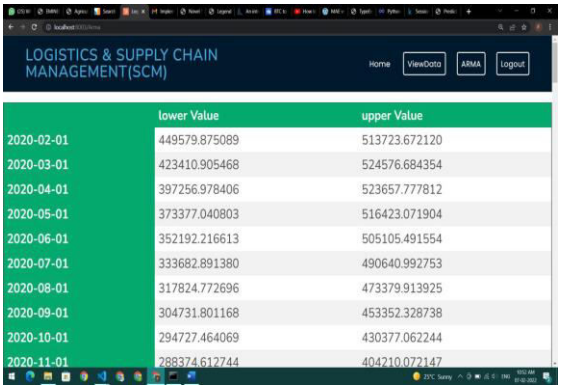


Figure 3: User View Data

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

RESULT



	lower Value	upper Value
2020-02-01	449579.875089	513723.672120
2020-03-01	423410.905468	524576.684354
2020-04-01	397256.978406	523657.777812
2020-05-01	373377.040803	516423.071904
2020-06-01	352192.216613	505105.491554
2020-07-01	333682.891380	490640.992753
2020-08-01	317824.772696	473379.913925
2020-09-01	304731.801168	453352.328738
2020-10-01	294727.464069	430377.062244
2020-11-01	288374.612744	404210.072147

Figure 4 ARMA Results

ARMA GRAPH

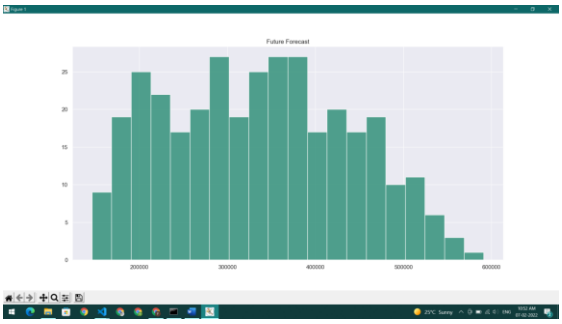


Figure 5: Future Prediction

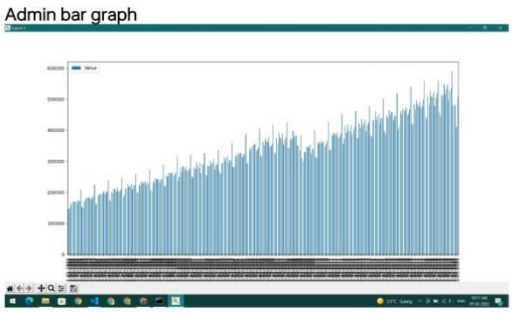


Figure 6: Bar Graph

CONCLUSION

The ability of network optimization in terms of distance and time is provided by artificial intelligence in logistics and supply chain management. Revenue creation, which cannot be achieved solely through human decision-making, is aided by this. It aids the logistics sector in redefining current operations, making wise decisions, planning (such as demand and seasonal forecasting), processing (by substituting human participation with automation), and changing traditional procedures to customized ones

REFERENCES

[1] Precision: Concepts, Processes, and Solutions for the Internet of Things, Chou, T. (2016).
[2] Putting AI to Work in the Business, Curran, C. (2017).
[3] Francis, S. (2017). Grey Orange introduces new AI for warehouse automation and logistics robots.
[4] Dr. Dirk Michelsen, Ben Gesing, and Steve J. Peterson, Artificial Intelligence in Logistics
[5] Hokey Min: Theory and applications of artificial intelligence in supply chain management
[6] A contemporary approach to artificial intelligence, Russell, S. and Norvig, P. 1995. Prentice-Hall, Upper Saddle River, New Jersey
[7] Williams-Timme and Timme, S.G., 2003- the true costs associated with keeping stock. 7, 30-37 of Supply Chain Management Review.
[8] M. Tarver and M.I. Fae, 2007. applications of multiagent systems in logistics and transportation. 3(4), 405-418, International Journal of Logistics Systems and Management.

AUTHOR PROFILE

Mrs P.CHAITANYA, well known teacher received M.Tech (CSE) from JNTU Kakinada University is working as Assistant Professor, Department of CSE, Sir C R Reddy College of Engineering. She is an active member of IAENG. She has 7 years of teaching experience in various engineering colleges. To her credit couple of Publications both national and international Conferences, journals Her area of interest includes Machine Learning, Deep Learning, Artificial intelligence, cloud computing, cyber security ,Cryptography and network security and operating system and other Advances in computer applications.

Mr. S KOTESWARA RAO YARLAGADDA, well known teacher received M.Tech (CSE) from JNTU Kakinada University is working as Assistant Professor, Department of IT, Sir C R Reddy College of Engineering; He is an active member of ISTE. He

has 12 years of teaching experience in various engineering colleges. To his credit couple of publications both national and international conferences /journals. His area of interest includes Machine learning, Deep Learning, information security, cryptography and network security, Operating systems and other advances in computer applications.