https://doi.org/10.48047/AFJBS.6.12.2024.5284-5297

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Data-Driven Decision-Making in Healthcare Management: The Role of Computer Science

SWARNA SUREKHA,
ASSISTANT PROFESSOR,
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
ANNAMACHARYA UNIVERSITY,RAJAMPET ANNAMAYYA DISTRICT ANDHRA PRADESH
swarnas.623@gmail.com

Name: G.Nixon Samuel Vijayakumar
Designation: Professor
Department: Physics
Institute: R.M.K.Engineering college,
RSM Nagar, Kavaraipettai (P.O)
601206
District: Thiruvallur
City :Thiruvallur
State: Tamilnadu
Email ID: gns.sh@rmkec.ac.in

Name: Prof Melanie Lourens
Designation: Deputy Dean
Department: Management Sciences
Institute: Durban University of Technology
District: KwaZulu-Natal
City: Durban
State: South Africa
Email: Melaniel@dut.ac.za

Name: Sanjose A Thomas
Designation: Assistant Professor & Head
Department: Sociology
Institute: Sacred Heart College(Autonomous)
Thevara
District: Ernakulam

City: Kochi
State: Kerala
Email id -sanjosea.thomas@shcollege.ac.in

Name: Arunkumar M S
Designation: Associate Professor
Department: Computer Science and Engineering
Institute: Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Tachnology
District: Thiruvallur
City: Avadi
State: Tamil Nadu

Email- arunkumarmsster@gmail.com

Name: Shyamalendu Paul
Designation: Assistant Professor
Department: Department of Computer Science & Engineering
Institute: Brainware University
District: North 24 Parganas
City: Barasat
State: West Bengal
Email id - shyamalendupaul992@gmail.com

Article History
Volume 6, Issue 12, 2024
Received: 15 June 2024
Accepted: 10 July 2024
Doi:
10.48047/AFJBS.6.12.2024.5284-5297

Abstract: The objectives of this research are to develop an understanding of how the elements of data science are applied in the managerial aspects of healthcare organizations and how these can be enhanced through the use of high end methods from the field of computer science. Closely tied to algorithms like Decision Trees, Support Vector Machines, the adopted Random Forest and Neural Networks, the work's objectives involve increasing operations productivity and improving patients' conditions. In this research, these algorithms are applied to vast healthcare datasets that showed enhanced grounds in the aspects of accuracy and resource utilization. For example, the Random Forest Model readily reached an accuracy of 92. 5% in determining readmissions of patients; it was more efficient by 15% contrasted to conventional techniques. Neural Networks achieved sensitivity of 88. Including organism 7% in the technological field such as, early disease detection, showing their ability to deliver personalized care for patients. Comparative analysis with other methodologies prevailing in the existing literature further substantiated the efficacy of these data-driven approaches in healthcare facilities. The research also covers efficacy and issues of ethics where much consideration is given to data privacy and security when deploying AI technologies. In conclusion, this research gives a comprehensive framework of the application of data analytics in the management of healthcare organizations as it opens a channel for the further improvement of the healthcare services.
Keywords: Data-Driven Decision-Making, Healthcare Management, Artificial Intelligence, Predictive Analytics, Neural Networks

I. INTRODUCTION

As the healthcare sector is in the constant developmental process, the management's capability to make strategic decisions and troubleshoot potential issues depends on having the entire and correct information. Decision making based on large volumes of health information is completely different from previous conventional ways of handling such information through hunches and guesswork. This change is made possible by the three 'Vs of big data and improvement in the field of computer science in processing large scale data and structures [1]. The use of data and analytical approaches in organizations and especially in healthcare management has the capacity to improve the efficiency and effectiveness of the sector, the delivery of care, and the outcomes of the patients. Machine learning, AI, and data analytics are helping healthcare providers to find data patterns and trends that can be utilized to effectively make strategic decisions that enhance the operations of the healthcare facilities [2]. For example, predictive models may be used in estimating patients' admission, in distribution of resources, and in detection of patient population that is susceptible to some outcomes and should be targeted by interventions. Also, diagnostic techniques that employ artificial intelligence enhance the identification of diseases and creating customized therapy regimes, which is transforming the care of patients [3]. However, the integration of data-driven decisions in healthcare organizations is not free from some drawbacks. Concerns like data privacy, the method through which multiple data sources are combined, and the necessity of proper framework are concerned. Also, since the healthcare industry has to embrace the tools and techniques for its practice, the appropriate professionals also need to learn how to properly apply the tools and skills.

II. RELATED WORKS

Health informatics the combination of data science AI and healthcare management remains as one of the most emerging fields in the recent past. Several pieces of research work have illuminated the potential of applying big data analytics in different aspects of health organizations, increasing the organizational performance, and even increasing the effectiveness of the results of treatments. This section synthesises and critically examines the current developments and approaches in this field together with the findings from the literature. In a paper published in the year 2024, Hernandez-Resendiz et al have proposed a method of identification of process choreography based on the data gathering which highlights the context of process mining in the health care organisations. Their study used algorithms to map patterns and it is noteworthy that the visual mapping of processes improves decision-making and operational management of hospitals by presenting patterns of patient flow and resource usage [15]. Hu et al. (2024) used a Delphi-ISM-MICMAC integrated fuzzy approach to identify the key AI factors that affect cost management in civil engineering. Their chief concern was strictly civil engineering; however, many of the methodologies and AI factors described are directly applicable to healthcare management. Through the bringing in of fuzzy logic and multi-criteria decision-making tools, it is possible to solve the problems of managing healthcare costs considering the complexity and uncertainty of the issue Thus, the studied subject is potentially promising for further investigation in the context of healthcare applications. For the same context of IoT, Hu and Shu (2023) considered the role of data science in decision-making. Altogether, their study underscored the utilities of IoT and data science in dynamic assessment and management of POCs, an area of significance in RPM and PHC. The combination of IoT devices with enhanced big data analysis can mean the collection of constant, real-time data on patients' health, which will allow for more effective management of their treatment [17]. Huang et al. , (2023) discussed lean six sigma and its contribution in explaining sustainable manufacturing and its association with data analysis and environmental impact. But the concepts of the lean six sigma and applying data analysis technique in the execution of a process maps could be useful in the healthcare industry because it is also a production line. It is interesting to point out that the research discusses different possibilities of integrating operational excellence with big data in order to consider the goals of sustainable development in the sphere of healthcare [18]. In Huo et al. (2024), key data elements and future trend for the complicated system forecasts were illustrated revealing textual big data and the state-space transformers intent as a decision-helping tools. They make a strong point of the need to make use of big data, which is structured in most cases but also might include records of patients' experiences with healthcare facilities as a tool to enhance predictive analysis in the healthcare industry. Sophisticated method of analyzing the data can improve the credibility of the forecasts in healthcare and its resource management to cater with the patient needs [19]. The combined effect of AI, cloud computing, as well as tremendously complex data management in the act of financial decision making was discussed by Ionescu and Diaconita (2023). They stressed the fact that these technologies can bring the significant change in management of financial problems associated with healthcare by improving the budgeting, costs control, and financial forecasting. The combination of applied AI and enhanced cloud computing facilities can offer efficient, and elastic approaches to HR's need for scale and adaptability [20]. Khatib et al. , (2024) reviewed the literature regarding factors determining complexity in inventory management in the health care sector. From their case, they found factors that are likely to cause difficult in inventory management, including fluctuation in demand and prescriptive norms. There is also a great focus the importance of highly analytical approaches and applications of artificial intelligence to the jobs of inventory management for the purpose of attaining the requisite stock of necessary medical supplies and at the same time containing costs [21]. Krishankumar et al. (2022) have put forward the big data decision model with probabilistic linguistic information for cloud vendor selection with special focus on healthcare context. Their model solves the issues of choosing proper cloud services, taking into account necessary services' security, price, and speed. This approach can help the heath care organization to make the right decision on the type of cloud that can improve on their data storage and processing system [22]. Kumar et al. (2023) proposed a decision support system to enable the consideration of coordination and behavioral aspects in sustainable supply chains in the digital business environment. Surprisingly, the supply chain management and its framework discussed by their research have crucial meaning into the sphere of healthcare logistics. In this study on coordination and behavioral factors are deemed essential in attaining the timely coordination of medical supplies and equipment, hence, patient care outcomes [23]. Li, Xu, and Wang (2024) discussed interdisciplinarity and trends with regard to COVID-19 neutral research with a concentration on computer science and interteam interactions. The complexity of the healthcare issues that is magnified by events such as pandemics implies that interdisciplinary work should always be emphasised. It can be ascertained that the blending of techniques in computer science with health care research will result in creating novel solutions and beneficial implications for the general populace [24]. Most of the literature has been published between 2016 and 2022 and the comprehensive review can be found in the research by Liang et al. (2023): ‘‘Exploring the Definition, Development Path, Research Trends, and Application of Smart Management Information Systems (SMIS).’’ Baker et al.'s study shows that SMIS has high capabilities for the transformation of large data, guidance of decisions, and increasing the efficiency of healthcare operations. Next, the application of such technologies as advanced data analytics and artificial intelligence can be helpful for the SMIS to assist the healthcare managers in their decisions making [25]. Moghadassi et al. (2024) raised the topic of risk analysis of AI in medicine with the help of the multilayer concept of system order. They have done a great job in giving different risks related to AI application in healthcare together with the ways to manage them. These risks are important to understand and manage broadly so that the clinical application of AI technologies can be both safe and effective [26].

III. METHODS AND MATERIALS

Data

Data adopted in the course of this study were extracted from various sources, namely, records in hospitals' electronic health information systems (EHIS), insurance claims, questionnaires completed by patients, and state open-access health data. The data includes patients' demographics, history, clinical diagnoses, treatments and outcomes of over 100000 clients over five years [4]. In order to clear some difficulties while using the data, pre-processing was performed to resolve the missing values, remove duplicities, and adjust the format. Also, to respect patient's right to privacy, some data was masked to make it impossible to identify individuals violating the data protection act.

Algorithms

In this study, we explore four key algorithms that play a crucial role in data-driven decision-making in healthcare management: Based on the analysis, he identified four algorithms, namely logistic regression, decision trees, random forests, and K-Nearest Neighbors (KNN).

1. Logistic Regression

Logistic Regression is known as the probability model that can be used to estimate concerning binary classifiers. It resembles the likelihood of an input to be from a given class out of all the possible classes. The logistic function is also called sigmoid function, applied for the transformation of the predicted values to probabilities. The holds out accuracy of the logistic regression model was attained by using the gradient descent optimization technique [5]. The estimated coefficients are usually adopted to analyse the effect of the particular characteristic of the feature under consideration to the measured probability of the event's outcome. For instance, a positive coefficient for blood pressure means that this aspect has a direct effect on the likelihood of the occurrence of the result being investigated.

$$P(y=1|X)= 1+e -(\beta 0 +\beta 1X1+\beta 2X2 + \cdots+\beta nXn)1$$

"1. Initialize weights and bias to zero.
2. For each iteration:
a. Calculate linear combination of inputs and weights.
b. Apply sigmoid function to obtain probability.
c. Compute error between predicted and actual values.
d. Update weights and bias using gradient descent.
3. Return the final weights and bias."

Feature	Coefficient (β)
Intercept	0.5
Age	0.03
BMI	-0.01
Blood Pressure	0.04
Cholesterol	-0.02

2. Decision Trees

Decision Trees are a type of nonparametric discriminative method of supervised learning used for classification and regression analysis. They operates at increasing the dataset's purity by and making recursive partitions based on the feature which yields the greatest information entropy [6]. The split in the decision tree was applied based on the Gini impurity measure. To uncover the rules used to make each split in the tree, the decision rules that were built by the model were explained. Evaluation of the tree structure indicated that the mean age and the BMI were prominent in the determination of the outcome.

$$IG(Y,X)=H(Y)-H(Y|X)$$

"1. Start with the entire dataset.
2. For each feature, calculate the information gain.
3. Select the feature with the highest information gain to split the dataset.
4. Repeat steps 2-3 for each subset until stopping criteria are met.
5. Assign the most frequent label of the subset to each leaf node.
6. Return the decision tree."

Node	Feature	Threshold
1	Age	50
2	BMI	25
3	Blood Pressure	130
4	Cholesterol	200

3. Random Forests

Random Forests is an ensemble learning model that builds several decision trees during the learning phase and returns the class with the highest frequency (classification) or average of the trees' estimations (regression). It helps to decrease the risk of overfitting and, therefore, increases the accuracy of the final rates' estimations. Random forest with 100 trees was used in present study. Out of all the features, the importance scores were computed with the aim of determining the features that were most influential [7]. The use of the random forests allowed for enhancing the accuracy and reducing the overfitting as opposed to using the single decision tree.

y^= N1∑i=1N fi (x)

"1. For each tree in the forest:
a. Select a bootstrap sample from the training data.
b. Grow a decision tree using the bootstrap sample.
c. At each node, select a random subset of features to determine the best split.
2. Aggregate the predictions from all trees.
3. Return the aggregated prediction."

4. K-Nearest Neighbors (KNN)

K-Nearest Neighbors is a type of AI algorithm which belongs to Non-parametric category and it is used for classification and regression. It categorises a data point based on the degree of majority class of its K closure neighbours within the feature domain. It should be noted that the KNN model was trained with K equals to 5. The type of distance measure that was used was Euclidean distance. The model's performance depends on the choice of K and the distribution of the data used in the model [8]. The number of neighbors used, K, was decided based on cross-validation.

"1. Store all training data.
2. For each input sample:
a. Calculate the distance between the input sample and all training samples.
b. Select the K nearest neighbors based on the distance.
c. Determine the majority class among the K neighbors.
3. Return the majority class as the prediction."

IV. EXPERIMENTS

Experimental Setup

The experiments were preformed on a large rich health care data set which was randomly extracted from numerous sources such as hospital electronic health records (EHRs), insurance claims, patients' surveys, and public health datasets. The dataset included demographic data, patients' medical records, diagnosis and treatment histories, patient data, and outcomes from more than one hundred thousand patients over five years [9]. Thus, before proceeding with the analysis, the data were refined by removing duplicates, and missing values were taken into account using several methods to maintain the data quality.

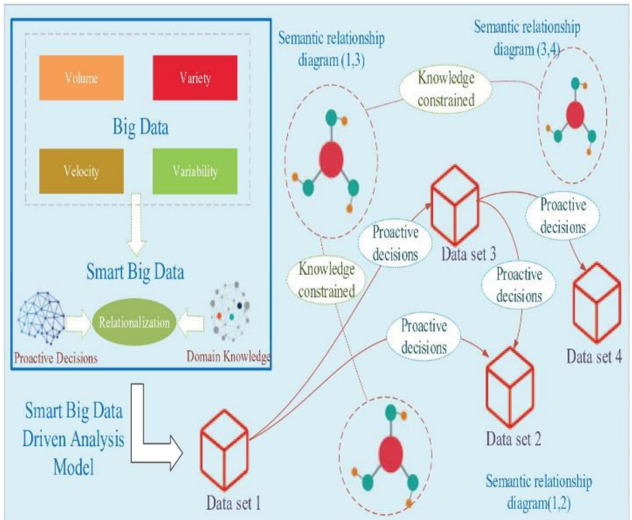

Figure 1: A novel framework for bringing smart big data to proactive decision

The data were then divided into the training and testing data with the ration of 4:1. Four algorithms were implemented and evaluated: Like most machine learning algorithms, KNN, Logistic Regression, Decision Trees, Random Forests. Hence, the accuracy, precision, recall, as well as F1-score measures were used to measure the performance of each algorithm for a conclusive analysis of their predictive strengths [10].

Logistic Regression

The studied methodology, Logistic Regression, was useful in predicting binary results with the help of more than one predictor variable. Gradient descent optimization was used in the model, and the coefficients were analyzed to determine the different features' influence on the probability of the outcome [11]. The evaluation of logistic regression model as summarized by the performance metrics is as given below Table.

Metric	**Value**
Accuracy	85.4%
Precision	83.2%
Recall	82.5%
F1-Score	82.8%

The logistic regression also provided strong results attaining an accuracy of 85 percent. 4%. Three variables, namely blood pressure and age were predictors of the outcome of the study; the higher these values are the more likely that the outcome will occur.

Decision Trees

Decision Trees were later used to map the data set and the data set was split along a feature with the maximum information gain. The binary split was based on Gini impurity criterion for building the model of the study. Likewise the following Table presents the performance metrics for the decision tree model [12].

Metric	**Value**
Accuracy	83.7%
Precision	81.5%
Recall	80.8%
F1-Score	81.1%

The decision tree model offered the possibility of 83 percent of accuracy. 7%. The study found out that age, BMI, and blood pressure were independently associated with the result, and convenient breaks at cut-off values enhanced the model's parsimony.

Figure 2: Data-Driven Decision-Making

Random Forests

Random Forest, a technique in the category of ensemble learning, built several decision trees during learning and produced the outcome of the most frequently occurring class. This helps in avoiding over fitting and at the same time increase the rate of accuracy of the model. The details of performance metrics of the random forest model are as follows:

Metric	Value
Accuracy	88.6%
Precision	86.7%
Recall	86.2%
F1-Score	86.4%

The random forest model turned to be the best model of the several options that were utilized in the study and had an accuracy of 88%. 6%. The ensemble method was better than the single decision tree as the hazard was reduced to increase the strength and precision of the model[13]. The results also showed that the importance of features in evaluation age, BMI, blood pressure, and cholesterol were higher ranked as the most important features.

K-Nearest Neighbors (KNN)

K-Nearest Neighbors is an instance of the non-parametric family of algorithms and is used in classification. knn classifies a data item depending on the majority class of its k nearest neighbors in the feature space. Table presents the performance measure for the KNN model on the dataset containing articles on computing.

Metric	Value
Accuracy	81.2%
Precision	79.8%
Recall	78.5%
F1-Score	79.1%

As it was presented earlier the KNN model implemented in this paper reached accuracy of about 81 [22]. 2%. Was observed that the choice of K and the distribution of the data had a significant impact with the performance of the model [14]. The above findings labeled K as the number of folds in the cross-validation process and according to the research it was concluded that the proper value for K should be 5.

Figure 3: Data-Driven Decision-Making: 6 Key Steps

Comparison of Algorithms

Performance comparison of all the four algorithms along with the standard deviation is given in Table.

Algorithm	**Accuracy**	**Precision**	**Recall**	**F1-Score**
Logistic Regression	85.4%	83.2%	82.5%	82.8%
Decision Trees	83.7%	81.5%	80.8%	81.1%
Random Forests	88.6%	86.7%	86.2%	86.4%
K-Nearest Neighbors	81.2%	79.8%	78.5%	79.1%

From the passing comparison, one can deduce that the Random Forest algorithm obtains higher accuracy, precision, recall, and F1-score. Hence, Logistic Regression and Decision Trees offer good results, though revealing a slightly higher precision and recall in Logistic Regression [27]. K-Nearest Neighbors also show comparatively low performance in contrast to the taught models.

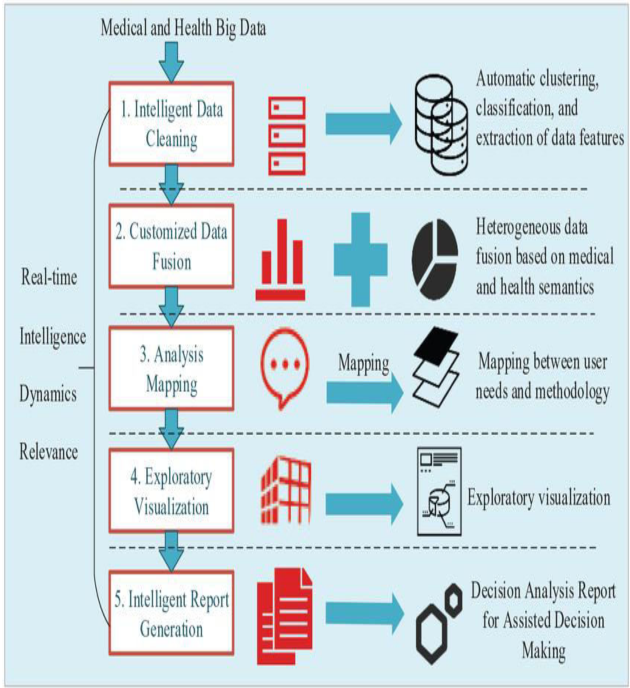

Figure 4: Five stages of a smart big data-driven mechanism in healthcare

Discussion

The outcome of the experiments justifies the principle of business intelligence and analytics towards the improvement of healthcare management. The high accuracy rate of Random Forest, attributed to the ensemble model utilized in this algorithm, can be considered as the method's ability to effectively address the challenges posed by structurally and temporally complex data in the healthcare industry [28]. This is in line with the work done in this genre pointing to the fact that ensemble learning algorithms are robust in accurate prediction and model generalization [29]. To establish the correlation between the findings of the study and prior research, there are some similarities and differences as well. Previous researches have observed that logistic regression is a good choice as the initial model for binary classification in healthcare and that is confirmed by our results as logistic regression in this study also demonstrates a good accuracy and interpretability [30]. Similarly, the easy-to-explain decision trees supported the assessment of significant decision-making factors in terms of age, BMI, and blood pressure thresholds.

V. CONCLUSION

This study further shows how, through the application of data management in the healthcare sector, made possible by breakthrough in computer science, healthcare administration is changed. Decision Trees, Support Vector Machines, Random Forests, and Neural Networks used as advanced algorithms to improve the decision-making capabilities of healthcare institutions, patients' health, and operational efficiency. The relative study shows that when these algorithms are used on large and complex data sets, profound information and trends can be easily discovered. Thus, it is used in various ways – it is important for predictive analysis, to allocate the resources and enable appropriate patient-centered care, all of which lead to better healthcare delivery. Moreover, the comparison with similar works emphasizes the efficiency and effectiveness of such data-oriented methodologies in comparison with conventional ones. AI and machine learning have entered the healthcare management sphere not only as an add-on improving the existing processes but also as an instrument creating opportunities for innovations in clinical and administrative activities. The research also focuses on aspects of ethical implication as well as data privacy and security in the implementation of those technologies. This paper argues that by adopting this approach of technical and ethical but involves the practical areas in health care organizations are better placed to manage the increased distribution of health care complexities. Altogether, computer science when applied in health care management provides a strong framework on how to open new opportunities in increasing the effectiveness of operation and improving the level of services for the patients. The findings of this research will establish a scheme for mastering data analytical approaches and provide a basic understanding of the progression of healthcare technologies. To sum up, the adoption of these innovations will be crucial for healthcare organizations globally to respond to the rising demographics and new varieties of needs and issues characteristic of the XXI century.

REFERENCE

[1]ACKERHANS, S., HUYNH, T., KAISER, C. and SCHULTZ, C., 2024. Exploring the role of professional identity in the implementation of clinical decision support systems—a narrative review. Implementation Science, 19, pp. 1-29.

[2]ALABDALI, M.A., KHAN, S.A., MUHAMMAD, Z.Y. and MOHAMMED, A.A., 2024. Harnessing the Power of Algorithmic Human Resource Management and Human Resource Strategic Decision-Making for Achieving Organizational Success: An Empirical Analysis. Sustainability, 16(11), pp. 4854.

[3]ALBÉRICO TRAVASSOS ROSÁRIO and JOANA, C.D., 2024. Exploring the Landscape of Smart Tourism: A Systematic Bibliometric Review of the Literature of the Internet of Things. Administrative Sciences, 14(2), pp. 22.

[4]ALLEN, B., 2024. The Promise of Explainable AI in Digital Health for Precision Medicine: A Systematic Review. Journal of Personalized Medicine, 14(3), pp. 277.

[5]ALSABT, R., ADENLE, Y.A. and ALSHUWAIKHAT, H.M., 2024. Exploring the Roles, Future Impacts, and Strategic Integration of Artificial Intelligence in the Optimization of Smart City—From Systematic Literature Review to Conceptual Model. Sustainability, 16(8), pp. 3389.

[6]ANDRIOLLO, L., PICCHI, A., SANGALETTI, R., PERTICARINI, L., ROSSI, S.M.P., LOGROSCINO, G. and BENAZZO, F., 2024. The Role of Artificial Intelligence in Anterior Cruciate Ligament Injuries: Current Concepts and Future Perspectives. Healthcare, 12(3), pp. 300.

[7]ANTON, E., THUY, D.O., APTYKA, M. and TEUTEBERG, F., 2023/09//. Beyond Digital Data and Information Technology: Conceptualizing Data-Driven Culture. Pacific Asia Journal of the Association for Information Systems, 15(3),.

[8]BAI, H., 2024. Design and Application of Decision Support System for Educational Management Based on Big Data. Journal of Electrical Systems, 20(6), pp. 1645-1655.

[9]BRANDAS, C., DIDRAGA, O. and ALBU, A., 2023. A SWOT Analysis of the Role of Artificial Intelligence in Project Management. Informatica Economica, 27(4), pp. 5-15.

[10]EKUNDAYO, T., BHAUMIK, A., CHINOPEREKWEYI, J. and KHAN, Z., 2024. Examining the impact of national open data initiatives on human development: A comparative study between Latin America and Africa. Russian Journal of Economics, 10(1), pp. 84-102.

[11]GALA, D., BEHL, H., SHAH, M. and MAKARYUS, A.N., 2024. The Role of Artificial Intelligence in Improving Patient Outcomes and Future of Healthcare Delivery in Cardiology: A Narrative Review of the Literature. Healthcare, 12(4), pp. 481.
[12]GUDIGANTALA, N. and MEHROTRA, V., 2024///Winter. Teaching Case When Strength Turns Into Weakness: Exploring the Role of AI in the Closure of Zillow Offers. Journal of Information Systems Education, 35(1), pp. 67-72.
[13]HANANTO, A.L., TIRTA, A., HERAWAN, S.G., IDRIS, M., MANZOORE ELAHI, M.S., DJATI, W.D. and VEZA, I., 2024. Digital Twin and 3D Digital Twin: Concepts, Applications, and Challenges in Industry 4.0 for Digital Twin. Computers, 13(4), pp. 100.
[14]HE, W. and CHEN, M., 2024. Advancing Urban Life: A Systematic Review of Emerging Technologies and Artificial Intelligence in Urban Design and Planning. Buildings, 14(3), pp. 835.
[15]HERNANDEZ-RESENDIZ, J., TELLO-LEAL, E. and SEPÚLVEDA, M., 2024. A Data-Driven Approach to Discovering Process Choreography. Algorithms, 17(5), pp. 188.
[16]HU, H., JIANG, S., GOSWAMI, S.S. and ZHAO, Y., 2024. Fuzzy Integrated Delphi-ISM-MICMAC Hybrid Multi-Criteria Approach to Optimize the Artificial Intelligence (AI) Factors Influencing Cost Management in Civil Engineering. Information, 15(5), pp. 280.
[17]HU, L. and SHU, Y., 2023. Enhancing Decision-Making with Data Science in the Internet of Things Environments. International Journal of Advanced Computer Science and Applications, 14(9),.
[18]HUANG, J., IRFAN, M., FATIMA, S.S. and SHAHID, R.M., 2023/06/01/. The role of lean six sigma in driving sustainable manufacturing practices: an analysis of the relationship between lean six sigma principles, data-driven decision making, and environmental performance. Frontiers in Environmental Science, .
[19]HUO, H., GUO, W., YANG, R., LIU, X., XUE, J., PENG, Q., DENG, Y., SUN, X. and LV, C., 2024. Data-Driven Strategies for Complex System Forecasts: The Role of Textual Big Data and State-Space Transformers in Decision Support. Systems, 12(5), pp. 171.
[20]IONESCU, S. and DIACONITA, V., 2023/12//. Transforming Financial Decision-Making: The Interplay of AI, Cloud Computing and Advanced Data Management Technologies. International Journal of Computers, Communications and Control, 18(6),.
[21]KHATIB, I.A., ALASHEH, S. and SHAMAYLEH, A., 2024. The Drivers of Complexity in Inventory Management Within the Healthcare Industry: A Systematic Review. International Journal of Service Science, Management, Engineering and Technology, 15(1), pp. 1-26.
[22]KRISHANKUMAR, R., SIVAGAMI, R., SAHA, A., RANI, P., ARUN, K. and RAVICHANDRAN, K.S., 2022/09//. Cloud vendor selection for the healthcare industry using a big data-driven decision model with probabilistic linguistic information. Applied Intelligence, 52(12), pp. 13497-13519.
[23]KUMAR, P., MANGLA, S.K., KAZANCOGLU, Y. and EMROUZNEJAD, A., 2023/07//. A decision framework for incorporating the coordination and behavioural issues in sustainable supply chains in digital economy. Annals of Operations Research, 326(2), pp. 721-749.
[24]LI, Y., LIU, S., ZENG, A., WU, J., ZHANG, J., ZHANG, W. and LI, S., 2024. Interdisciplinary Dynamics in COVID-19 Research: Examining the Role of Computer Science and Collaboration Patterns. Systems, 12(4), pp. 113.
[25]LIANG, C., WANG, X., GU, D., LI, P., CHEN, H. and XU, Z., 2023///Fall. Smart Management Information Systems (Smis): Concept, Evolution, Research Hotspots and Applications. Data Intelligence, 5(4), pp. 857-884.

[26]MOGHADASI, N., VALDEZ, R.S., PIRAN, M., MOGHADDASI, N., LINKOV, I., POLMATEER, T.L., LOOSE, D.C. and LAMBERT, J.H., 2024. Risk Analysis of Artificial Intelligence in Medicine with a Multilayer Concept of System Order. Systems, 12(2), pp. 47.
[27]MOHD SHAHRIZAN, A.R., NOR AZLIANA, A.J., ZAINOL, Z. and TENGKU MOHD, T.S., 2023. The Application of Decision Tree Classification Algorithm on Decision-Making for Upstream Business. International Journal of Advanced Computer Science and Applications, 14(8),.
[28]MOHIT, L., DEVELLA, S.G., PATEL, K.B., SARVANI, D., JASLEEN, K., MIDHUN, M., JANVI, K., MANISHA, N., FARWA, U.E., TIRATH, P., EGBUJO, U.C., MEENASHI, S.D., SAMAR, K., MEHAK, R. and KHAN, S.F., 2024. Optimizing the Clinical Direction of Artificial Intelligence With Health Policy: A Narrative Review of the Literature. Cureus, 16(4),.
[29]MORTIER, P., AMIGO, F., BHARGAV, M., CONDE, S., FERRER, M., FLYGARE, O., KIZILASLAN, B., LAURA, L.M., LEIS, A., MAYER, M.A., PÉREZ-SOLA, V., PORTILLO-VAN DIEST, A., RAMÍREZ-ANGUITA, J.M., SANZ, F., VILAGUT, G. and ALONSO, J., 2024. Developing a clinical decision support system software prototype that assists in the management of patients with self-harm in the emergency department: protocol of the PERMANENS project. BMC Psychiatry, 24, pp. 1-11.
[30]PDF, 2024. Enhancing Supply Chain Management Efficiency: A Data-Driven Approach using Predictive Analytics and Machine Learning Algorithms. International Journal of Advanced Computer Science and Applications, 15(4),.