Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/23357
DOI URL: http://dx.doi.org/10.21474/IJAR01/23357

*CONFERENCE PAPER*

# COMPARATIVE ANALYSIS AND CHARACTERIZATION OF DIFFERENT MACHINE LEARNING ALGORITHMS IN DEVELOPMENT OF BUSINESS AND MANAGEMENT EDUCATION

**Barsha Baishali Sahoo[1], Monalisa Sahoo[1] and Ankita Sahoo[2]**

1. Asst. Professor,College of Engineering, Bhubaneswar, BPUT University, Odisha, India.
2. Student Scholar, College of Engineering, Bhubaneswar, BPUT University, Odisha, India.

## *Manuscript Info*

***Manuscript History***
Received: 8 February 2026
Final Accepted: 10 March 2026
Published: April 2026

***Key words:-***
Comparative Analysis, ML Algorithm, Business, Management Education.

## *Abstract*

Artificial intelligence (AI) represents a significant advancement within the technological domain over the last decade. The integration of artificial intelligence (AI) into pedagogical approaches in business and management education has surfaced as an essential catalyst for modern educational practices. AI possesses the potential to revolutionize the educational framework comprehensively by catering to a variety of learning styles and improving the educational environment. AI invigorates pedagogical methods, thus fundamentally transforming traditional instructional and learning paradigms. This transformation is propelled by AI's extraordinary capability to manage numerous functionalities, including intelligent tutoring systems, automated assessment processes, and personalized content distribution. This paper studies different AI/ML algorithms, compare them and find out the best one for management education.This paper elucidates the foundational role of AI in educational revolutions, outlining various methods of AI implementation in educational progress, current trends, and future research trajectories.



## Introduction:-

The commercial environment is undergoing profound alterations attributed to emerging technologies, thereby escalating the imperative to equip both the workforce and entrepreneurs with digital competencies and skills requisite for adapting to the dynamic requirements of the contemporary business milieu. As advancements in artificial intelligence revolutionize various industries, the demand for digitally literate professionals who can comprehend, implement, and manage AI technologies significantly intensifies. Simultaneously, business education faces novel challenges to adapt and equip students with relevant competencies for the current business landscape.

**Corresponding Author:-** Barsha Baishali Sahoo
**Address:-**Asst. Professor,College of Engineering, Bhubaneswar, BPUT University, Odisha, India.

However, while AI has long been recognized for its transformative potential in business operations, the advent of generative AI (GenAI) introduces an additional layer of complexity, necessitating a comprehensive examination of its lasting effects on educational outcomes and skill development within the realm of business education.

## Literature Survey:

The artificial intelligence-integrated business and management education is in its highest peakamongst research community. Some recent articles for its literature surveyhave been analyzed here.

**Table 1: Literature Study**

| Author/Article Details | Key Findings | Domain of Study |
|---|---|---|
| Solorzano et al., 2024 | • Bibliometric analysis of AI's educational impact.<br>• Examines adaptive learning and personalized instruction methods. | Learning analytics |
| Huo & Siau, 2024 | • The paper discusses generative AI's transformative opportunities in business education.<br>• Also emphasizes knowledge acquisition, intelligent co-ideation, and personalized learning, but does not specifically address leveraging different AI and machine learning algorithms to enhance productivity in business and management education. | Generative AI |
| Xu, 2024 | • The paper discusses the integration of AI tools like ChatGPT in business education, emphasizing the need to adapt teaching methodologies and assessment strategies to enhance learning outcomes, thereby improving productivity and relevance in the evolving educational landscape. | Comprehensive analysis |
| Dey, S. & Sahoo, B. B. 2025 | • Vital role of AI and ML in educational framework with key algorithms.<br>• Focuses on current challenges | Intelligent education platform and AI/ML analytics |

**Comparative Analysis of Different ML algorithms:**

Artificial Intelligence enhances the creation of tailored educational paths for each student, ensuring that the learning framework is constantly adjusted to meet the varying needs and learning styles of every individual. The ability of AI to analyze large datasets, identify trends, and provide immediate feedback and adjustments is vital for its application in this area; in this segment, we will explore: student profiling, the creation of adaptable learning routes, and the systems for ongoing evaluation and feedback, along with a detailed examination of a mathematical model that clarifies the connection between these processes.

**Several applications include:**

- Maintaining and updating student profiles using AI.
- Generation of adaptive learning pathways.
- Mechanisms for continuous assessment and feedback.
- Personalized learning experiences.
- Rapid and intelligent content creation.
- Educational gamification.
- AI for writing assistance and language processing.
- AI driven intelligent tutoring system.
- Automated and effective grading and assessment

**Table 2: ML Algorithm comparison in Business and Management Education.**

| Algorithm | Key Details | Practical Application |
|---|---|---|
| Linear regression | It models the relationship between a dependent variable and one or more independent variables by fitting a linear equation to observed data. | Risk Management,Productivity forecasting |
| Logistic regression | Logistic regression is applied in scenarios involving binary classification issues. The likelihood of a binary result is determined using one or more predictor variables. | Fraud Detection |
| Support Vector Machines(SVM) | Support Vector Machines are robust algorithms employed for classification and regression tasks. They identify the optimal hyperplane that maximizes the separation between various classes. | Text classification, Image recognition |
| K-Nearest Neighbors | K-Nearest Neighbors is an uncomplicated, non-parametric algorithm utilized for both classification and regression tasks. It designates a class to a data point by considering the predominant class among its k-nearest neighbors. | Anamoly detection |
| Neural networks | Neural networks represent a collection of algorithms inspired by the human brain, utilized for classification and regression tasks. They are composed of layers of interconnected nodes (neurons) that analyze data and acquire knowledge from it. | Image recognition, Fraud detection |

## Result Analysis:

The comparative evaluation of machine learning algorithms in the context of business and management education reveals distinct strengths and limitations across different approaches. Each algorithm demonstrates unique capabilities in handling educational data, supporting adaptive learning, and enhancing decision-making processes.

**The analysis can be summarized as follows:**

- **Linear Regression:-**
  - **Strengths**: Simple, interpretable, and effective for trend analysis and forecasting.
  - **Limitations**: Limited in handling non-linear relationships and complex educational datasets.
  - **Result**: Best suited for productivity forecasting and risk management in business education modules.
- **Logistic Regression:-**
  - **Strengths**: Efficient for binary classification tasks such as pass/fail predictions or fraud detection.
  - **Limitations**: Restricted to categorical outcomes and less effective in multi-class scenarios.
  - **Result**: Valuable for assessment systems where binary outcomes are predominant.
- **Support Vector Machines (SVM):-**
  - **Strengths**: High accuracy in classification tasks, robust in handling high-dimensional data.
  - **Limitations**: Computationally intensive and less scalable for very large datasets.

- **Result**: Effective in text classification (e.g., analyzing student feedback) and image recognition tasks in educational gamification.

- **K-Nearest Neighbors (KNN):-**
- **Strengths**: Easy to implement, intuitive, and effective for anomaly detection.
- **Limitations**: Sensitive to noisy data and computationally expensive with large datasets.
- **Result**: Useful for detecting irregular student performance patterns and personalized learning pathways.

- **Neural Networks:-**
- **Strengths**: Highly flexible, capable of modeling complex non-linear relationships, and powerful in pattern recognition.
- **Limitations**: Requires large datasets, significant computational resources, and careful tuning to avoid overfitting.
- **Result**: Most effective for advanced applications such as intelligent tutoring systems, fraud detection, and adaptive content creation.

**Comparative Insights:-**

- Simpler algorithms (Linear and Logistic Regression) provide interpretability and ease of use, making them suitable for foundational applications in management education.
- Advanced algorithms (SVM, KNN, Neural Networks) offer greater adaptability and precision, but require more resources and expertise.
- Neural networks emerge as the most promising for long-term integration into Education 5.0 frameworks due to their scalability and ability to personalize learning experiences.
- A hybrid approach—combining regression models for forecasting with neural networks for adaptive learning—appears to be the most effective strategy for business and management education.

```
import matplotlib.pyplot as plt
import numpy as np

# Define ML algorithms
algorithms = [
    "Linear Regression",
    "Logistic Regression",
    "Decision Tree",
    "Random Forest",
    "SVM",
    "KNN",
    "Neural Network"
]

# Criteria for comparison (scale: 1 = low, 5 = high)
# Values are illustrative based on typical business use cases
accuracy = [3, 4, 4, 5, 5, 4, 5]
interpretability = [5, 4, 4, 3, 2, 3, 1]
training_time = [5, 4, 4, 3, 2, 3, 1] # Higher = faster
scalability = [4, 4, 3, 4, 3, 2, 5]

# Combine into a matrix
data = np.array([accuracy, interpretability, training_time, scalability])

# Radar chart setup
labels = ["Accuracy", "Interpretability", "Training Speed", "Scalability"]
num_vars = len(labels)
angles = np.linspace(0, 2 * np.pi, num_vars, endpoint=False).tolist()
angles += angles [:1] # Close the loop
# Plot each algorithm
plt.figure(figsize= (10, 8))
for i, algo in enumerate(algorithms):
    values = data [:i]. tolist ()
    values += values [:1] # Close the loop
plt.polar(angles, values, label=algo, alpha=0.25)
plt.polar(angles, values, alpha=0.7)
# Add labels
plt.xticks(angles [: -1], labels)
plt.yticks(range (1, 6), color="grey", size=8)
plt.ylim(0, 5)
plt.title("Comparison of ML Algorithms in Business & Management", size=15, y=1.1)
plt.legend(loc='upper right', bbox_to_anchor= (1.3, 1.1))
plt.show()
```

Here’s a clear tabular comparison of the machine learning algorithms based on the criteria defined:

**Comparison of ML Algorithms in Business & Management**

| Algorithm | Accuracy | Interpretability | Training Speed | Scalability |
|---|---|---|---|---|
| Linear Regression | 3 | 5 | 5 | 4 |
| Logistic Regression | 4 | 4 | 4 | 4 |
| Decision Tree | 4 | 4 | 4 | 3 |
| Random Forest | 5 | 3 | 3 | 4 |
| SVM | 5 | 2 | 2 | 3 |
| KNN | 4 | 3 | 3 | 2 |
| Neural Network | 5 | 1 | 1 | 5 |

**Figure 1: Comparison Table**

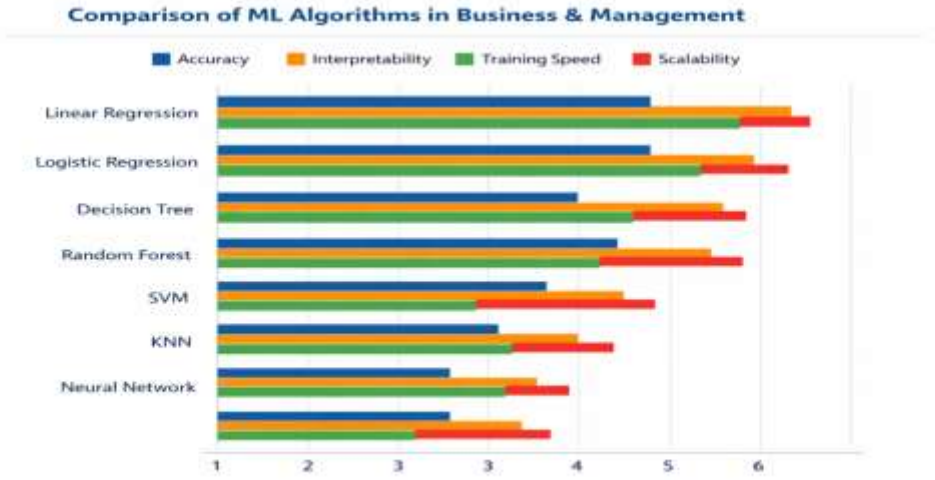


**Figure 2: Comparison Graph**

## Conclusion:-

The integration of AI within the education sector is set to enhance productivity and efficiency for both students and educators.Numerous AI-driven services can be incorporated into the educational framework. As discussed in this chapter, this integration will undoubtedly aid in addressing the challenges associated with establishing a sustainable educational environment. Education 5.0 will fully embed AI into its framework, rendering it significantly more efficient and appealing compared to traditional systems. This chapter explores the fundamental concept of an education system linked to AI.It is also intended to incorporate various AI/ML techniques within the educational framework, resulting in a more effective learning experience. The educational revolution and its ongoing research are certainly the focal points of this chapter, as the constructive integration of AI into the existing domain is further analyzed.

## References:-


1. Alp, D. (2024). “AI in Education: Benefits and concerns”. Next Generation Journal for the Young Researchers.vol.8.no.1.doi:10.62802/3fr4f412.
2. Dey, S. & Sahoo, B. B. (2025). AI Integration in Education 5.0: Design, Challenges, and Future Prospects. In F. Mobo (Ed.), Impacts of AI on Students and Teachers in Education 5.0 (pp. 77-92). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8191-5.ch003.
3. Dey, S. (2024). Phenomenon of Excess of Artificial Intelligence: Quantifying the Native AI, Its Leverages in 5G/6G and beyond. In S. Mehta & R. Kumar (Eds.), Radar and RF Front End System Designs for Wireless Systems (pp. 245-274). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-0916-2.ch010.
4. Dey, S. (2023), "Play Store App Analysis & Rating Prediction Using Classical ML Models & Artificial Neural Network," 7th International Conference on Computing, Communication, Control and Automation (ICCUBEA), Pune, India, 2023, pp. 1-5, doi: 10.1109/ICCUBEA58933.2023.10391960.
5. Dey, S., Panda, A. K., & Pati, C. (2023). “Unlocking the potential of machine learning and deep learning algorithms in recent communication: AI is the best revolutionary tool in the current era”. CPPPT, 23(2), 2794-2805.
6. Dey, S., Khampariya, P., & Jain, M. (2022). “Analysis of various AI based algorithms and learning perspective for 5G wireless networks”. IJME, vol., 7(5), 1234-124.
7. Dey, S., & Sahoo, B. B. (2014). Link Budget of LEO Satellite (Sky Bridge) For Communication Operated at Ku Band Frequency Range (12-14) GHz. International journal of innovations in engineering and technology (IJIET), 4(1).
8. Dey, S. (2025). From Ingestible to Edible: Quantifying and Analyzing Edible Electronics' Role in Environment Monitoring and Future Advancement. In S. Mehta & F. Al-Turjman (Eds.), Edible Electronics for Smart Technology Solutions (pp. 197-216). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-5573-2.ch008.
9. Dey, S. & Himanshu, K. (2025). Edible Electronics' Role in Healthcare: Application, Challenges, and Future Research. In S. Mehta & F. Al-Turjman (Eds.), Edible Electronics for Smart Technology Solutions (pp. 217-236). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-5573-2.ch009.
10. Dey S. Mohapatra D. Archana S. D. R. P. (2014). An approach to calculate the performance and link budget of leo satellite (iridium) for communication operated at frequency range (1650–1550) mhz.International Journal of Latest Trends in Engineering & Technology: IJLTET, 4(4), 96–103.
11. Dey S. (2014). Performance Analysis of LEO Satellite (Sky Bridge) For Mobile Terminal with Varying Implementation Margin. IJLTET, 4(2), 191–196.
12. Dey S. Moharana B. De U. C. Samant T. Behera T. M. Banerjee S. (2024), “Search Engine for QnA using Distributed Inverted Index System,” 3rd International Conference for Innovation in Technology (INOCON), Bangalore, India, 2024, pp. 1-4, 10.1109/INOCON60754.2024.10511792.
13. Dey, S., & Sahoo, B. B. (2014). “Link Budget of LEO Satellite (Sky Bridge) For Communication Operated at Ku Band Frequency Range (12-14) GHz”. International journal of innovations in engineering and technology (IJIET), 4(1).
14. Dey, S. (2021). Various Antenna Design Schemes in Recent MIMO Wireless System. International Journal of Future Generation Communication and Networking, 14(1), 1570-1585.
15. Dey S. Sahoo B. B. (2024). Machine learning and AI based human resource managementin KGI: An algorithm-based crossover.JEMIT, 02(02), 69–76. http://doi.org/10.61552/jemit.2024.02.003.
16. Dey, S. (2025). Phenomenon of AI-Driven Traffic Flow Prediction: Conceptualization, Utilization, and Research Perspective. In P. Bhambri & J. Anand (Eds.), Neural Networks and Graph Models for Traffic and Energy Systems (pp. 293-316). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-0290-4.ch011.
17. Dey, S. (2025). Analysis and Quantification of Different Security Issues in Deploying AI and Blockchain: Cybersecurity Perspective. In R. Kumar, S. Peng, P. Jain, & A. Elngar (Eds.), Deep Learning Innovations for Securing Critical Infrastructures (pp. 121-132). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-0563-9.ch008.
18. Dey, S. & Sahoo, B. B. (2025). Artificial Intelligence-Integrated Educational Revolution (AIIER): Current Trends, Key Algorithms, and Future Research Path. In E. Babulak (Ed.), Educational AI Humanoid Computing Devices for Cyber Nomads (pp. 99-116). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8985-0.ch005.
19. Gopalakrishna, Mohanty and Dey, Snehasis, Study and Modelling of Solar Energy and Solar Power Tower (April 14, 2022). Journal of Interdisciplinary Cycle Research, ISSN NO: 0022-1945, Volume XIV, Issue IV,

April/2022 Page No:360-365, Available at SSRN: https://ssrn.com/abstract=4388420 or http://dx.doi.org/10.2139/ssrn.4388420.
20. Hamdi, M. (2024). "How AI is Transforming and Shaping the Future of Education," 2024 IEEE 28th International Conference on Intelligent Engineering Systems (INES), Gammarth, Tunisia, pp. 000115-000116, doi: 10.1109/INES63318.2024.10629089.
21. Huo, X., & Siau, K. (2024). Generative Artificial Intelligence in Business Higher Education. Journal of Global Information Management, 32(1), 1–21. https://doi.org/10.4018/jgim.364093.
22. Xu, X. (2024). Navigating the AI Revolution: Implications for Business Education and Pedagogy. Journal of Curriculum and Teaching, 13(1), 371. https://doi.org/10.5430/jct.v13n1p371.
23. Janarthanam, V., & Rao, V. C. S. (2024). Implementation of hybrid artificial neural network and multi-criteria decision model for the ranking of criteria that affect productivity – a case study. South African Journal of Industrial Engineering, 35(1). https://doi.org/10.7166/35-1-2906.
24. Lampou, R. (2023). "The Integration of Artificial Intelligence in Education: Opportunities and Challenges". Review of Artificial Intelligence in Education, eissn:2965-4688,4,20. https://doi.org/10.5281/zenodo.8280959.
25. Nagtilak, S. A. (2024). ML Enhanced Workforce Management. Indian Scientific Journal of Research in Engineering and Management, 08(02), 1–13. https://doi.org/10.55041/ijsrem28674.
26. Solorzano, V., Faruk, R., Garzozi-Pincay, T., Garcia, M., Lainez-Villao, D., Alcivar-Ponce, J., Guandinango-Vinueza, Y., Amaya, V., & Neira-Quinteros, P. (2024). The Fourth Educational Revolution and the Impact of AI on Pedagogy. Evolutionary Studies in Imaginative Culture,4. https://doi.org/10.70082/esiculture.vi.1315.
27. Snehasis Dey, Reetu Sonali Vandana, Uma Vicky Patikrit. (2014) "Capacity calculation and performance analysis of different transmission structures in wireless communication", IJLTET, volume 4 Issue 4 - November 2014.
28. Sahoo B. B. Dey S. (2024). SVM and RF Based Performance Enhancement in Organization: A Study on KGI, Odisha and its Organizational Growth. Journal of Engineering Research and Reports, 26(6), 190–197. 10.9734/jerr/2024/v26i61173.