JOURNAL OF MULTIDIMENSIONAL RESEARCH & REVIEW

http://www.jmrr.org Volume: 6, Issue: 1, April 2025 | ISSN: 2708-9452

AI-Based IT Training System

Subalakshmi Priya C
Assistant Professor, Department of Computer Science and Applications
Vivekanandha College of Arts and Sciences for Women [Autonomous],Tiruchengode, Namakkal, Tamilnadu, India.
Iswariya D
MCA Student, Department of Computer Science and Applications
Vivekanandha College of Arts and Sciences for Women [Autonomous],Tiruchengode Namakkal, Tamilnadu, India.

Abstract

The proposed AI-Based IT Training System delivers personalized course recommendations for employees by analyzing their historical course interactions and ratings. The system utilizes neural network embeddings to represent both employees and courses, capturing latent patterns and preferences. Trained on historical rating data, the model predicts the relevance of unattempted courses for individual employees and ranks them accordingly to recommend the most suitable options. By leveraging deep learning, collaborative filtering, and educational data mining techniques, the system addresses the inefficiencies of traditional training systems and enhances workforce development. Its integration capabilities with Learning Management Systems (LMS) make it scalable, cost-effective, and adaptive to evolving organizational needs. This intelligent recommendation engine significantly reduces training overhead while aligning employee development with career trajectories and business objectives.

Keywords: Educational Data Mining (EDM), Knowledge Tracing, Course Recommendation System, Personalized Learning, Collaborative Filtering, Training System, Skill Development, Learning Management System (LMS), Employee Training, Data-Driven Learning, Adaptive Learning, Natural Language Processing (NLP), User Engagement, Predictive Analytics, Workforce Development, Recommendation Algorithm

1 Introduction

In the dynamic landscape of the IT industry, continuous learning is imperative for employees to remain competitive [1]. Traditional training models lack the flexibility to cater to individual learning needs, often resulting in disengagement and inefficiency[2]. The AI-Based IT Training System is developed to overcome these limitations by providing tailored course suggestions based on prior learning behaviors, preferences, and skill gaps. By embedding employees and courses in a shared feature space using neural networks, the system ensures highly personalized and relevant training paths[3].

In the context of Industry 4.0, IT professionals are expected to adapt swiftly to emerging technologies such as cloud computing, cybersecurity, artificial intelligence, and data analytics[4]. Organizations are increasingly investing in upskilling programs to ensure their workforce remains agile and competitive. However, generic and rigid training models often fail to meet the evolving needs of individual employees, leading to suboptimal learning outcomes and inefficient resource utilization. Personalized training systems that align with individual learning histories and preferences are essential to maximize employee potential and enhance organizational productivity[5].

Artificial Intelligence (AI) presents a transformative solution to this challenge by enabling intelligent, adaptive learning systems that analyze user data to generate tailored recommendations[6]. The proposed AI-Based IT Training System applies neural network embeddings to encode complex relationships between users and courses, allowing for fine-grained personalization at scale. By predicting course relevance based on prior ratings and behaviors, the system supports data-informed decision-making in employee training[7]. This not only fosters targeted skill development but also aligns employee learning pathways with the strategic goals of the organization.

2 Literature Review

This section synthesizes key findings from recent studies in personalized learning, recommendation systems, and educational data analytics. Researcher [8]demonstrates how adaptive learning technologies boost engagement. Ontology-based and deep learning-based recommendation systems [9]highlight the effectiveness of AI in course selection. Studies in educational data mining [10] and social learning analytics[11] provide foundational methods for understanding learner behaviors. Recent developments in adaptive learning architectures[12] emphasize the importance of modular, AI-integrated platforms for scalable education solutions.

3 System Design and Methodology

The AI-Based IT Training System is designed with a modular architecture that enables seamless data flow from raw input to actionable course recommendations. The system utilizes neural network-based collaborative filtering techniques, implemented using Python libraries such as TensorFlow and Keras. The entire process is divided into five major phases: data loading and preprocessing, feature extraction, model training and testing, evaluation, and recommendation generation[13].

3.1 Data Loading and Preprocessing

In the initial phase, the system ingests a structured dataset typically stored in formats such as CSV or SQL databases. This dataset includes key attributes: EmployeeID, CourseID, Rating, and optionally CourseTitle or Department. Preprocessing involves cleaning the data by removing null entries, duplicates, and outliers that could skew the model. Categorical variables like employee names and course titles are encoded into numerical representations using label encoding or one-hot encoding. Additionally, the dataset is split into training and testing subsets to facilitate model validation[14].

3.2 Feature Extraction

The core of the system's intelligence lies in the transformation of categorical identifiers into dense numerical vectors using embedding layers. Each EmployeeID and CourseID is mapped to an embedding vector in a latent feature space that captures hidden relationships and preferences[15]. These embeddings allow the model to represent users and courses in a form suitable for neural network processing. The embeddings are trained alongside the network and are refined to reflect nuanced patterns of interaction between users and learning content.

3.3 Model Training and Testing

The neural recommendation model is constructed using a deep learning framework such as TensorFlow/Keras. It consists of parallel embedding layers for employees and courses, followed by a concatenation layer that merges the embeddings. Dense hidden layers are added to model nonlinear interactions, followed by a final output layer that predicts the expected course rating for a given employee-course pair. The model is trained using backpropagation and gradient descent on the training set, minimizing the Mean Squared Error (MSE) between actual and predicted ratings. Dropout and regularization techniques are employed to avoid overfitting.

3.4 Evaluation

To assess the model's effectiveness, performance metrics such as Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and prediction accuracy are computed on the test set. These metrics quantify how closely the model's predictions align with real employee ratings. A lower RMSE value indicates a more reliable recommendation engine. Additionally, K-fold cross-validation is optionally used to ensure the model generalizes well to unseen data.

3.5 Recommendation Generation

Once the model is trained and validated, it is used to predict ratings for all unattempted courses for each employee. These predicted ratings are ranked, and the top N courses are selected as recommendations. The output includes course IDs, names, and predicted scores. Recommendations are presented through a user-friendly dashboard or exported for LMS integration. The model architecture allows for continuous learningnew interaction data can be periodically added, retraining the system to enhance recommendation accuracy over time.

This comprehensive system design ensures that the recommendation engine remains adaptive, scalable, and efficient in supporting employee skill development aligned with organizational goals.

4 Results and Output

The output of the AI-Based IT Training System is designed to be both personalized and actionable, ensuring that employees receive the most relevant training suggestions based on their historical learning behaviors. After processing the employee-course interaction data and training the recommendation model, the system generates a ranked list of courses tailored to each individual. This list includes key information such as the Course ID, Course Title, and the Predicted Rating Score, which represents the estimated suitability or relevance of the course for the given employee.

The recommendation output is generated dynamically by the neural network model, which evaluates all unattempted courses and assigns a predicted rating to each. These predicted ratings are then sorted in descending order, ensuring that the most relevant courses those with the highest expected impact or interest appear at the top. This ranking mechanism allows employees to easily identify which courses are most aligned with their skill development needs and career growth goals.

To enhance usability and accessibility, the output is presented through multiple channels. A web-based dashboard interface allows employees to log in securely and view their personalized training recommendations in real time. Each recommendation entry includes metadata such as course duration, prerequisites, and a link to enroll or preview the content. For organizational reporting and integration purposes, the results can also be exported in formats like PDF or Excel, enabling HR teams to monitor training alignment and participation trends. Furthermore, the system can be seamlessly integrated with existing Learning Management Systems (LMS) via API, allowing automatic synchronization of recommendations with internal training portals.

This intelligent and user-centric recommendation output minimizes the effort required by employees to find suitable courses and eliminates guesswork in the training process. It increases employee engagement, ensures efficient skill acquisition, and supports data-driven workforce planning. The system's feedback loop also allows for continuous improvement, as future recommendations are adjusted based on actual employee interactions and outcomes, thereby making the system more accurate and responsive over time.

5 Conclusion

The AI-Based IT Training System presents an effective solution to the limitations of traditional training models by offering personalized, data-driven course recommendations for employees. By utilizing neural network embeddings and analyzing historical course interaction data, the system accurately predicts course relevance and aligns training paths with individual skill development needs. This personalized approach not only improves employee engagement and learning outcomes but also streamlines the training process, reducing time and resource inefficiencies for organizations. The system's scalability, integration capability with existing LMS platforms, and adaptive learning mechanisms make it a practical and robust tool for modern workforce development. As the system continues to learn from user interactions, its recommendation accuracy improves, ensuring that

employees receive up-to-date and relevant training suggestions. Future enhancements, such as incorporating natural language processing for deeper course content analysis and expanding multilingual support, will further extend the system's applicability and impact across diverse professional environments.

References

[1] G. J. Hwang, and C. C. Tsai, "Research Trends in Mobile and Ubiquitous Learning," Educational Technology & Society, vol. 17, no. 2, pp. 4–22, 2020.

[2] L. Zhang, and X. Zhai, "The Role of AI in Personalized Learning," IEEE Transactions on Learning Technologies, vol. 13, no. 1, pp. 88–99, 2020.

[3] Nur W. Rahayu, A. Farida, and D. Setyohadi, "A Systematic Review of Ontology-Based Course Recommendation Systems," in Proceedings of the 5th International Conference on Informatics and Computing (ICIC), 2020.

[4] S. Alia, J. M. Herrera, and M. M. Alotaibi, "Virtual Agent-Based Recommendation System for Personalized Learning," Education and Information Technologies, vol. 26, pp. 3687–3707, 2021.

[5] G. Abdelrahman, D. Nye, and S. Saito, "Deep Learning-Based Knowledge Tracing Models: A Review," IEEE Transactions on Learning Technologies, vol. 15, no. 1, pp. 14–26, 2022.

[6] S. Keskin, and O. Dönmez, "Analyzing Student Interactions in E-Learning Systems Using Log Data," Journal of Learning Analytics, vol. 7, no. 3, pp. 58–74, 2020.

[7] R. Huang, J. M. Spector, and J. Yang, Educational Data Mining and Learning Analytics in Higher Education, Springer, 2019.

[8] E. Araka, E. Maina, R. Gitonga, and R. Oboko, "Analysis of Educational Data Mining Techniques for Predicting Student Performance," International Journal of Educational Technology, vol. 11, no. 4, pp. 95–110, 2020.

[9] K. Cela, M.-Á. Sicilia, and S. Sánchez, "Social Network Analysis in E-Learning Environments: A Literature Review," Journal of Educational Technology, vol. 46, no. 3, pp. 252–271, 2015.

[10] M. Chang, "AI-Driven Adaptive Learning Systems for Vocational Education: Enhancing Personalized Skill Development," International Journal of Sustainable Development in Computing Science, vol. 3, no. 2, 2022.

[11] Anand Tilagul, R. Firdouse, R. Sirisha, M. Swathi, and T. Gowda, "AI-Based IT Training System," International Journal of Advanced Research in Computer Science and Technology, vol. 11, no. 1, 2023.

[12] A. J. Saindane, A. Khot, R. Hegade, R. Datar, and S. Ghorwade, "Artificial Intelligence Based IT System," International Journal of Advanced Research in Computer Science and Communication Engineering, vol. 13, no. 4, 2024.

[13] S. Zheng, "Design and Implementation of Continuing Education Online Training System Based on Artificial Intelligence Algorithm," Mobile Information Systems, 2022.

[14] IEEE, "Integrating Artificial Intelligence in Improving Educational System: The Mediating Role of Smart Learning," in Proceedings of the IEEE Conference, 2024.

[15] IEEE, "Integration of Artificial Intelligence for Educational Excellence and Innovation in Higher Education Institutions," in Proceedings of the IEEE Conference, 2024.

Cite this article:

Subalakshmi Priya C & Iswariya D, "AI-Based IT Training System", Journal of Multidimensional Research and Review (JMRR), Vol.6, Iss.2, pp.75-80, 2025