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Research Paper on Recommendation Systems Using Machine Learning

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National Conference on Recent Innovation in Software and Computer (NCRISC-2025) ACEIT, Jaipur .Table of ContentsIntroductionLiterature ReviewResearch Gaps & Objectives Research MethodologyExperimental ResultsIOT And Big Data Analytics Use Cases in Real LifeChallenges and LimitationsConclusion & Future Recommendation***

Table of contents can be modified as per author requirements.

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .IntroductionRecommendation systems are designed to address the information overload problem by filtering and presenting a subset of items from a large pool of choices. They utilize data and algorithms to predict what items a user may be interested in.A recommendation system is a machine learning application that offers personalized suggestions to users, helping them discover relevant products, content, or items based on their preferences and behavior. These systems are widely used in e-commerce, streaming services, and more, enhancing user experiences and driving engagement by filtering and presenting choices from a vast pool of options.

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Literature Review.Collaborative Filtering: Uses user-item interaction data; effective but suffers from sparsity and cold-start issues.Content-Based Filtering: Recommends items based on item features; good for new users but lacks diversity.Hybrid Models: Combine CF and CBF to improve accuracy and handle limitations of individual methods.Deep Learning: Techniques like Neural Collaborative Filtering, RNNs, and Autoencoders enhance personalization.Challenges: Key issues include data sparsity, scalability, explainability, and user privacy

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Research Gaps & ObjectivesResearch Gaps (Small Points)Cold-start and sparse data problems.Lack of explainability in model outputs.Poor scalability for large datasets.Biased and unfair recommendations.Research Objectives (Small Points)Handle cold-start and sparse data effectively.Improve model explainability and transparency.Develop scalable, real-time recommendation systems..

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Research MethodologyResearch Methodology (Small Points)Data Collection – Gather user-item interaction data from public datasets (e.g., MovieLens, Amazon, etc.).Data Preprocessing – Clean and prepare data by handling missing values, normalization, and encoding.Model Development – Build and train ML models (e.g., collaborative filtering, neural networks, hybrid models)..

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Experimental ResultsExperimental Results (Small Points)Model Accuracy – Neural Collaborative Filtering achieved higher accuracy compared to traditional CF (e.g., 10% improvement in Precision).Cold-Start Handling – Hybrid models showed better performance for new users and items than standalone models.Evaluation Metrics – RMSE and MAE were lower in deep learning models, indicating better prediction quality.Scalability – Lightweight models scaled better with larger datasets, while deep models required more computation..

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Recommendation systems Use Cases in Real LifeReal-Life Use Cases (Small Points)E-commerce – Amazon recommends products based on user browsing and purchase history.Streaming Services – Netflix and Spotify suggest movies or songs based on viewing/listening patterns.Social Media – Facebook and Instagram recommend friends, pages, and posts based on user behavior.Online Education – Platforms like Coursera suggest courses based on user interests and progress.Healthcare – Recommender systems suggest personalized treatment plans or health tips based on patient data..

National Conference on Recent Innovation in Software and Computer (NCRISC-2025)ACEIT, Jaipur .Challenges and LimitationsChallenges and Limitations of Recommendation SystemsCold-Start Problem – Difficult to recommend items to new users or for new products with little data.Data

Sparsity – Many users interact with only a few items, making it hard to find patterns. Scalability – Managing large-scale user and item data can be computationally expensive. Lack of Diversity – Recommenders may repeatedly suggest similar items, reducing content variety. Bias and Fairness Issues – Recommendations may favor popular items or certain user groups unfairly..

National Conference on Recent Innovation in Software and Computer (NCRISC-2025) ACEIT, Jaipur . Conclusion & Future Recommendation Conclusion – Machine learning has greatly improved the accuracy and personalization of recommendation systems across various industries. Future Scope: Use of ML models for predictive analytics. Real-world deployment with edge computing. Enhancing security and privacy in data handling..

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