

# Movie Recommendation System Using Machine Learning (KNN Algorithm)

Title:

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## 1. INTRODUCTION

### 1.1 Background

Recommendation systems have become integral to digital platforms, especially in the entertainment industry. Platforms like Netflix, Amazon Prime, and Hotstar rely on these systems to suggest personalized content to users. The main goal is to enhance user experience by helping users discover movies they are likely to enjoy. Traditionally, recommendation systems used collaborative or content-based filtering. However, these systems have limitations when it comes to sparse data or scalability.

### 1.2 Motivation

With the explosion of digital content, users are often overwhelmed with choices. This leads to decision fatigue and underutilization of available content. A machine learning-based recommendation system that uses the K-Nearest Neighbors (KNN) algorithm can provide intelligent, data-driven suggestions that address this issue. KNN is simple yet powerful for handling classification and regression tasks, and is well-suited for recommendation engines based on user similarity.

### 1.3 Scope of the Project

This project will focus on building a movie recommendation system using the KNN algorithm. It will include steps like data preprocessing, similarity measurement, and generating recommendations. The scope is limited to offline recommendation generation using static datasets and does not include dynamic real-time recommendations or user authentication systems.

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## 2. PROBLEM STATEMENT

### 2.1 Problem Definition

The main problem is the difficulty users face in finding relevant movies amidst a vast collection. Existing systems may not always deliver accurate or personalized recommendations due to lack of effective filtering techniques or limitations in algorithm performance.

### 2.2 Challenges

- Dealing with sparse user rating data
- Selecting optimal similarity measures
- Scalability as the dataset grows
- Cold start problem for new users or movies

### 2.3 Need for a Solution

There is a clear need for efficient and user-centric recommendation systems. Machine learning offers tools like KNN that can analyze user behavior and similarities to provide tailored movie suggestions, enhancing the overall user experience.

## 3. OBJECTIVES

### 3.1 Primary Objectives

- To build a recommendation system using the KNN algorithm.
- To recommend top-N movies to users based on their preferences.
- To evaluate the system's performance using appropriate metrics.

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## 3.2 Secondary Objectives

- To analyze and preprocess movie rating datasets.
- To visualize user-item relationships for better understanding.
- To explore improvements in KNN for scalability.

## 4. SYSTEM DESIGN

### 4.1 System Architecture

The system will follow a modular architecture including:

- Data Collection Module
- Data Preprocessing Module
- Similarity Computation Module
- Recommendation Generation Module
- Evaluation Module

### 4.2 Workflow

1. Import movie ratings dataset.
2. Clean and preprocess data (e.g., handle missing values).
3. Compute user similarity matrix using KNN.
4. Predict ratings or preferences for unseen movies.
5. Recommend top-N movies to each user.
6. Evaluate using metrics like precision, recall, and RMSE.

### 4.3 Model Selection

## **Movie Recommendation System Using Machine Learning (KNN Algorithm)**

The KNN algorithm is chosen due to its simplicity and efficiency in computing user-user or item-item similarities. It does not require model training, which makes it faster to implement for medium-sized datasets.

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