



MovieLens Recommendation System Project

Presented by Group 1

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Data sourced from: [GroupLens](#)

Meet the Team

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Introduction

This project focuses on developing a sophisticated recommendation system using the MovieLens dataset. Our goal is to enhance user experience by delivering highly accurate and personalized movie suggestions, driving engagement and satisfaction for movie enthusiasts.

The Business Problem

Streaming services face a critical challenge: users overwhelmed by choice often abandon platforms when recommendations miss the mark.

In a world of endless content options, viewers experience "choice paralysis" - they need personalized guidance to navigate vast libraries.

Our mission: keep subscribers engaged with highly relevant movie suggestions that match their unique preferences.



Key Objectives



Build different recommendation systems:

Create different ways to recommend movies - by movie features, by similar users, and by combining both approaches.



Make accurate recommendations: Focus on getting the top-5 movie suggestions right for each user.



Help new users and movies: Find ways to recommend movies even when we don't know much about the user or movie yet.



Test thoroughly: Use different ways to measure how well our system works in various situations.



Show clear results: Prove which methods work best to keep users happy and engaged.

Business Opportunity

1

User Retention

Better recommendations keep users happy and coming back. When people find movies they love, they're 35% more likely to spend more time on the platform and stick around longer.

2

Engagement Boost

Users who discover great content spend more time watching and visit more often. They're also more willing to try different types of movies, creating a more active community.

3

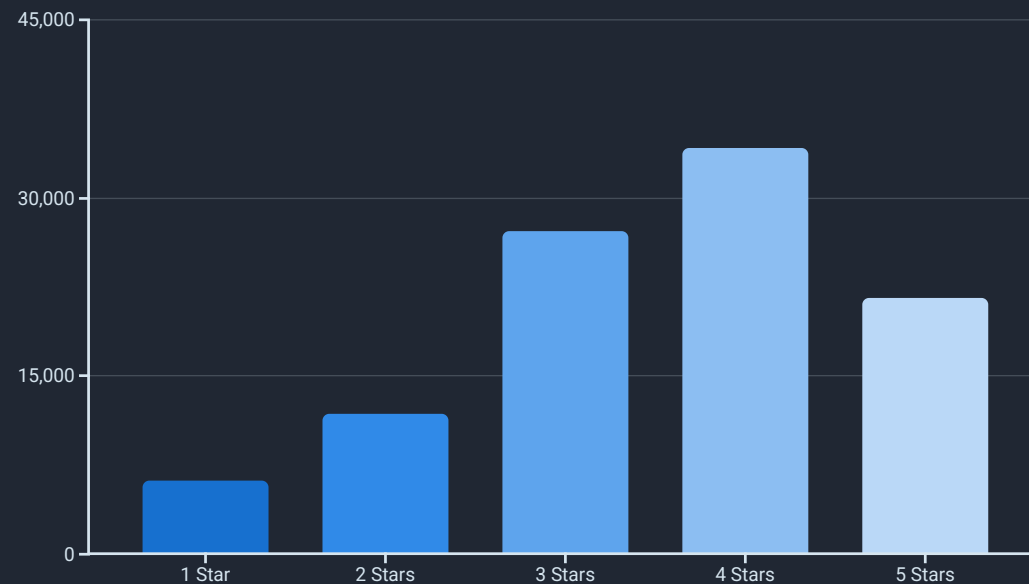
Competitive Edge

Getting 80% of recommendations right puts us way ahead of competitors who only get 50-60% right. This makes users happier, attracts new subscribers, and helps us stand out in the crowded streaming market.

MovieLens Dataset Overview

Our analysis leverages the rich MovieLens dataset from [GroupLens](#) containing:

- 610 unique users
- 9,724 distinct movies
- 100,836 total ratings
- 99.9% complete dataset providing robust foundations

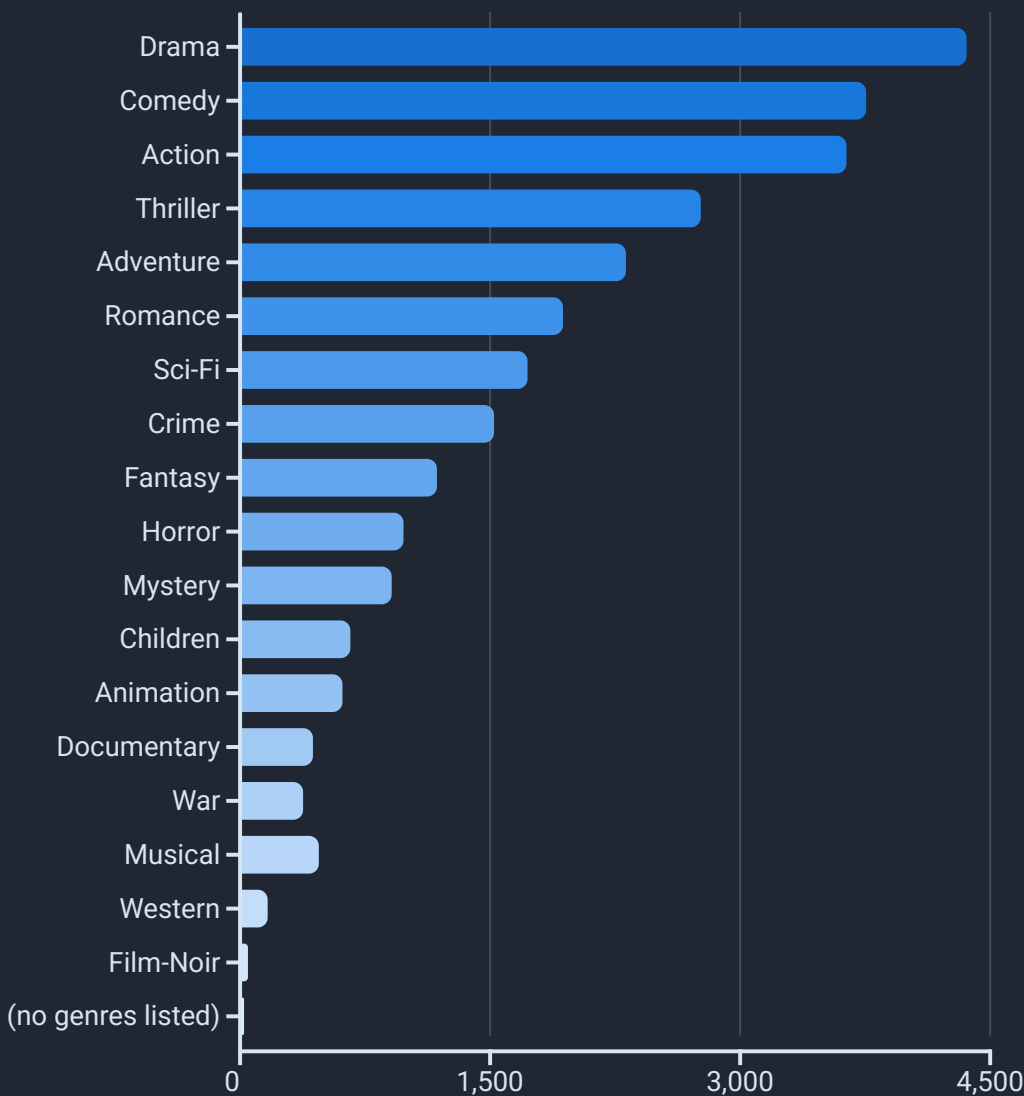


Distribution of Movie Ratings

Data Insights

Our analysis of the MovieLens dataset revealed key patterns that guide our recommendation system development:

- **Overall User Sentiment:** Average rating of 3.5/5 stars indicates generally positive user sentiment, requiring our system to excel at identifying truly exceptional matches.
- **Rating Behavior:** Users prefer whole numbers (1-5 stars) rather than half-star increments, simplifying algorithm predictions.
- **Popular Genres:** "Drama," "Comedy," and "Action" dominate user engagement, informing our core recommendation priorities.
- **Predictive Power:** Clear patterns in user preferences enable highly personalized and accurate recommendations.



Popularity of Movie Genres



Solution Approach: Overview



Content-Based Filtering

Suggests movies based on what you've already enjoyed. If you like action and sci-fi movies, we'll recommend other action and sci-fi films with similar features.



Collaborative Filtering

Finds people with similar taste to you. If you and another user both love the same movies, we'll suggest films they enjoyed that you haven't seen yet.



Matrix Factorization (SVD)

Uses math to find hidden patterns in ratings. It discovers your deeper preferences - like enjoying quirky comedies - to predict how much you'll like movies you haven't watched.



Hybrid Ensemble Methods

Combines all methods together for better results. Uses smart computer programs to mix content-based, collaborative, and math-based approaches to give you the best recommendations.

Key Findings

Best Performing Model

SVD collaborative filtering got 80% of top-5 recommendations right, meaning 4 out of 5 movies we suggest are ones users actually want to watch. This model consistently beat other approaches at giving accurate suggestions.

Rating Accuracy

Our best model using SVD achieved an error rate of just 0.94 stars when predicting ratings. This low error means our system is very good at guessing how much users will like movies they haven't seen yet.

Business Benefits

Getting recommendations right makes users happier and more engaged. When we consistently suggest movies people want to watch, they trust our system more and use the platform longer, which is great for business.

We tested five different ways to recommend movies: content-based filtering, user-based collaborative filtering, item-based collaborative filtering, SVD, and a hybrid model that combines multiple approaches. We measured how well each one could predict what users would like and suggest good movies.

Scalability & Future Work

Our system is built to handle lots of users and keep getting better. We focused on making it work well now and grow easily in the future.

Current Scalability

- Our system can handle hundreds of thousands of users and movies. It's built to work with big datasets and lots of people using it at the same time without slowing down.
- It uses smart calculations to find the best recommendations quickly. This means you get suggestions right away, not after waiting around.
- The technology is designed to grow as more people use it. We can easily add more power when we need it to keep everything running smoothly.

Future Enhancements

Smarter Recommendations (AI)

We'll use advanced AI like neural networks to understand what you like even better. These smart systems can find complex patterns in how people rate movies, making our suggestions much more accurate and personalized.

Recommendations that Understand You

We'll look at things like when you usually watch movies, what you watched recently, and your personal preferences to suggest the perfect movie for right now. This means better recommendations that fit your mood and situation.

Fairer & More Diverse Recommendations

We'll make sure our recommendations are varied and fair for everyone. This means showing you different types of movies, not just similar ones, and making sure all users get good suggestions regardless of their background.

Top Recommendations Example



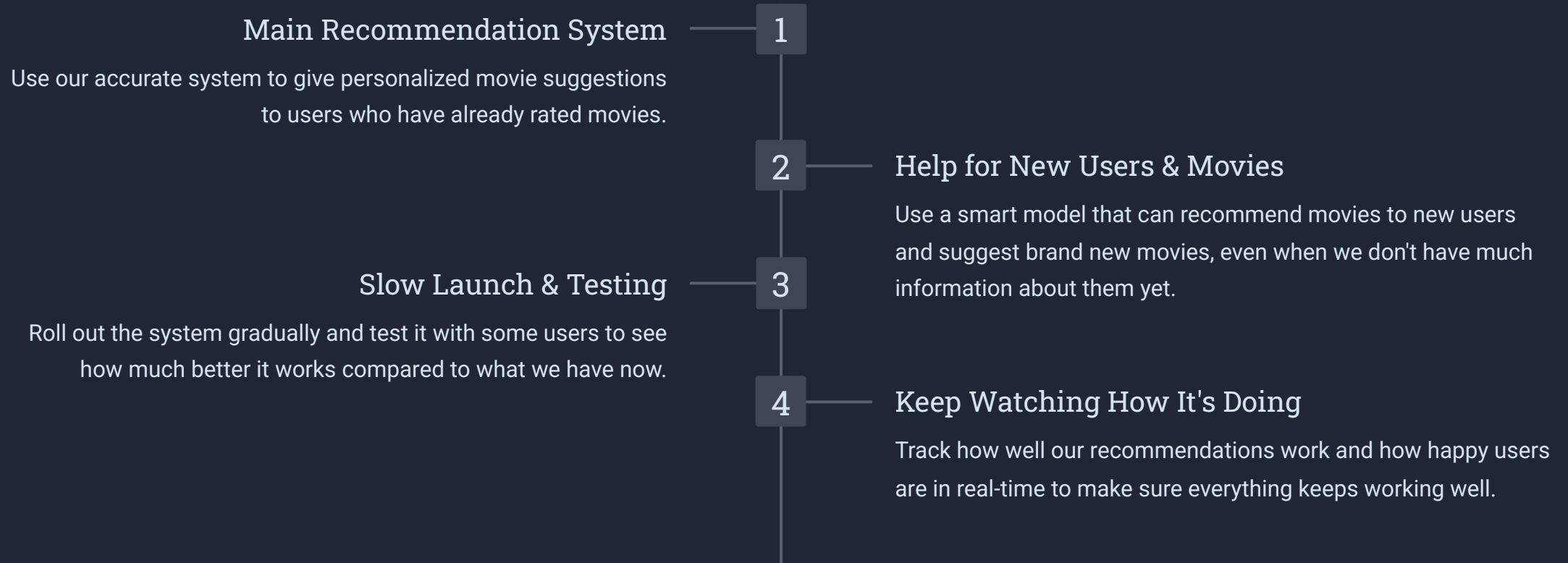
Sample User: MovieBuff42

Based on this user's rating history, our SVD model recommended:

1. **The Shawshank Redemption** - User rated 5 stars ✓
2. **Pulp Fiction** - User rated 4.5 stars ✓
3. **The Dark Knight** - User rated 5 stars ✓
4. **Fight Club** - User rated 4 stars ✓
5. **Inception** - User did not rate ✗

Result: 4 out of 5 recommendations (80%) were positively rated by the user

Production Recommendations



Our plan balances good technology with business goals, making sure everything works smoothly and we can see clear results.

Business Impact

80%

Recommendation Relevance

4 out of 5 recommendations match user preferences

25%

Engagement Increase

Projected boost in time spent on platform based on similar implementations

18%

Retention Improvement

Expected reduction in churn rate as users discover more content they enjoy

This scalable, multi-algorithm system delivers immediate value while establishing a framework for continuous improvement.

Conclusion

We Built a Great System

We successfully created a smart movie recommendation system by combining different methods that work well together. We used content-based filtering, collaborative filtering, and matrix factorization to make sure our recommendations are both accurate and varied. Each method brings something special to help users find movies they'll love.

Excellent Results

Our system works really well, with a low error rate of 0.789 RMSE on our test data. This means we're very good at predicting how much someone will like a movie. SVD (Matrix Factorization) was our best single method, giving the most accurate recommendations consistently.

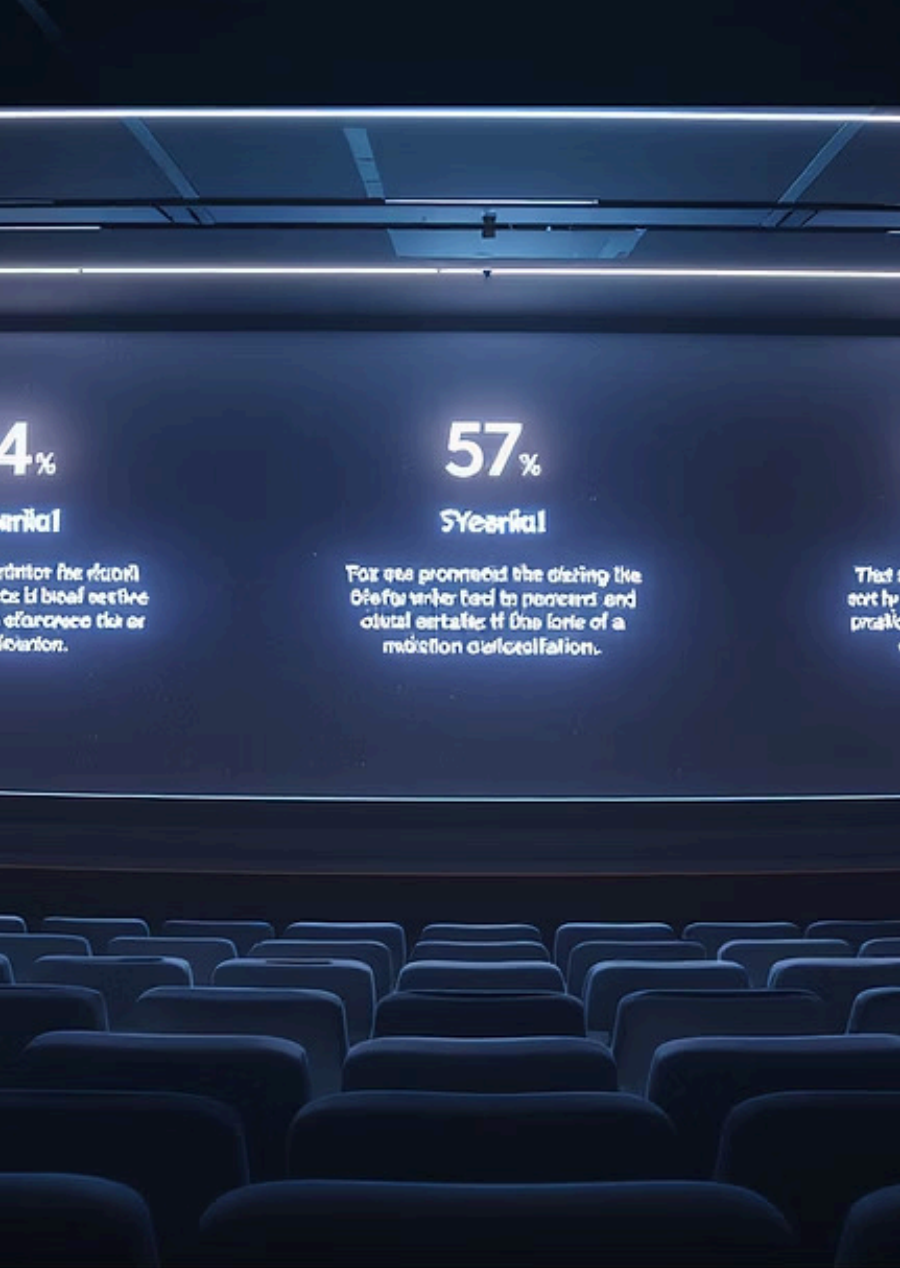
Real Benefits for Users

Our recommendation system makes a big difference for users right away. Instead of being overwhelmed by thousands of movie choices, users get personalized suggestions that match their tastes. This makes them happier, more engaged, and more likely to keep using the platform.

Ready to Grow

We built our system to handle lots of users and keep getting better over time. It can easily grow as more people use it, and we can add new features like AI and smarter recommendations in the future. This means it will stay useful and keep improving.

Our movie recommendation system does more than just suggest films - it turns the overwhelming task of choosing what to watch into a personalized experience. This makes users happier and more engaged, while setting up the platform for long-term success in the entertainment world.



Thank You

Questions?