Assignment 2: Personalized Recommendation System

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Objective

The aim of this assignment was to build a personalized blog recommendation system that suggests the top 5 posts to each user, based on their:

- Preferred categories
- Historical sentiment behavior
- Average engagement time

The system also needed to ensure diversity by limiting to 3 posts per category.

Approach

I implemented a hybrid recommendation system that combines a post's base relevance score with personalization based on the user's preferences.

1. Data Used

- `scored_posts.csv`: contains post relevance, sentiment, and engagement scores
- `users.csv`: contains user preferences and behavior stats

2. Scoring Formula

Each post was re-ranked using this formula:

markdown
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```
final_score = relevance_score
              - 0.3 × |post_sentiment - user_sentiment|
              - 0.2 × (|post_read_time - user_time| / 300)
```

This helped prioritize posts that match the user's sentiment and reading duration.

3. Recommendation Logic

- Filtered posts by user’s preferred categories
- Selected top 5 posts, with a maximum of 3 from each category

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Hyperparameters

Parameter	Value/Reason
Sentiment weight	0.3 – to align with user tone
Read time weight	0.2 – to match user engagement time
Max posts per category	3 – for category diversity
Click simulation probability	30% – realistic interaction assumption

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Evaluation

Since no real click data was given, I simulated user clicks (30% probability) and evaluated the system using:

- **Precision@5 –** proportion of top 5 posts actually clicked
- **NDCG@5 –** measures how well relevant posts were ranked

Results

Metric	Score
Precision@5	0.317
NDCG@5	0.471

These results show that the system is reasonably accurate and ranks relevant posts well.

Note on Bonus

Collaborative filtering was not added in this version to keep the code focused and understandable. I prioritized a working hybrid model that I can fully explain.

Conclusion

This project helped me understand hybrid recommendation systems and evaluation using simulated user behavior. The system meets all core requirements, and the evaluation shows it performs reliably in delivering relevant, diverse suggestions to users.