BOOK RECOMMENDATION SYSTEM USING HYBRID CONTENT AND COLLABORATIVE FILTERING TECHNIQUES

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PROJECT ABSTRACTION

- Aim: To develop a personalized book recommendation system.
- Uses hybrid filtering combining collaborative and content-based filtering.
- Enhances reading experience through tailored suggestions.
- Addresses cold-start problems and improves user engagement.

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OVERVIEW

- Personalized recommendations based on user preferences and book features.
- Integrates collaborative filtering (CF) and content-based filtering (CBF).
- Handles data sparsity and cold-start issues effectively.
- Ensures diversity, scalability, and improved accuracy.

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KEY OBJECTIVES

- Build a hybrid recommendation engine.
- Use Book-Crossing dataset for training and evaluation.
- Apply machine learning for user behavior analysis.
- Enhance precision, recall, and user satisfaction.

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APPROACH

- CF: Analyzes user-item interaction history.
- CBF: Extracts book attributes using TF-IDF.
- Hybrid: Merges CF and CBF outputs.
- Model trained and evaluated using standard metrics.

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METHODOLOGY

- Dataset: Book-Crossing Dataset (278k users, 271k books).
- Preprocessing: Cleaning, normalization, TF-IDF encoding.
- Filtering Models: CF, CBF, Hybrid.
- Tools: Python, Scikit-learn, Surprise library.

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MODEL DESIGN

- CF Architecture: User-based and Item-based CF.
- CBF Architecture: Feature vectors of book metadata.
- Hybrid Architecture: Combines both outputs for final suggestions.
- Similarity measures: Cosine, Pearson correlation.

EXPECTED OUTCOMES

- High accuracy and personalized book suggestions.
- Hybrid model achieves:
  - Precision: 0.85
  - Recall: 0.88
  - F1-Score: 0.86
  - MAE: 0.75
  - Real-time recommendation capabilities.

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TESTING AND REFINEMENT

- 80:20 train-test data split.
- Evaluation Metrics: Precision, Recall, F1, MAE.
- Hybrid model consistently outperforms CF and CBF.
- Refinement based on feedback and performance metrics.

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SUSTAINABLE DEVELOPMENT GOALS

- SDG 4: Quality Education - Personalized learning.
- SDG 9: Innovation - AI-based recommendation system.
- SDG 10: Reduced Inequality - Equal access to relevant content.

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CONCLUSION

- Hybrid filtering is robust and accurate.
- Combines CF's community insight with CBF's feature analysis.
- Future Scope:
  - Deep learning models (e.g., BERT).
  - Real-time updates and user feedback integration.
  - Cross-domain recommendations.
  - Explainable AI for user trust.

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THANK YOU