Personalization in the era of Artificial Intelligence

Recommender Systems

FOReSiGHT

Introduction

- Definition: What is a recommender system?
- Importance: Why are recommender systems crucial in today's digital age?
- Examples: Netflix movie recommendations, Amazon product suggestions, Spotify music playlists.

Types of Recommender Systems

- Collaborative Filtering
  - User-based: Recommendations based on similar users' preferences.
  - Item-based: Recommendations based on items similar to what the user likes.
- Content-Based Filtering
  - Description: Recommendations based on item attributes and user preferences.
  - Example: Recommending movies based on genres, actors, or directors.
- Hybrid Systems
  - Combining collaborative and content-based filtering for more accurate recommendations.
- Knowledge-Based Systems
  - When user-item interactions are sparse, these systems provide personalized recommendations by leveraging explicit knowledge about users and items.

Techniques and Algorithms

- Matrix Factorization
  - Concepts: Singular Value Decomposition (SVD), Principal Component Analysis (PCA).
  - Use case: Netflix Prize Challenge.
- Neural Networks & Deep Learning
  - Deep learning models for recommendation.
  - Example: Autoencoders for collaborative filtering.
- Association Rule Mining
  - Concepts: Apriori and Eclat algorithms.
  - Use case: Market basket analysis.

Evaluation Metrics

- Accuracy Metrics
  - Mean Absolute Error (MAE), Root Mean Square Error (RMSE).
- Ranking Metrics
  - Precision@K, Recall@K, F1-score, Normalized Discounted Cumulative Gain (NDCG).
- Diversity, Novelty, and Coverage Metrics
  - Ensuring a diverse set of recommendations.

Challenges in Recommender Systems

- Cold Start Problem:
  - New users or items with no interaction history.
  - Solutions: Hybrid systems, knowledge-based recommendations.
- Scalability:
  - Handling large datasets with millions of users and items.
  - Solution: Distributed computing, sampling techniques.
- Diversity vs. Accuracy
  - Striking a balance between recommending popular items and diverse, novel items.

Ethical Concerns

Filter Bubbles

Users getting trapped in a loop of similar recommendations, limiting exposure to diverse content.

Privacy Concerns

Handling user data responsibly.

GDPR and other data protection regulations.

Bias and Fairness

Ensuring recommendations don't perpetuate existing biases.

Future of Recommender Systems

- Integration with Augmented Reality (AR) and Virtual Reality (VR)
  - Personalized virtual shopping experiences.
- Reinforcement Learning in Recommendations
  - Systems that learn and adapt over time based on user feedback.
- Cross-domain Recommender Systems
  - Integrating recommendations across different platforms and services.

Conclusion

- Recap of the importance and applications of recommender systems.
- Encouraging continuous learning and adaptation in the field.

Q&A Session

- Open the floor for questions and discussions.