Next-Click Prediction System for Fashion Campus

Enhancing Product Recommendations, Through Sequential Modeling

Problem Statement & Objectives

Problem:

- Users frequently leave without completing purchases due to lack of personalized recommendations.

Objectives:

- Understand user navigation behavior.
- Predict the next-clicked product using user sessions.
- Compare Markov chains and GRU (Gated Recurrent Unit) in recommendation accuracy.
- Visualize user journey and product relationships.

Data Used & Feature Engineering

Datasets:

- Clickstream: 12.8M records (100K sampled records for efficiency)
- Customer: 100K
- Product Metadata: 44K
- Transactions: 850K

Key Features Extracted:

- Product sequences by session.
- Time-based features: hour, weekday, time since last click.
- Click counts, session metrics.
- Embedding-based product similarities.

Methodology & System Architecture

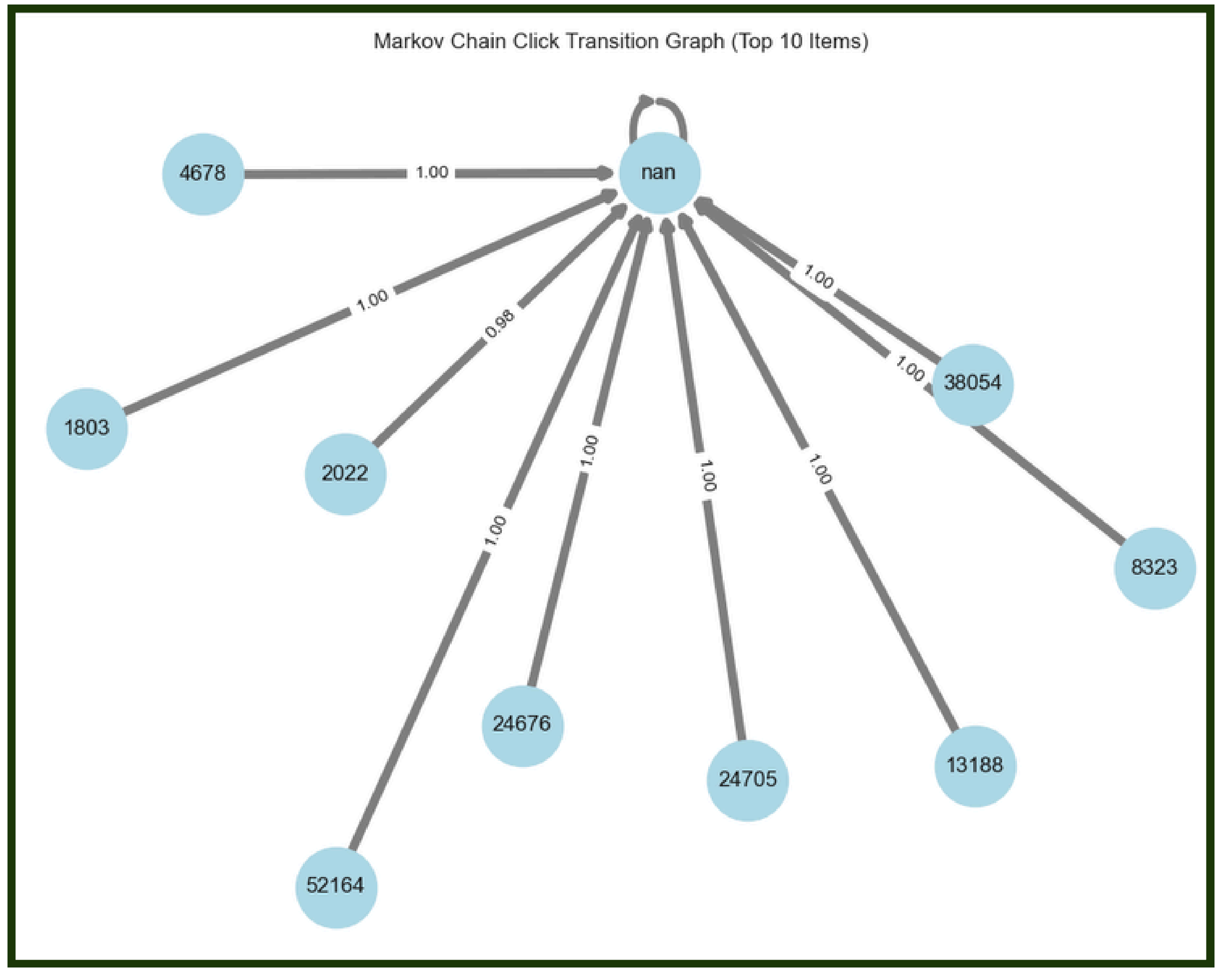
Pipelines:

- Preprocess → Sequence Creation
- Word2Vec: Learn product embeddings
- t-SNE: Visualize product relationships
- Markov Chain: Simple next-click modeling
- GRU (Gated Recurrent Unit): Sequential deep learning
- Simple Input-Output Setup: User interaction for next-click prediction

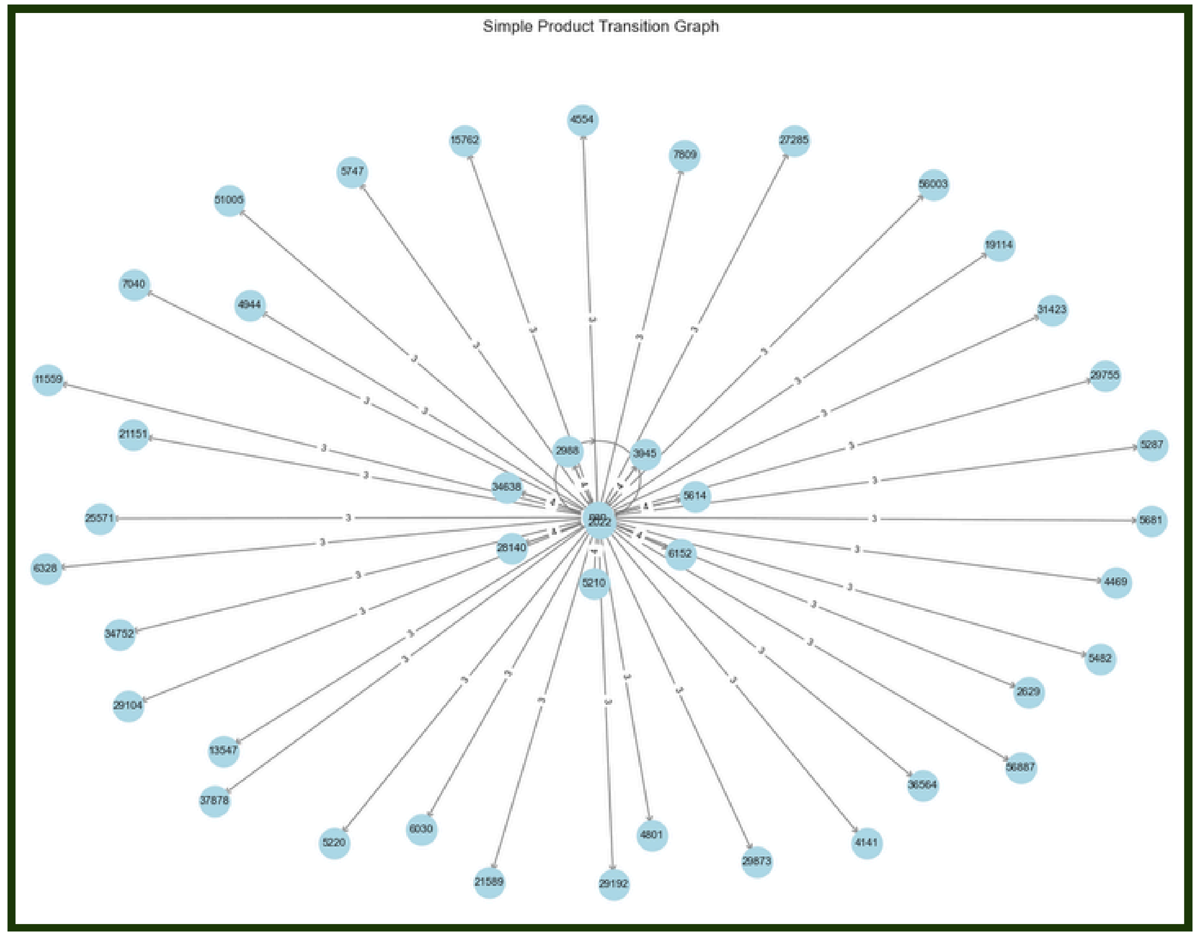
Tools & Libraries:

- Python, Pandas, Gensim, TensorFlow, Keras, Seaborn, NetworkX

Model Evaluation & Results



Model	Top-1 Accuracy	Top-3 Accuracy
Markov Chain	88.68%	90.07%
GRU	87.16%	88.51%



User interaction for next-click prediction

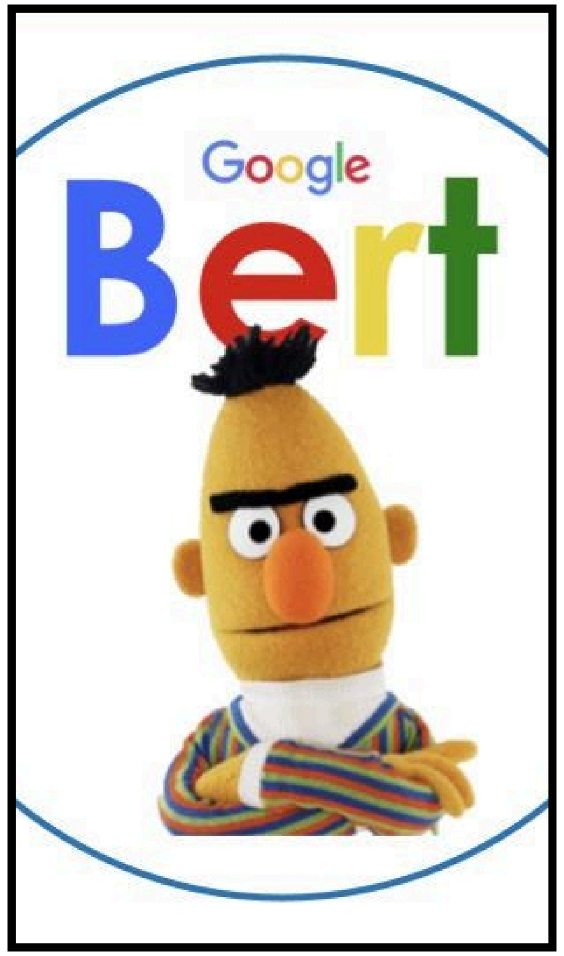
```
    print("\n[!] No similar products found.")

 ===  Next-Click Prediction ===

 Available Product IDs (sample): ['nan', '2022', '2988', '5210', '5614', '6152', '5217', '3945', '28140', '34638'] ...
Enter your last clicked Product ID: ↑↓ for history. Search history with c-↑/c-↓

]:
```

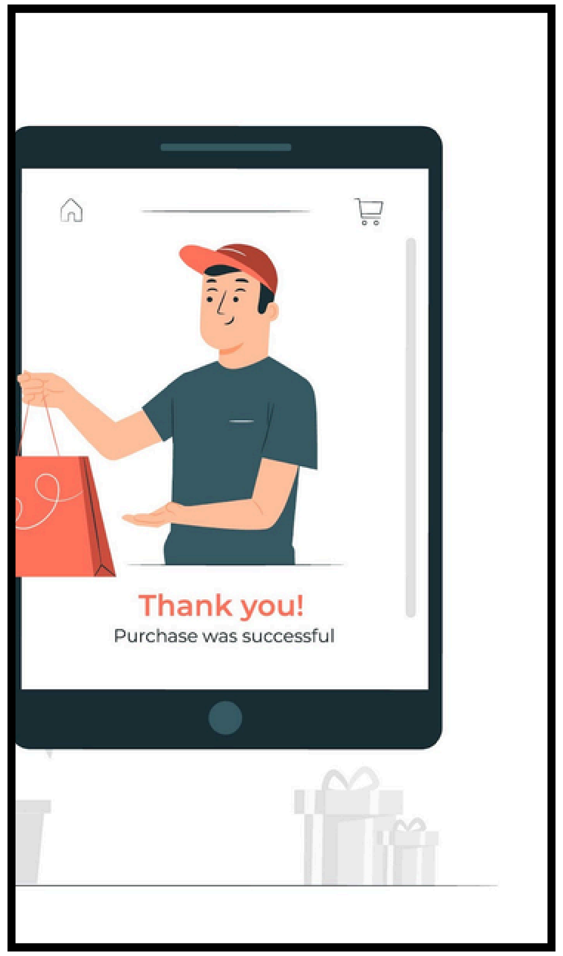
Conclusion:

- Built a scalable Next-Click Prediction System for Fashion Campus.
- Combined classical (Markov Chain) and deep learning (GRU) methods.
- Used Word2Vec to capture product semantics and user behavior.
- GRU performed well on complex sessions; Markov excelled on simpler ones.
- Implemented a simple CLI for real-time user interaction.
- Showcased the power of embeddings and sequence modeling in e-commerce.

Future Work

- Integrate user demographics & real-time feedback
- Use Transformers (like BERT4Rec) for deeper context
- Deploy on cloud (AWS/GCP) for real-time scalability
- Personalized recommendations via reinforcement learning





References

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Fashion Campus

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