Recommendation Systems for Item Recommendation in MOBA Games

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Context/Background

MOBA

- Global esports revenues and its audience will grow to $1.1 billion and 495 million people in 2020, respectively
- The League of Legends World Championship, which was the biggest tournament of 2019 with more than 105 million hours live on Twitch and YouTube
- Recommendation systems to boost users' interest with a focus on game sales.

Context/Background

MOBA

- The game consists of two teams that compete to be the first to destroy the enemy base.
- The pace of the game is encouraged by an in-game currency reward system, which is used to buy items that increase the performance of characters.
- Unlike canonical recommendation problems, in-game recommendation presents further challenges.
  - Character recommendation
  - Item recommendation
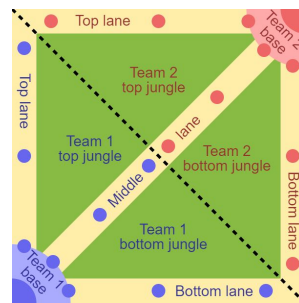
Problem

Item Recommendation

- Help the players to make decisions
- Maximize their gaming experience
- Keep the player interested

Who benefits?

- Newcomer players
  - smooth the learning curve
- Expert players
  - relevant items for particular cases

Solution

RecSys for Item Recommendation

A recommender system for item recommendation:

- Based on Machine Learning techniques.
- Use data at character level (matches)

Given a character "champion", and enemies, suggest a item set.

Methodology

Dataset Analysis → **Implementation** → **Evaluation**

- Get the dataset (Opt)
- Feature selection
- Preprocessing

- Data Mining for recommendation
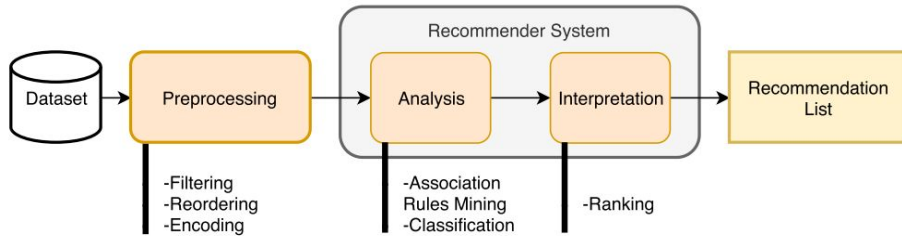 - Association Rules
  - ML Classifiers
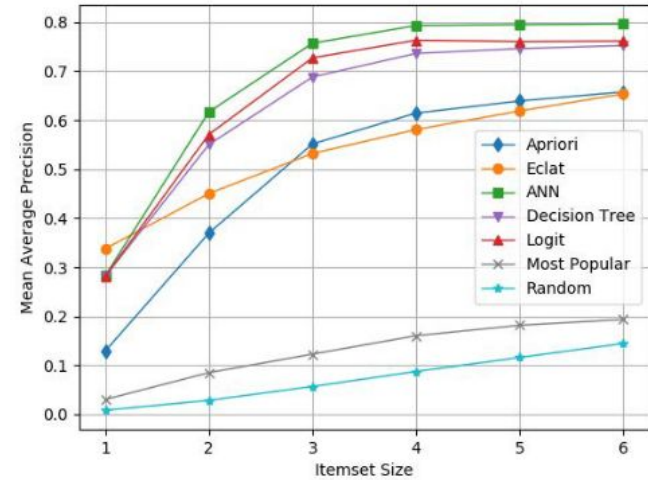
Recent work:

- DL approach
- Transformer

- Performance metrics
  - F1
  - Precision
  - Recall
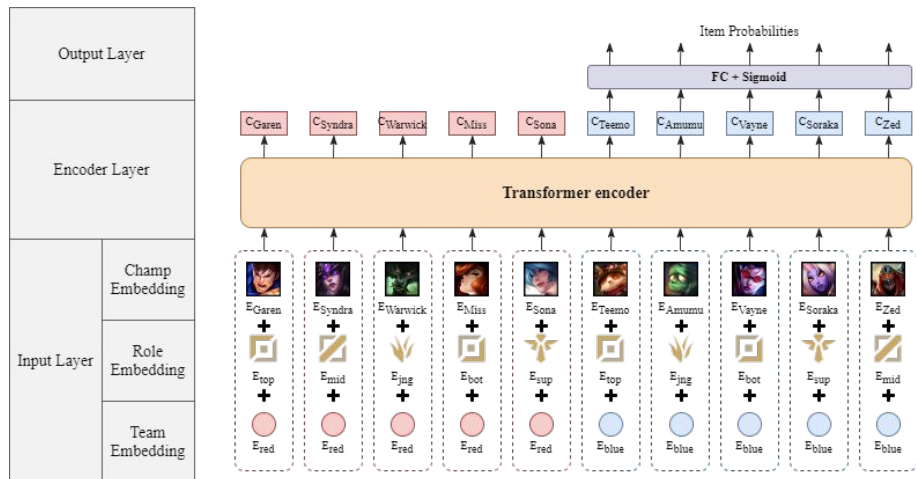- Ranking metrics
  - MAP
  - MRR

Results

Recommendation framework based on data mining process

ANN model outperforms the other approaches, achieving F1 of 53%, and MAP of 74%

Results

Transformer for Team-aware Item Recommendation architecture (TTIR) for exploiting contextual data

TTIR outperforms, achieving MAP of 81%

Question	Global M±SD (N=16)	Subjects by year of first play		
		2009-11 (N=5)	2012-14 (N=5)	2015-2017 (N=6)
Q1. How good were the recommendations for the *Blue team* ?	7.98±1.22	7.7±1.24	7.7±1.16	8.46±1.3
Q2. Is it understandable the influence of every team member upon each champion being recommended ?	7.44±1.72	7.4±1.55	7.1±0.8	7.75±2.49
Q3. Is it useful the information provided by the visualization in order to understand the item recommendations made ?	6.9±2.15	6.7±1.98	6.6±1.65	7.33±2.87

Preliminary Survey

Publications

Data mining for item recommendation in MOBA games

Authors: Vladimir Araujo, Felipe Rios, Denis Parra Authors Info & Affiliations

Interpretable Contextual Team-aware Item Recommendation: Application in Multiplayer Online Battle Arena Games

Authors: Andrés Villa, Vladimir Araujo, Francisca Cattan, Denis Parra Authors Info & Affiliations

Blog for more details: vgaraujov.github.io/posts/2020/blog-1-recsys-moba/

Future work

Sequential Approach

- A session-based system, where a match is a session (Prediction of next item).
- It is quite different to typical approaches:
- There are 3 kinds of items with hierarchy

Future work

Sequential Approach

Considerations
- it should take into account enemies (and allies) and their build at time t
- the system should take into account available gold for buying items
- it should be aware about the items the champion have at time t

Data
- Dataset Dota2 with temporal information
https://www.kaggle.com/devinanzelmo/dota-2-matches
- API Riot
https://developer.riotgames.com/

Future work

Visualization Study

- Some models are interpretable

- What kind of visualization is "best" for the user?
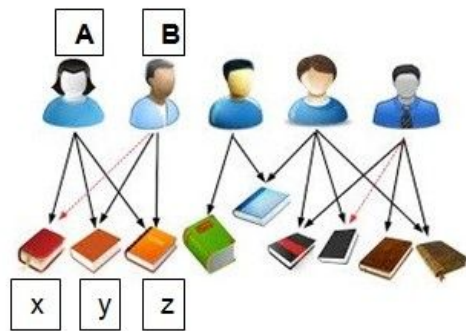- Qualitative study with users

Bonus: Books Recommendation

Problem

Books Recommendation

- The majority of models does not use information of books
- Works that uses content of books uses features such as tf-idf, word2vec, counting, etc

SOTA References
- Overview on NLP Techniques for Content-Based Recommender Systems for Books
- A survey of book recommender systems
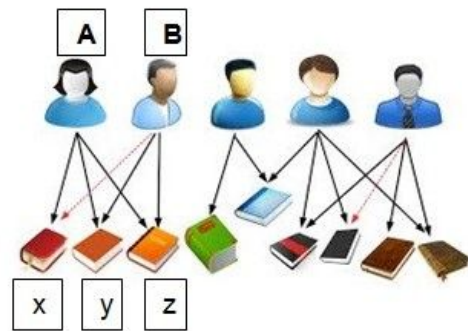
Moving towards NLP

Books Recommendation

There is not work using NLP approaches for book recommendation

- Could be possible to use summarization task of books for recommendation?
- Could be possible to use NER or STS for helping recommendations?

Datasets
- GoodReads, Book-Crossing, LitRec, LibraryThing, INEX, and Amazon reviews datasets

Useful References

RecSys LoL (Sequential)

- SSE-PT: Sequential Recommendation via Personalized Transformer
- Contextual and Sequential User Embeddings for Large-Scale Music Recommendation

RecSys Books

- What does BERT Know about Books, Movies and Music? Probing BERT for Conversational Recommendation
- KRED: Knowledge-Aware Document Representation for News Recommendations