Slate Recommendation Systems

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Slate Recommendation Systems

Combinatorial Action **Spaces**

Long Term Engagement

Real Time Recommendation

Problem Objective

Utilize slate-based reinforcement learning techniques to optimize the selection of reading material on a 3x3 clickable grid.

Problem Space

Nine cards are displayed out of 350 options on a reading grid

Newer choices are often added, older ones aren't removed

Feature data is available on users, predicted to be single-use

Correlation expected between different reading items.

Placement of items also expected to play a role in output

There may be seasonality and trends in the reading material's popularity.

Current Approach

Random
Exploration

Greedy
Most visited recently

Rule-Driven
Feature Data

Linear Contextual Bandit
User-feature based

User Choice Model

- The primary motivation to not consider each item as one action and then simply work on the choice of the top 9 is to consider interaction effects between items.

- To this effect, we create a user-choice model that will work on identifying probability of selection of every item from a given slate.

- This model can be built learning from user interactions or by a heuristic/rule-based method.

- The former would involve significant investment into it since it's own accuracy would have a significant impact on the results of our algorithm.

- The latter would allow us to focus on a simpler model and invest more time into learning from the same.
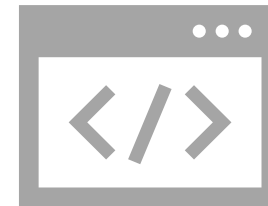
SlateQ Recommendation Sytems

Q Learning

Assumes a prepared user choice model

Generates LTVs for each item

Uses TD Learning to learn LTVs

Uses a DQN with Experience Replay

Slate Optimisation

Mixed Integer Programming offline

Uses k-best or sequentially greedy methods online

Proposed Next Steps

1 Obtaining and cleaning data

2 Creating and understanding user features

3 Creating a User Choice Model

4 Implementing the SlateQ Algorithm

5 Factoring in placement metrics

6 Implementing trends and seasonality