Online Learning of Assignments

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Optimizing Assignments Offline

Motivation

Assign.

Tasks

Assign locations on a webpage
Automata sensors to sensing tasks
Rank, etc.

Evaluate agent's performance

Information sources

Recommendations

Learning Assignments Online

Online Assignment Problem

K positions, and K sets of items, P_1, P_2, ..., P_K.
Assign each P_i to one of its items: S(P_i).

Worst-case for Locally Greedy

Local greedy may pick
functions.

The Algorithm

Theoretical Results

\( \alpha \)-Regret measures how much worse you are than an \( \alpha \)-approx to the best fixed solution.

Experimental Results

Results: Ad Selection

Ad settings:

- Targeting: Show ads to users based on their demographic.
- Bidding: Automatically adjust bids for each ad.
- Conversion: Measure the number of clicks a user makes.

Results: Blog Ranking

We can model blog posting behavior as a stochastic process, where

- Blogs post content at different rates.
- Users read content at different rates.
- The model captures the dynamics of content creation and consumption.

Conclusions

- New algorithm to learn to optimize tasks and assignments.
- Theoretically optimal worst-case guarantees for monotone submodular objectives.
- Includes a broad class of holistic quality measures.
- Enables a new line of research in learning to optimize.
- Empirical demonstration that Online Tabular Greedy is superior to previous approaches for some important applications.