DISSERTATION PROPOSAL

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“Bandit Algorithms for Large-Scale Recommender Systems”

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Online platforms today face challenging decision-making problems, especially while applying learning algorithms in the process. In this thesis, we try to address two of these problems: recommendations under certain restrictions and sampling strategies.

In Chapter 1, we tackle the problem of making recommendations on online platforms in which there is a budget constraint on each item-user pair. We model the problem using multi-armed bandits and introduce the concept of budgeted linear bandits. Our work generalizes the well-known asymptotically optimal algorithm, with which we also provide a computationally tractable heuristic that outperforms the state-of-the-art methods on the real-world data.

In Chapter 2, we look at the problem of match-making in an online platform and model this problem as a new concept we call "matching multi-armed bandit", where the 'rewards' are functions defined between each user and realized through matching recommended by the platform. We implement a combined algorithm of matrix completion and Thompson Sampling over a set of synthetic data. Further steps of this work will include confidence intervals in matrix space and the development of a matching bandit UCB algorithm based on these intervals.

In Chapter 3, we propose ongoing work where we study the randomized column sampling methods in large linear programs. Current methods use certain restrictive assumptions on the distribution over columns. However, we wish to work on a general scheme where columns may be statistically dependent, and inspired by graph sparsification algorithms, we hope to develop a method that performs better than state-of-the-art.