Here is a list of research I want to work on:

Wish list

Low rank matrix

- [ ] Adding change points to robust low rank matrix recovery. Using factor decomposition as the method for solving the sub-problems. Provide guarantees for change point detection, such as consistency or FDR control.
- [ ] Adding privacy in the estimating procedure.

Causal Inference

- [ ] Model selection and post selection inference on randomized experiments.
- [ ] ML/RL combined with causal inference topics. For example, using matrix completion to estimate causal effects; using RL for identifying causal relations as well as designing the optimal treatment regimes.

Machine Learning

- [ ] Investigate the statistical property of a bunch of ML algorithms.

Reinforcement Learning

- [ ] Make inference on the value or the action-value function. For example, can we drop the MDP assumptions and make the data non-stationary? Can we extend our study to non-linear MDPs?
- [ ] Provable methods for reinforcement learning tasks. How to design feasible RL optimization procedures, achieve good performance while providing theoretical guarantee?

Computational Perspective

- [ ] Design online algorithms/adaptive programs for state-of-art methods.
- [ ] Design large-scale parallel computing algorithms for learning methods.