Wang Zhenlin

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EDUCATION

National University of Singapore (NUS)   **Aug 2018 – May 2022 (Expected)**

- *B.S. in Applied Mathematics, Double Major in Computer Science* (**Cumulative GPA:** 4.84/5.00)
- **Awards:** Faculty of Science Dean's List Award in 2019's 1st Semester and 2020's 1st Semester (Top 5% in the Faculty)

PROJECTS/RESEARCH EXPERIENCE

Distributionally Robust Batch Bayesian Optimization   **Jul 2021 – Present**

Supervisor: **Bryan Low Kian Hsiang** | Associate Professor, Department of Computer Science, National University of Singapore

- Designed an optimization algorithm robust in an environmental setup with potential covariate shifts.
- Used uncertainty sets with $\emptyset$-divergence or Wasserstein metrics for the distributionally robust Bayesian Optimization (DRBO) with Gaussian Process model, modifying information-theoretic acquisition functions like Entropy Search for functions with context variables.
- Studied and investigated potential methods to run point selection in batch mode, evaluating their efficiency in DRBO.
- Analyzed algorithm performance based on regret and theoretical convergence rate.

Linear Bandit Best Arm Identification under Constraint   **May 2021 – Nov 2021**

Supervisor: **Kevin Jamieson** | Assistant Professor, Paul Allen School of Computer Science and Engineering, University of Washington

- Constructed a best arm identification problem in a linear bandit setting with a safety restriction for available arms to be sampled, and explored a two-phased G-optimal design with optimal allocation strategies, with a safety and reward variable.
- Designed a δ-PAC confidence-based elimination algorithm with a doubling trick, which was then extended to the monotonic reward and constraint functions setup.
- Analyzed the model sampling complexity upper bound to meet the lower bound, showing the near-optimality of the algorithm.
- Ran experiments to compare the algorithm's performance to existing works and show its superior performance at times.
- Under review at AISTATS arxiv link: https://arxiv.org/abs/2111.12151

Max-Min Grouped Bandit   **Nov 2020 – Sep 2021**

Supervisor: **Jonathan Scarlett** | Assistant Professor, Department of Computer Science, National University of Singapore

- Designed a Successive Elimination Algorithm utilizing UCB/LCB to find a group of bandits with best of the worst-case arm among all groups. Extended an existing Gaussian Process-based algorithm to this problem setup via variation and simplification.
- Used PAC learning analysis to derive a performance upper bound for the algorithm, dependent on the "gaps" between bandit arms, demonstrated its superior performance over brute-force UCB algorithm by utilizing the group-wise elimination to prevent unnecessary arm pulls, and further analyzed and derived an instance-dependent lower bound for this problem setup.
- Under review at AAAI arxiv link: https://arxiv.org/abs/2111.08862

Value-at-Risk Optimization with Gaussian Processes.   **Jan 2021 – May 2021**

Supervisor: **Bryan Low Kian Hsiang** | Associate Professor, Department of Computer Science, National University of Singapore

- Using Botorch (a package based on PyTorch), implemented an algorithm with Gaussian process and novel acquisition function on conditional value-at-risk (CVaR) and tested its performance as compared to state-of-art algorithms on optimizing CVaR.
- Extended the result by running an algorithm on 6 real-world models and problem setups to analyze its empirical performance.

WORK EXPERIENCE

Emporio Analytics (Eyos) - Data Science Summer Intern   **May 2020 – Aug 2020**

- Analyzed price-quantity variations for consumer products with 20 million grocery transactions and proposed a reliable quantity estimation model via kernel density estimation and bandwidth selection models.
- Used a two-phased algorithm to improve module and pipeline efficiency (sped up 10 times) while ensuring scalability, whereas the estimated quantity achieved 14.5% better accuracy on test data when compared to earlier models.
- Deployed the model on AWS as a tool for sales estimation data displayed in the main sales report.
- Experimented with anomaly detection methods and clustering analysis for suspicious transaction records in parsed receipts.
- Scaled up a price validation process to identify types of errors in extreme prices observed, successfully classifying 3 major errors with only 3% false positive in the deployment when using Gaussian Mixture Model and Hierarchical Clustering methods.

TECHNICAL SKILLS

- **Programming skills:** Python; MATLAB; C++; JavaScript; SQL; NoSQL (MongoDB); Java; R; Hadoop.
- **Technical Knowledge:** Bandit; Reinforcement Learning; Recommender System; Statistical Learning Theory; Bayesian Optimization; Full-stack web development; Cloud Computing.