

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: 2019 Sem 1 and 2020 Sem 1 Dean's List Award (Top 5% in Faculty)

PROJECT/RESEARCH EXPERIENCE

Batch Bayesian Optimization with Model Replicability

Jul 2021 – Present

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

- Designed optimization algorithm robust in an environment setup with potential covariate shifts. Used metrics like ϕ -divergence and Wasserstein metrics for the distributionally robust Gaussian Process model with acquisition functions like Predictive Entropy Search, investigated potential ways to run point selection in batch mode.
- Analysed 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 linear bandit with a safety restriction for available arms to be sampled. Design a confidence-based doubling algorithm, which later is extended to allow monotonic reward and constraint functions.
- Analysed the sampling complexity upper bound to meet the lower bound, hence showing near-optimality of the algorithm
- Run experiments to compare algorithm's performance with existing works and show superior performances on certain instances.
- (under review at AISTATS [arxiv link])

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. The complexity bound outperforms brute-force UCB algorithm by utilizing the group-wise elimination to prevent unnecessary arm pulls. Further analysed and derived an instance-dependent lower bound for this problem setup.
- (under review at AAAI [arxiv link])

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 experiments on 6 other real-world models and problem setups to analyse its empirical performance.

WORK EXPERIENCE

Emporio Analytics - Data Science Summer Intern

May 2020 – Aug 2020

- Analyzed price-quantity variations for consumer products with 20 million grocery transactions. came up with a reliable quantity estimation model via kernel density estimation. Used a two-phased algorithm to improve module and pipeline efficiency (10 times speed up) while ensuring scalability. The estimated quantity achieves 14.5% better accuracy on test data vs earlier models. Deployed the model on AWS as a tool for sales estimation data displayed in the main sales report.
- Scaled up a current price validation process to identify types of errors in extreme prices observed. Successfully identified and classified 3 major errors with only 3% false positive in the records using a combination of feature engineering, dimensionality reduction, Gaussian Mixture Model and Hierarchical Clustering.

TECHNICAL SKILLS

- Programming tools: Python (NumPy, Pandas, Scikit-learn, Pytorch); MATLAB; C++; JavaScript; SQL (MySQL, Postgres); NoSQL(MongoDB); Java; R; Hadoop, AWS.
- Technical Knowledge: Bandit; Reinforcement Learning; Recommender System; Statistical Learning Theory; Bayesian

