ZHAO Wanbo

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EDUCATION

National University of Singapore, NUS Business School — Singapore

Ph.D. Student in the Department of Analytics and Operations — Aug 2024 - Present

Nanjing University, School of Management & Engineering — Nanjing, Jiangsu

Bachelor of Economics in Financial Engineering — Sep 2020 - Jun 2024

- **GPA:** 4.56/5.00 (91.2/100.0)
- **Selected Coursework:**
  Mathematics: Multivariable Calculus I (97), Multivariable Calculus II (95), Linear Algebra (92), Probability Theory (95), Applied Statistics (90), Applied Time Series (91), Convex Optimization (93).
  Computer Science: C Language Programming (97), Object-Oriented Programming (99), Data Structure and Algorithm (95).
  Economics/Finance: Principles of Economics (96), Financial Economics (93), Econometrics (taking it now).
- **Honors:** First Prize People's Scholarship (Top 5%), Outstanding Student of Yuxiu Academy (Top 10%).

University of California, Berkeley, Berkeley Extension — Berkeley, California

Berkeley International Study Program (BISP) — Jan 2023 - Aug 2023

- **GPA:** 4.0/4.0
- **Selected Coursework:** Introduction to Real Analysis (A), Nonlinear and Discrete Optimization (A), Linear Programming and Network Flows (A), Programming for Mathematical Applications (A).

RESEARCH INTERESTS

My research interests involve using **machine learning, causal inference, and optimization methods** to improve **decision-making under uncertainty**. Specifically, my focus areas include:

- **Revenue Management:** Dynamic Pricing, Network Revenue Management, Assortment Optimization.
- **Supply Chain Management:** Inventory Management, Transportation, and Logistics Planning.
- **Experimental Design:** Adaptive Clinical Trials (Enrichment Design, Adaptive Dose-finding), etc.

RESEARCH EXPERIENCES

Adaptive Experimental Design for Adaptive Clinical Trials — Cambridge, Massachusetts

Independent Research, Advisor: David Simchi-Levi, Institute for Data, Systems and Society, MIT — Sep 2023 - Dec 2023

- **Background:** Traditional clinical trials are often time-consuming and lead to poor outcomes, significantly increasing the cost of drug development. Adaptive clinical trials modify their designs based on interim data, enhancing statistical efficacy and addressing ethical considerations. In this study, we apply Adaptive Experimental Design for adaptive clinical trials.
- **Literature review:** Reviewed 50+ papers on adaptive clinical trials. Summarized literature reviews on 7 different types of adaptive clinical trials such as Enrichment Design, Adaptive Dose-finding, Group Sequential Design, and Adaptive Endpoint Selection.
- **Proposal of Potential Research Topics:** Explored the application of Contextual Bandit and Threshold Bandit for Enrichment Design, Multi-objective Bandit for Adaptive Dose-Finding, and the utilization of multiple endpoints in adaptive clinical trials through multiple hypothesis tests.

Demand Forecasting and Inventory Optimization for a Retailer — Cambridge, Massachusetts

Independent Research, Advisor: David Simchi-Levi, Institute for Data, Systems and Society, MIT — Jul 2023 - Dec 2023

- **Abstract:** Predicted the demand probability distribution for the upcoming year based on historical sales data. Subsequently, we optimized the order strategy based on the predicted distribution, meeting constraints such as service level and inventory turnover rate.

- **Simulator Establishment:** Simulated the entire process of inventory management, elucidating the inputs, outputs, and dynamics of the system. Described the simulator with a picture and gathered necessary data by communicating with retail company staff.
- **Demand Distribution Generation:** Divided SKUs based on historical demand volatility and sales volume. Utilized forecast data and historical records to generate empirical demand distributions for SKUs with high sales volume and high volatility, and used Poisson demand distributions for other SKUs, based on charts and statistical analysis.
- **Inventory Optimization:** Used traditional inventory management and simulation techniques to yield an order strategy that minimizes the inventory cost while meeting service level and inventory turnover rate requirements.

Identifying Financial Fraud in Chinese Listed Companies through Machine Learning (National level project) Nanjing, Jiangsu

Independent Research, Advisor: Prof. Guojun Wang, School of Management and Engineering, NJU Dec 2021 - May 2022

- **Abstract:** Used feature selection techniques and accounting expertise to identify indicators reflecting financial fraud. Then utilized Random Forest to identify companies with financial fraud in China. Achieved a final AUC value of 90%, and a fraud identification rate of 86%, surpassing the algorithms presented in all known relevant papers.
- **Feature construction and selection:** Created and selected 28 features such as ROE and cash ratio through the Relief algorithm, LVW algorithm, in reference to relevant literature on identifying financial fraud.
- **Data processing:** Used multiple imputation (MICE) to fill missing values, and used the SMOTE oversampling method to balance the number of fraudulent companies with non-fraudulent companies (The original scale is 1:13).
- **Algorithm selection:** Conducted theoretical analysis and calculation experiments on SVM, XG-Boost, and Random Forest. Best-performing Random Forest was used as the final classification algorithm.

COURSE RESEARCH PROJECT

Optimizing Expert Assignment for Customer Task Fulfillment: A Heuristic Algorithm Design Approach Nanjing, Jiangsu

Independent Research, Advisor: Prof. Qian Hu, School of Management and Engineering, NJU Apr 2022 - Jun 2022

- **Abstract: A**ssigned 133 experts to solve 8840 tasks and evaluated algorithms based on total time cost and other metrics. Designed a heuristic algorithm, integrating Variable Neighborhood Search (VNS) and Tabu tables for suboptimal solution exploration. Our algorithm achieved the highest score in the course over the past five years.
- **Generation of initial solutions:** Ranked 133 experts by time spent completing a task, and sorted 8840 tasks in reverse order of their latest response time. Then traversed the above tasks, and assigned each to the expert who was capable of completing it earliest.
- **Variable Neighborhood Search:** Designed exchange, injection chain and relocate operators to perform VNS, which exchanges experts in two pairs of tasks in pursuit of reducing the total time cost, reducing the task response timeout, and reducing the variance of working hours between experts, respectively.
- **Tabu search:** Recorded the tasks that have been completed as a one-dimensional tabu table, and recorded the expert-task pairs that have been completed as a two-dimensional tabu table, thus reducing VNS search times by forbidding searching the elements in the tabu list. Added the perturbation operator in the process of domain change to avoid falling into local optimum.

ADDITIONAL INFORMATION

Programming Skills: fluent in R, Python, C/C++, Java, LaTeX, SQL, and CPLEX.

Language: Chinese (native), English (fluent)

· TOEFL iBT: 105/120 (Reading 29, Listening 27, Speaking 22, Writing 27).

· GRE General: Verbal 161/170, Quantitative 170/170, Analytical Writing 4.0/6.0.