Yufeng Zheng

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EDUCATION

University of Toronto   **Ontario, Canada**
Ph.D. Candidate, Operations Management and Statistics
University of California, Berkeley   **California, United States**
MSc, Industrial Engineering & Operation Research
Shanghai Jiao Tong University   **Shanghai, China**
Bachelor of Engineering in Industrial Engineering & Operation Research

PUBLICATIONS

LOLA: LLM-Assisted Online Learning Algorithm for Content Experiments
University of Washington
- Developed LOLA, a framework that combines Large Language Models (LLMs) with adaptive experimentation to optimize content delivery for media firms.
- Analyzed Upworthy's dataset (17,681 A/B headline tests), achieving 82-84% accuracy in identifying engaging headlines with embedding-based and fine-tuned LLMs.
- Integrated LLMs with the Upper Confidence Bound algorithm in LOLA, enabling adaptive traffic allocation to maximize user engagement.
- Demonstrated LOLA's scalability and superior performance over standard A/B testing in experimental scenarios with limited traffic.
- Manuscript Under Major Revision for [Marketing Science](#).

A Doubly Stochastic Simulator with Applications in Arrivals Modeling and Simulation
UC Berkeley
- Propose a new framework named DS-WGAN that integrates the doubly stochastic (DS) structure and the Wasserstein generative adversarial networks (WGAN) to model, estimate, and simulate a broad class of arrival processes with general non-stationary and random arrival rates.
- Prove consistency and convergence rate for the estimator solved by the DS-WGAN framework under a non-parametric smoothness condition.
- Regarding computational efficiency and tractability, we address a challenge in gradient evaluation and model estimation arising from the discontinuity in the simulator.
- Implement numerical experiments with synthetic and real-world data sets to demonstrate the performance of DS-WGAN. Measure performance from both statistical and operational perspectives.
- Outlet: Operation Research. [[Informs](#)]

Mind Your Step: Continuous Conditional GANs with Generator Regularization
UC Berkeley
- We suspect that the mode collapse issue of Conditional GAN may be caused by the generator not having enough smoothness. The smoothness means that the generator should output similar conditional distribution given similar conditions.
- We propose a simple generator regularization term on the GAN generator loss in the form of a Lipschitz penalty to promote smoothness.
- The regularization term will leverage the neighbor information and push the generator to generate samples with similar conditional distributions for neighboring conditions.
- Analyze the effect of the proposed regularization term and demonstrate its robust performance on a range of synthetic tasks as well as real-world conditional time series generation tasks.
- Outlet: NeurIPS SyntheticData4ML workshop, 2022. [[Link](#)]

Demand Prediction, Predictive Shipping, and Product Allocation for Large-scale E-commerce
UC Berkeley
- Explore the data set containing information about logistics, price, and order of the real business scene of nearly 130GB.
- Predict the sale of products by incorporating features like historical sales, prices, and page views. In addition to the price of an item itself, the price of other correlated items also affects sales, so we build a network to illustrate the competitive and complementary relationship among products and boost prediction accuracy through representation learning.
- Find out that the products are stored in warehouses too dense. By theoretical analysis and numerical experiment, we conclude that increasing the density of products stored in warehouses can considerably reduce transportation costs.
- Finalist: M&SOM Data-driven Research Challenge, 2018. [[SSRN](#)]

An Adaptive Deep RL Method for Non-Stationary Environments with Piecewise Stable Context
Microsoft Research Asia
- Address the Reinforcement Learning (RL) problem with a piecewise stable unobservable environment context, such as changing terrains in robotic tasks and fluctuated bandwidth in congestion control.
- Existing works on adaptation to unknown environment contexts either assume the contexts are the same for the whole episode or assume the context variables are Markovian, which makes these methods unfit for our setting.
- Propose a Segmented Context Belief Augmented Deep (SeCBAD) RL method; with the help of the change point detection technique, our method can jointly infer the belief distribution over latent context and perform more accurate belief context

inference.
- Empirically demonstrate that SeCBAD can accurately infer context segment length and outperform existing methods on a toy grid world environment, Mujoco tasks with piecewise-stable context, and a real-world bandwidth control task for real-time communications.
- Outlet: NeurIPS, 2022. [Link]

Robust Situational Reinforcement Learning in Face of Context Disturbances

Microsoft Research Asia
- Developed a framework called Robust Situational Markov Decision Process (RS-MDP) to address challenges in reinforcement learning when dealing with real-world tasks where context transitions can be contaminated, causing performance degradation.
- Explicitly captured possible deviations of context transitions, providing a more accurate representation of the problem compared to existing methods.
- Introduced a softmin smoothed robust Bellman operator to learn robust Q-values, allowing scalability to large context spaces.
- Demonstrated the effectiveness of the RS-MDP framework by applying it to the Soft Actor-Critic (SAC) algorithm in robot control and inventory management tasks, showcasing superior generalization and robustness compared to existing robust RL algorithms.
- Outlet: ICML, 2023. [Link]

WORKING PROJECTS

Revenue Management and Pricing for Machine Learning Products

University of Toronto
- Design an algorithm to dynamically learn scaling law parameters, optimizing pricing and retraining decisions for ML products over time.
- Implement strategies to maximize total profits by adjusting ML product pricing while balancing retraining costs.
- Analyze trade-offs between improved performance through additional training and cost savings, to achieve an optimal balance of exploration and exploitation.

Analyzing Equity in Private Tutoring Markets Post-Regulation

University of Toronto
- Exam the impact of government regulations on the fairness and accessibility of private tutoring markets, with a focus on equitable educational opportunities.
- Develop analytical models to assess the effects of regulation on market dynamics and tutoring pricing, aimed at optimizing educational equity.
- Identify trade-offs between market efficiency and educational fairness, propose regulatory strategies to ensure equitable access to tutoring services.

Enhancing Discrete Event Simulation with Advanced Language Model Techniques

UC Berkeley
- Developed an approach to code discrete event simulations by leveraging LLM akin to GitHub Copilot, focusing on enhancing efficiency and accuracy in queuing system simulations.
- The project involves strategic use of prompt engineering and Retrieval-Augmented Generation (RAG) for better handling of extensive input lengths and complex context management in simulations.
- Plan to explore 'AI4Research', a concept focusing on the fine-tuning of LLM with scientific papers and documents, aiming to enhance their application across a diverse range of scientific research tasks.

INTERNS

Microsoft Research Asia
- Develop a Pretrained Video Foundation Model for Embodied Agents, focusing on generalizability and few shot learning in new real world environments.
- Implement an AI-based Control System for HVAC (Heating, Ventilation, and Air Conditioning) using Reinforcement Learning to optimize energy efficiency and operational performance.
- Execute a multi-agent Reinforcement Learning algorithm for multi-SKU inventory management, optimizing supply chain operations.

Shun Feng Express (Group) Co., Ltd
- Design and develop an Algorithm for Large-Scale Truck Scheduling, improving logistics efficiency and reducing operational costs.

TEACHING EXPERIENCE

University of Toronto Teaching Assistant
- RSM8432H: Management Analytics Practicum

UC Berkeley Teaching Assistant
- IDENG 173: Introduction to Stochastic Processes
- IDENG 174: Simulation for Enterprise-Scale Systems

COURSES AND SKILLS

Core Courses:

University of Toronto: Online and Data-Driven Decision Making (RSM3091H), Advanced Topics in Linear and Nonlinear Optimization (RSM3090H), Machine Learning for Mathematical Optimization (MIE1666H)

UC Berkeley: Mathematical Programming (IDENG 262), Applied Stochastic Process (IDENG 263), Supply Chain and Logistics Management (IDENG 253), Introduction to Production Planning and Logistics Models (IDENG 250), Network Flows and Graphs (IDENG 266), Statistical Learning Theory (COMPSCI 281), Deep Reinforcement Learning (COMPSCI 285), Introduction to Machine Learning (COMPSCI 289A)

SJTU: Calculus, Probability and Statistics, Linear Algebra, C++ Programming, Fundamentals of Industrial Engineering, Microeconomics, Introduction to Operations Research, Logistics and Supply Chain, Production Plan and Control, Stochastic Model

Programming: PyTorch, TensorFlow, MATLAB, Gurobi, CPLEX, C++