# Yufeng Zheng

yufeng_zheng@berkeley.edu

## Education

**University of California, Berkeley** **CA, United States**
MSc, Industrial Engineering & Operation Research
**Shanghai Jiao Tong University** **Shanghai, China**
Bachelor of Engineering in Industrial Engineering & Operation Research

## Publications & Submitted Papers

**Doubly Stochastic Generative Arrivals Modeling**
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.
- Submitted to Management Science. [arXiv]

**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. [OpenReview]

**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. [OpenReview]

**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]

**Research on Pricing Strategy of Power Grid**
SJTU
- Employ linear regression to model the demand-price relationship of electricity consumption.
- Develop a linearly-constrained quadratic program (LCQP) to model the pricing strategy that ensures customer satisfaction while increasing the company's revenue.
- Optimize the self-adaptive penalty function, and the optimal model increases the company's revenue by 13% with better stability.
- Outlet: Industrial Engineering and Management, 2019. [CNKI]

## WORKING PAPERS

**Contextual Input driven Reinforcement Learning**

Microsoft Research Asia

- Address the RL problem with input processes that are predictable to a certain extent, such as inventory control problems with random customer demand.
- Consider the setting that input processes have varying dynamic among episodes. Develop algorithm to infer input process dynamic and incorporate inference uncertainty into decision-making.
- Introduce off-dynamic learning, allowing the derivation of a sound policy using only input process sequences.
- Preparing for ICML 2023.

## INTERNS

**Shun Feng express (group) co., Ltd | Designing Algorithm for Large Scale Truck Scheduling**

- Construct a dynamic programming algorithm to solve the large-scale truck scheduling problem (500+ trucks and 10000+ tasks) the company encountered in the actual operation.
- In collaboration with the hardware team, we implement parallel computing with OpenMP to speed up the algorithm iteration, reducing the solution time from minutes to seconds.
- Deploy our algorithm to a real production environment. Our algorithm significantly reduces shipping costs compared to the original manually scheduling method.

## TEACHING EXPERIENCE

UC Berkeley Teaching Assistant

IDENG 173: Introduction to Stochastic Processes

IDENG 174: Simulation for Enterprise-Scale Systems

## COURSES AND SKILLS

**Core Courses:**

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++