Baikun (Leon) Leng

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[Personal Page]

EDUCATION

The Chinese University of Hong Kong, Shenzhen, *Bachelor of Science in Data Science and Big Data Technology, Sep. 2020 - Present.*
Selected Coursework: Optimization; Operations Management; Machine Learning; Introductory Econometrics; Probability and Statistics.

- CGPA**:** top 25% of Data Science School (Computer Science, Statistics, Data Science)
- Skills: Python, Java, MATLAB, Mathematica

The University of California, Berkeley, *Visiting Student, Aug. 2022 – May. 2023.*
Selected Coursework: Introduction to Data Modeling, Statistics, and System Simulation (Ph.D. level); Applied Stochastic Process (Ph.D. level); Frontiers in Revenue Management (Ph.D. level); Data Structures; Efficient Algorithms and Intractable Problems, Simulation for Enterprises.

WORKING IN PROGRESS

Fairness in Blockchain-Enabled Insurance Adoption

Supervisor(s): Rowena Gan

Online Learning Under Markov Choice Model with Network Effect

Supervisor(s): Gallego Guillermo & Zizhuo Wang & Yinyu Ye

RESEARCH EXPERIENCE

Two-stage Pollution Regulation of Competitive Carbon Markets [See Slides]

Supervisor(s): Costas Courcoubetis & Jiaqi Lu

- **Proposed and optimized** firms' policies (investment; production; pollution abatement) in the carbon market by **formulating** a **two-stage** problem in which firms are free to choose investment/no investment (resulting in high/low abatement ability) with a cost K in Stage I and then decide their own optimal production quantity, pollution abatement level with the aim of **maximizing whole process profits** under the constrain of **pollution regulation** in stage II.
- **Discovered and proved** that the **equilibrium solutions** for production quantity, carbon abatement ratio, and trading volume of each firm—as presented in Anand (2020)—remain **unaffected** by our extension from a **one-stage model** to a **two-stage model**. This consistency holds true across variations in emission cap (S), the number of regulated firms (n), and the number of firms with high abatement capability (m).
- **Utilized** the concept of Nash equilibrium to delineate **Stage I investment equilibrium boundaries** for n firms as functions of decision variables S and K. By plotting these **(K, S) boundary curves**, the space is partitioned into distinct regions, each indicating a specific equilibrium strategy. This visualization illustrates how equilibrium outcomes shift with variations in S and K.
- **Initiated** the study with a basic 2-firm model, employing Python to conduct numerical tests that affirm the **stability** of our decision equilibrium boundaries. When extending to 3 and more firms, analytical solutions for boundary intersections proved challenging. Resorted to ***Mathematica*** for these numerical evaluations, **revealing** a hypothesized rapid convergence towards asymptotic behaviors as firm numbers increase.

Simulation for Video Game Server Under Different Matchmaking Strategies [See Report]

Supervisor(s): Zeyu Zheng

- **Proposed** a competitive game scenario: players, categorized into Rookie, Normal, and Master skill levels, join a server pool following a **Poisson distribution**, with both match waiting times and game round durations adhering to a **log-normal distribution**. Exit probabilities are influenced by recent **win/loss records** and the **match waiting time**. Sensitivity analysis was performed for all distribution parameters.
- Sourced **exogenous data** from the open game resource, Lichess, to gather figures on the **distribution** of the players and the **win probabilities**.
- To enhance **player retention** through improved matchmaking strategies, we **formulated the "Smart Match" algorithm**, rooted in a multi-state Markov model. This **dynamic strategy** centers on stabilizing players' recent win-lose records: it pairs high-skilled players with recent unfavorable records against those of lower skill but with favorable recent results, thereby aiming to **reduce their probabilities of exiting**.
- **Compared** the 'Smart Match' algorithm to two traditional static matching strategies: 'Fair Match' and 'Random Match' through **simulation**. The results highlighted a **trade-off** between stabilizing win-loss records and increasing matchmaking wait times: while player retention saw significant improvement, this came at the cost of extended wait times.
- **Enhanced** the "Smart Match" strategy to "Smart Match with AI Bots" by **integrating AI bots** to pair with players who experience wait times exceeding a certain threshold, resulting in significant improvements.

INDIVIDUAL PROJECTS & Ph.D. COURSE PROJECTS

Assortment Planning for two stages personalized recommendations [See Report]

- Set up two **dependent** stages **personalized recommendation choice model**: retailer can give an assortment at first stage based on customer preference and gives second stage assortment based on what customer put in the shopping cart in first stage.
- Proof the **poly-time solvable** for one customer MNL/Markov Choice Model and used **backward induction** and **dynamic programming** by simulation to proof that m customer choice model is **exponential** to customer number.

Survey: Queuing Simulation under Heavy Traffic Condition [See Report]

- Reviewed literature on **queueing simulations**, specifically single-queue systems with FCFS discipline and **heavy-traffic scenarios**. Highlighted the impact of heavy-traffic assumptions and covered key mathematical concepts like run-lengths, budgets, and variance reduction.

Sequential Subspace Change-Point Detection [See Report]

Supervisor(s): Liyan Xie & Tianwei Yu

- **Paper recurrences** for *First Order Optimal Sequential Subspace Change-Point Detection*, *Multi-Sensor Change-Point Detection for Seismic Tremors*; **Applied** change-point detection in low-dimension datasets using SVD decomposition, CUSUM algorithms, and likelihood ratio test.

Berkeley Undergraduate Research Program

Supervisor(s): Ernesto Dal Bó & Lukas Leucht

- **Data collection, analysis and visualization**: used **regular expressions** to process biographies of members of the house of lords; **scraped** and structured the index to the wills of famous people; **plotted** the percentage of wills by decade that belong to individuals with the occupation "Gentleman" or "Esquire"; **coded up** data from the book *Dictionary of Battles and Sieges*.

INDUSTRY EXPERIENCE

Blockchain Researcher & Investment Analyst [View detailed contributions here] **01/2023 - 04/2023**

Firm: Nothing Research (Venture Capital)

- **Conducted** research on the blockchain industry, **sourcing** A-round projects to help investment decisions. Authored an **eighty-page** presentation, "**The Dawn of Web3: Unveiling the Blockchain Universe** [View Slide]," demystifying the **crypto landscape** for newcomers.
- **Framework & Guidance Creation**: Created multiple **tools** and **frameworks** for interns and **blockchain newcomers**, such as the "case analysis memo," a project sourcing guide, and the "**How to Find Data in Web3**" resource, facilitating efficient industry navigation.
- **Collaborated** with the Nex Gen Venture Team to author "**Our View on 2023 and Beyond [View Report]**", a forward-looking **analysis** of the blockchain industry's developments for **2023**. The report features **10 pivotal points** that cover all subfields of the blockchain ecosystem.
- Specialized in comprehensive **research** on blockchain **economics** and **finance**, delving into "quadratic voting", "Harberger Tax", and "Property Ownership". Authored a detailed "**Y2K Finance**" analysis [View Report], providing **mathematical** and **financial insights**.

Data Analyst **02/2023 - 05/2023**

Organization: US Arctic Research Commission (USARC) & UC Berkeley Data Science Discovery Program

Supervisor(s): John Farrell & Hadjira Schmitt

- Collaborated with the **US Arctic Research Commission**, to investigate the intricate dynamics of Arctic cooperation among the **U.S., Russia, and China**. **Showcased** research insights through a **comprehensive report** [View Report] and an on-campus **academic poster session.**
- **Mastered** data management for the project, executing rigorous **data collection**, **cleaning**, and **visualization** processes, primarily using **NASA/NSF datasets**, demonstrating a strong acumen for **data analytics** and **insightful interpretation**.

Research Associate [View detailed contributions here] **05/2023 - 06/2023**

Firm: Mandala Ventures (Venture Capital)

- **Authored** a detailed report on "**Ethereum Staking and Liquidity Staking Derivatives** [View Report]," highlighting technology specifics, future prospects, and current hurdles. Presented an analysis contrasting **CEX with DEX**, emphasizing a deep-dive into "**Aboard**" from both a **competitive landscape** and an **investment logic** standpoint [View Report]

SERVICE

Database Administrator, Crypto and Blockchain Economics Research Forum (CBER)

- Created a database of **blockchain-related papers** from **UTD-24** and **top-5** Econ journals, detailing features such as journal name, relevant areas, keywords, and citation count. Continuously responsible for **updating** with **new publications**. [Original Database can be found here]

HONORS & AWARDS & LEADERSHIP

Undergraduate Research Apprentice Program Admission [Acceptance Rate: around 2%], UC Berkeley 2023 Spring
Undergraduate Research Award, CUHK-Shenzhen AY2021-2022
Gold Prize: Whole-Person Development Star [Top Master's List Awards], CUHK-Shenzhen AY2021-2022
School of Data Science Outstanding Contribution Award, CUHK-Shenzhen AY2021-2022
University Leadership Award, CUHK-Shenzhen AY2021-2022
Dean's List Award, CUHK-Shenzhen AY2020-2021
Inspirational Admission Scholarship, CUHK-Shenzhen AY2020-2024
Founder & President, School of Data Science Student Club, CUHK-Shenzhen AY2022-2023
Vice President, **EECS Student Association**, CUHK-Shenzhen AY2021-2022
Cofounder, Yue Yi Tutor Organization [provide tutoring service], Shenzhen AY2021-2022