Jiaming Cheng (He/His/Him)

Tel: (587) 938-5347 | E-mail: jiaming@ece.ubc.ca | Add: 8189 Cambie st, Vancouver, BC, Canada

Research Interest

My research interests lie in decision-making under uncertainty and its applications in edge/cloud computing, intelligent transportation, EV charging.

Keywords: Optimization under uncertainty; Mechanism design; Decision-making; Applied operation research; Network economics.

EDUCATION

University of British Columbia, Vancouver, BC   **Sep 2021 – Present**
P.h.D in Electrical Engineering

University of British Columbia, Vancouver, BC   **Sep 2019 – Aug 2021**
M.A.Sc in Electrical Engineering (with distinction)

University of Alberta, Edmonton, AB   **Sep 2015 – Apr 2019**
B.Sc in Electrical Engineering (with distinction)

RESEARCH EXPERIENCE

Transdisciplinary Collaborative PhD Pilot Fellowship for Climate Emergency   **Sep 2022– Aug 2023**
Collaborative project for Climate Action   *Supervisor: Prof. Naoko Ellis/ Derek Galdwin*

- Worked with external stakeholders (Metro-Vancouver, BC hydro) on EV charging infrastructures planning and electrification for non-road equipment.
- Developed ideas to analyze and improve the current mode of transdisciplinary and interdisciplinary programs for collaborative graduate research study.
- Identified stakeholders' barriers and conflicts to support policymaking for regulatory sectors (Metro-Vancouver).

Decision making under uncertainty and its applications in edge network design   **Sep 2019 – present.**
Information theory and network group in UBC   *Supervisor: Prof. Vijay Bhargava*

- Worked on service placement and resource management problem under uncertainty in edge computing.
- Decision-making problems arising from economic perspectives (i.e., auction; mechanism design).
- Adaptive robust optimization with uncertainty problem: with a specific focus on edge/cloud computing.

Adaptive Ramp Metering Control for Urban Freeway Using Large-Scale Data   **June 2019 – Sep 2019**
Group of networked sensing and control in Zhejiang University   *Supervisor: Prof. Jiming Chen*

- Established a dynamic congestion controller (Adaptive ALINEA controller) for each road segment to reduce the congestion in the main highway.
- Used Direct radial basis function (RBF), neural network controller, to compare the performance (vehicle volume; speed; flow)

Electric Bus Integration in Public Transit (Final-year project)   **Sep 2018 – April 2019**
St. Alberta government associated with University of Alberta   *Supervisor: Prof. Hao Liang*

- **Data analysis**: Generated random numbers into real measurement data selected. Used Gaussian mixture model to cope with missing data to generate the distribution curve of energy charging demand (Weibull distribution).

- **Power grid upgrade plan**: The generated probability density function was simulated into the charging station to obtain the affected per unit voltage on different branches.
- **GPS Sensor**: Designed data collection unit for electrical buses; data recording system upgrade.

User Scheduling and Antenna Selection in Massive MIMO System   **Sep 2018 – April 2019**

University of Alberta ECE Department (NSERC Undergraduates Dean's Research)   *Supervisor: Prof. Yindi Jing*

- Simulated a downlink process in a single cell with i.i.d Rayleigh fading channels and zero forced beam-form precoding method under both perfect and imperfect CSI
- Proposed an algorithm to select the best antenna set for users to approximate the maximum reachable sum rate by spatial selective gain. Presented a performance comparison (average per-user rate) and computational complexity obtained with the proposed algorithm and previous work.
- Eliminated both undesired transmit antennas and users; yielded a minimum contribution to MIMO system.

PROFESSIONAL EXPERIENCE

Policy support/evaluation for Electrification of Non- Road equipment (NRE)   **Sep 2022 – Aug 31, 2023**

Metro-Vancouver, Burnaby, Vancouver (Part of Fellowship program)

- **Quantitative analysis:** used surrogate data testing to disaggregate data from provincial level data provided by Environment and climate change Cananda (ECCC) to Metro-Vancouver bylaw data for different tier NREs.
- **Qualitative analysis:** interviewed more than 10 different stakeholders from private companies, infrastructure providers, regulatory sectors to analyze the attitudes towards main barriers for electrification adoption.
- **Policy-making:** integrated both analyses for policy support, along with the electrification of NREs.

Design, Construct and Test Smart Grid   **May 2018 – Sep 2018**

Forschungscampus Flexible Elektrische Netze FEN, RWTH Aachen University, Germany

- Designed suitable switchgears and power converters to eliminate the power loss on the transmission line.
- Simulated the best-fitted transfer functions to describe the smart grid based on the telegrapher equation.
- Used finite element analysis to simulate the Resistance, Inductance and Capacitance of the testing underground transmission power line considering all magnetic effects and skin effects.

SKILLS AND QUALIFICATION

Publication:

- **J. Cheng**, D.T. Nguyen, and V.K. Bhargava, "Resilient edge service placement under demand and node failure uncertainties", IEEE Transactions on Network and Service Management, early access 2023.
- D.T.A. Nguyen, **J. Cheng**, Ni Trieu, and D.T. Nguyen, "A fairness-aware attacker-defender model for optimal edge network operation and protection", IEEE Networking Letters, 2023
- D.T.A. Nguyen, **J. Cheng**, D.T. Nguyen, and A. Nedic, "CrowdCache: A decentralized game-theoretic framework for mobile edge content sharing", 21st International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (Wiopt), Singapore, 2023 (Best paper finalist).
- **J. Cheng**, D.T.A. Nguyen, L. Wang, D.T. Nguyen, and V. K. Bhargava, "A bandit approach to online pricing for heterogeneous edge resource allocation", 2023 IEEE 9th International Conference on Network Softwarization (NetSoft), Spain, 2023.
- K. N. R. Surya Vara Prasad, **J. Cheng** and V.K. Bhargava, "Accurate distance estimation for RSS localization with statistical path loss exponent model", accepted for presentation at IEEE GLOBECOM, Taipei 2020.

- **J. Cheng**, D.T.A. Nguyen, Ni Trieu and D.T. Nguyen, "Delay-aware robust edge network hardening under decision-dependent uncertainty", submitted to ACM/IEEE Transaction on Networking.
- **J. Cheng**, D.T.A. Nguyen, and D.T. Nguyen, "Two-stage distributionally robust edge node placement under endogenous demand uncertainty", submitted to INFOCOM 2024, Vancouver.
- D.T.A Nguyen, **J. Cheng**, N. Trieu, and D.T. Nguyen, "Optimal Workload Allocation for Distributed Edge Clouds with Renewable Energy and Battery Storage", submitted to IEEE ICNC 2024, Big Island, Hawaii.
- **J. Cheng**, D.T.A. Nguyen, and D.T. Nguyen, "Robust dynamic edge service placement under correlated demand uncertainty", working paper.
- D.T.A Nguyen, **J. Cheng**, L. Wang, and D.T. Nguyen, "Bandit with knapsack for online heterogeneous edge resource pricing and allocation", working paper.

Graduate course (Total 8 courses in UBC)
- Advanced control theory (EECE 571U); Game theory (EECE 571U); Random graph theory (EECE 571W); Information theory (EECE 571Y); Advanced topics in signal processing (EECE 562); Optimization theory (CPSC 536M); Communication network (EECE 565)
- Convex optimization (EECE 571Z); Trade off DSG computer system (EECE 571H)

Supervisory/teaching experience
- REX mentor in undergraduate research organization (URO) in UBC, 2023-2024
- Undergraduate summer research mentor: Utilizing a Graph Convolution Network for Forecasting on Unobservable Nodes in Spatial-temporal network (May-August 2023) - Fourth-year student in CPEN: Bingyu (Vicky) Xie
- Final year project supervisor (2022-2024)

Teacher Assistant (UBC)
- 2023-2024 CPEN 491/492 (Capstone project)
- 2023-2024 ELEC 421: advanced topic in image & signal processing
- 2020-2023 Winter-term EECE 571 E & ELEC 433 (Error Control Coding)
- 2022-2023 CPEN 491/492 (Capstone project): A supervised team achieved second place across all rankings.
- 2022-2023 Winter-term ELEC 221 (Introduction to signal processing)

Skills:
- **Software**: MATLAB, Julia, Python, C++, MySQL, GAMS
- **Optimization solvers**: GUROBI, CPLEX, MOSEK, Julia (JuMP)

Scholarship
- GSI scholarship
- Transdisciplinary Collaborative PhD Pilot Fellowship for Climate Emergency 2022-2023 (8 students across UBC)
- Graduate student assistantship award
- International student award (UBC)
- NSERC Dean's research award in 2018
- Educational abroad individual award 2018
- German Academic Exchange Service scholarship 2018
- Faculty of Engineering academic excellence scholarship
- International student scholarship (UA)