Bingqing Chen

Looking for Research Internships
PhD Candidate at Carnegie Mellon University
Building Systems; Smart Grid; Machine Learning
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A. Education

2017 – Present	*Carnegie Mellon University*; Ph.D., Advanced Infrastructure Systems; M.S., Machine Learning
2015 – 2017	*University of Hong Kong*; M.Sc. (with *Distinction*), Structural Engineering
2012 (Fall)	*McGill University*; Exchange Programme; GPA: 3.94/4
2011 – 2014	*University of Hong Kong*; B.Eng. (*First-class Honours*), Civil Engineering; GPA: 3.83/4

B. Experience

2020 (Summer)	Graduate Research Intern, *Lawrence Berkley National Laboratory*, CA – *Research, Machine Learning*
2014 – 2016	Structural Engineer, *Ove Arup & Partners*, Hong Kong – *Engineering Design & Consulting*
2013 – 2014	Intern, *Frost & Sullivan*, Shanghai – *Management Consulting*
2013 (Summer)	Research Assistant, *Imperial College London*, London – *Statistical Modelling*
2012 (Summer)	Intern, *China Three Gorges Corporation,* Beijing – *Construction Management*

C. Selected Projects

Distributed Control of Building Loads for Grid Services; Carnegie Mellon University; *PA*
Research, Distributed Optimization, Smart Grid | 2020

- Proposed a distributed control solution to coordinate heterogeneous building loads with non-convex dynamics to achieve grid-level objectives, while ensuring individual loads' operational constraints and end-use requirements are satisfied
- Validated the proposed solution is practical using a hardware-in-the-loop simulation, which includes a real-world testbed operated via a smart thermostat. It curtailed daily peak load by an average of 12.5%, while maintained comfort temperatures.
- Nominated for Best Student Paper Award at IEEE SmartGridComm'20 based on this work [3]

Off-Policy Evaluation for Building Control; Lawrence Berkley National Laboratory*; PA*
Research, Reinforcement Learning, Off-Policy Evaluation, Building Control | 2020 (Summer)

- Presented the 1st study of off-policy evaluation in the context of building control, focusing on the appropriateness of existing methods given the characteristics of building operational data.
- The selected method estimated the energy and comfort costs with 1.84% and 14.1% error, averaged over 10 target policies.

Domain Adaptive Energy Disaggregation; Carnegie Mellon University*; PA*
Research, Domain Adaptation, Non-intrusive Load Monitoring (NILM) | 2019

- Incorporated application-specific knowledge into domain adversarial training to develop a domain-adaptive model for NILM
- Evaluated the solution on a publicly available dataset and demonstrated that it compares favourably to unsupervised methods

Practical and Scalable Reinforcement Learning for Building Control; Carnegie Mellon University*; PA*
Research, Reinforcement Learning, Building Control | 2019

- Proposed the 1st reinforcement learning solution for building control that enables real-world deployment without the resource-intensive process of developing high-fidelity simulation models
- Deployed the proposed solution in a real-world testbed, which saved 16.7% energy compared to the existing control
- Won Best Paper Award at ACM BuildSys'19 based on this work [7]

Infrastructure Project Coordination; Ove Arup & Partners*; HK, CN*
Engineering Design, Coordination | 2014-2016

- Coordinated design changes and addressed contractor queries, for a work-package under the *Tuen Mun-Chek Lap Kok Link*, a major infrastructure project in Hong Kong with a contract sum of $6 billion
- Liaised with engineers from different disciplines and compiled holistic solutions for the client

Statistical Analysis of Travel Behaviour; Imperial College London; *UK*
Research, Data Analysis | 2013 (Summer)

- Conducted statistical analysis to characterise the relationship between travel behaviour and disaggregated income sources on a dataset containing 16,183 households
- Found evidence that the assumption of homogeneous income elasticity of road traffic, commonly used in transport planning models, was not true under some circumstances

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D. Selected Publications

[1] **Chen, B.,** Francis, J., Pritoni, M., Kar, S., & Bergés, M. (2020). COHORT: Coordination of Heterogeneous Thermostatically Controlled Loads for Demand Flexibility. *In Proceedings of the 7th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys'20)*. ACM.

[2] **Chen, B.,** Jin, M., Wang, Z., Hong, T., & Bergés, M. (2020). Towards Off-policy Evaluation as a Prerequisite for Real-world Reinforcement Learning in Building Control. *In The 1st International Workshop on Reinforcement Learning for Energy Management in Buildings Cities (RLEM'20)*. ACM.

[3] **Chen, B.,** Yao, W., Francis, J., & Bergés, M. (2020). Learning a Distributed Control Scheme for Demand Flexibility in Thermostatically Controlled Loads. *In 2020 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm'20)*. IEEE. **(Best Student Paper Nominee)**

[4] **Chen, B.,** Cai, Z., & Berges, M. (2020). Gnu-RL: A Practical and Scalable Reinforcement Learning Solution for Building HVAC Control using a Differentiable MPC Policy. *Frontiers in Built Environment*, *6*, 174.

[5] **Chen, B.,** Liu, J., Lange, H., & Bergés, M. (2020). Dyna-Bolt: Domain Adaptive Binary Factorization of Current Waveforms for Energy Disaggregation. *In ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (pp. 3262-3266). IEEE.

[6] Liu, J., **Chen, B.,** Chen, S., Bergés, M., Bielak, J., & Noh, H. (2020). Damage-sensitive and Domain-invariant Feature Extraction for Vehicle-vibration-based Bridge Health Monitoring. In *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (pp. 3007-3011). IEEE.

[7] **Chen, B.,** Cai, Z., & Bergés, M. (2019). Gnu-RL: A Precocial Reinforcement Learning Solution for Building HVAC Control Using a Differentiable MPC Policy. *In Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation* (pp. 316-325) *(BuildSys'19)*. ACM. **(Best Paper Award)**

[8] Le Vine, S., **Chen, B. E.,** & Polak, J. (2014). Does the income elasticity of road traffic depend on the source of income?. *Transportation Research Part A: Policy and Practice*, 67, 15-29.

E. Skills

- Programming Languages: Python, C/C++/C#, Java
- Data Analysis: numpy, pandas, PySpark, R, SQL, Matlab, Mathematica, SPSS
- Machine Learning: tensorflow, pytorch, keras, scikit-learn

F. Formal Coursework

CMU 10701 Intro. to Machine Learning	CMU 11785 Deep Learning	CMU 10703 Deep Reinforcement Learning
CMU 10702 Statistical Machine Learning	CMU 10705 Intermediate Statistics	CMU 10708 Probabilistic Graphical Model
CMU 10725 Convex Optimization	CMU 10805 ML w. Large Datasets	

G. Professional Service

TPC Co-chair	*ACM Workshop on Reinforcement Learning for Energy Mgmt. in Buildings & Cities @ BuildSys'20*
Reviewer	*ACM BuildSys'20; Building Simulation*

H. Honours & Scholarships

2017-Present	Dean's Fellowship
2011-2014	Dean's Honors List
2013	Chow Che King Prize
2013	Ms. Chu Yuk Baw Prize in Structural Engineering
2013	HKU Worldwide Exchange Scholarship
2012, 2013	Professor YK Cheung Scholarship
2012	CV Starr Scholarship

I. Outreach

Volunteer – *Social Entrepreneurship;* Pollinate Energy, India; *2016*

- Visited slums communities; promoted and sold solar lamps to replace kerosene ones; conducted field trials and surveys on the user-experience of new solar products as a potential addition to the existing product portfolio

Volunteer – *Infrastructure Development*; Project Little Dream, Cambodia; 2015

- Contributed to designing and building an elementary school in rural Cambodia