

Clement Wong

📞 6469195859 | ✉ clemwong@umich.edu | 🌐 github.com/clementwong | 🔗 linkedin.com/in/clementwong8 | 🎓 Clement Wong | 🇺🇸 U.S. Citizen

Personal Profile

I am currently working on degradation diagnostics and fault detection of grid-connected Lithium-ion battery systems. I have expertise in Lithium-ion batteries and a strong background in machine learning, data science, and controls. I am interested in opportunities to leverage my knowledge of batteries and machine learning to improve battery development and operations.

Education

University of Michigan

PhD Candidate, Mechanical Engineering

Ann Arbor, MI

Sept 2021 - Current

- **Advisor:** Anna Stefanopoulou
- M.S. in Mechanical Engineering (GPA: 3.93/4)
- **Relevant Coursework:** Battery Systems and Controls | Machine Learning | Matrix Methods for Signal Processing, Data Analysis and Machine Learning | Probability and Random Processes | Estimation, Filtering, and Detection | Linear Feedback Controls

Carnegie Mellon University

B.S. in Mechanical Engineering, double major in Engineering and Public Policy

Pittsburgh, PA

May 2015 - May 2019

- **Advisor:** Venkat Viswanathan
- Graduated with University and College of Engineering Research Honors

Relevant Research Experiences

Degradation Diagnostics and Fault Detection for Grid-Connected Lithium-ion Battery Systems (with LG Energy Solutions's Battery AI Diagnostics team)

Ann Arbor, MI

University of Michigan Graduate Research Assistant

June 2022 - Current

- Developed algorithms to estimate State-of-Health (SOH) parameters (capacity, resistance, electrode SOH) and quantify degradation modes (LLI, LAM) of 45 grid-connected Li-ion battery systems, using real-world operational time-series data
- Leveraged expertise in Li-ion batteries to engineer physically meaningful features from operational data to capture degradation processes and cell-to-cell variations, with a primary focus on risk classification and fault detection
- Applied machine learning and statistical techniques to classify the risks of cells and to predict faults in battery modules.
- Quantified the uncertainty in State-of-Health estimations, taking into account sensor accuracy and data measurement conditions
- Collaborated with LGES's Battery AI Diagnostics team to integrate degradation diagnostics and fault detection algorithms into their systems
- **Knowledge** Li-ion Batteries, Physics-Informed Machine Learning, Data Science, Time-Series Analysis, Signal Processing
- **Programming** Python, MATLAB
- **Libraries:** Scikit-Learn, Scipy Pandas, NumPy, Matplotlib, Plotly, Seaborn

Autonomous Robot for Battery Electrolyte Discovery (with Toyota Research Institute)

Pittsburgh, PA

Carnegie Mellon University Undergraduate Research Assistant

June 2018 - May 2019

- Created an machine learning driven autonomous robot that optimizes electrolyte design for batteries using Bayesian optimization
- Wrote control software for the autonomous robot and designed a REST API to link robot with machine learning software
- **Knowledge** Data Analysis and Visualization, Experimental Design
- **Software** Python, LabVIEW

Publications (Google Scholar)

Differential Voltage Analysis and Patterns in Parallel-Connected Pairs of Imbalanced Cells

Clement Wong, Andrew Weng, Sravan Pannala, Jeeseon Choi, Jason B. Siegel, Anna G. Stefanopoulou

American Control Conference (Pending Review) (July 2024). The IEEE Control Systems Society Conference, 2024

Voltage Differential Analysis during Power Discharge Operation in Energy Storage Systems

Clement Wong, Jason B Siegel, Anna G Stefanopoulou

ECS Meeting Abstracts (May 2023). The Electrochemical Society, Inc., 2023

Current imbalance in dissimilar parallel-connected batteries and the fate of degradation variability

Andrew Weng, Hamidreza Movahedi, **Clement Wong**, Jason B Siegel, Anna G Stefanopoulou

Journal of Dynamic Systems, Measurement and Control (May 2023). 2023

Challenges of a Fast Diagnostic to Inform Screening of Retired Batteries

Joseph A. Drallmeier, **Clement Wong**, Charles E. Solbrig, Jason B. Siegel, Anna G. Stefanopoulou

IFAC-PapersOnLine 55.24 (2022) pp. 185–190. 2022

Other Research and Work Experiences

Photovoltaic Solar Energy Production Forecasting

Pittsburgh, PA

Carnegie Mellon University Course Project

May 2019

- Predicted photovoltaic energy production by applying Neural Network, Dynamic Linear Model, and SARIMAX techniques to historical production and weather data using Python and PyTorch

Battery Cathode Material Capacity Prediction

Pittsburgh, PA

Carnegie Mellon University Course Project

Dec 2018

- Predicted battery cathodes' capacity through exploratory data analysis, feature engineering, and implementing machine-learning algorithms to battery data using Python and Scipy-Numpy libraries

Hydrogen Storage Research

Pittsburgh, PA

Carnegie Mellon University Undergraduate Research Assistant

Jan 2017-Jan 2018

- Conducted an expert elicitation assessment to project hydrogen storage systems' expected development trajectories and inform future hydrogen storage R&D funding
- Co-authored an extended abstract that guided national policymakers how to improve hydrogen storage systems' technical and economic performance for Fuel Cell Electric Vehicles.

Tutor

Pittsburgh, PA

Self-Employed

Aug 2019-May 2021

- Taught 10 high school students in various math, computer science, and science classes including Calculus, Java Programming with Data Structures, and Physics

Awards

2021 **Mechanical Engineering Department Fellowship**, University of Michigan

2019 **Undergraduate Excellence in Research Award**, Carnegie Mellon

2019 **Best Poster Presentation for Bayesian Machine Learning**, Carnegie Mellon

2018 **Tau Beta Pi Engineering Honor Society**, Carnegie Mellon

2017 **Pi Tau Sigma Mechanical Engineering Honor Society**, Carnegie Mellon

2017 **Summer Undergraduate Research Fellowship**, Carnegie Mellon

2015-2019 **College of Engineering Dean's List**, Carnegie Mellon University

Activities

Battery Club at University of Michigan

Ann Arbor, MI

President & Co-Founder

Jan 2023 - Present

- Initiated and led a student organization focusing on battery technology, quickly attracting over 60 battery student researchers
- Organized educational events, including seminars, workshops, and events connecting students to academic and industry leaders