

# Lawrence Lai

+1 (626)-202-2052 | laitcl@mit.edu | <http://laitcl.mit.edu/>

Highly motivated 6<sup>th</sup> year PhD Student in Chemical Engineering. Experienced with both computer science and experimental methods. Highly organized leader, president of two student organizations seeking to leverage a broad spectrum of skills in industry.

## Education

Massachusetts Institute of Technology

Cambridge, MA

PhD in Chemical Engineering

June 2019

- Thesis Title: Chemistry of Alkylaromatics in Crude Oil Upgrading
- Relevant coursework include managerial finance, machine learning, patent law, and entrepreneurship lab

University of Michigan, Ann Arbor

Ann Arbor, MI

B.S.E in Chemical Engineering

2012

- Relevant coursework include process economics, and environmental and sustainable engineering

## Recent Industry and Research Experience

**Massachusetts Institute of Technology,**

Cambridge, MA

Department of Chemical Engineering, PI: William H Green Lab

September 2013 – Present

PhD Candidate

- Characterized coke formation behavior through study of alkylaromatic reactions in supercritical water for petroleum upgrading using high pressure batch reactor and gas chromatography
- Achieved superior separation of hydrocarbons in alkylaromatic and petroleum related mixtures through development of 2-dimensional gas chromatography method
- Characterized chemical details of intricate alkylaromatic pyrolysis system through generation of chemical mechanisms using computational tools
- Calculated training data for machine learning algorithm in reaction mechanism generation algorithm by quantum methods; 154 species thermochemistry and 28 rate constants calculated
- Developed methods of rapid and efficient estimation of unknown species thermochemistry and reaction rate coefficients using group additivity methods, decision trees, and machine learning

**Corning Inc.**

Corning, NY and Wilmington, NC

Engineering Consultant

September 2014 – October 2014

- Identified corrective measures to improve damage resistance of existing product line of glass products through experimentation with controlled variables

**General Mills**

Minneapolis, MN

Engineering Consultant

November 2014 – December 2014

- Developed method to identify and eliminate potential safety hazard in 13 product lines

**University of Michigan**

Ann Arbor, MI

Undergraduate Research Assistant

May 2011 – December 2012

- Improved Isobutanol tolerance of E.coli to produce potent fuel source
- Introduced over 90 mutations to E.coli in multiplex method through use of mutagens
- Designed multiplex screening method to identify mutations in polymerase chain reaction and gel electrophoresis

## Computational Skills

General computational skills: statistics, differential equations, estimation models (including machine learning), data visualization, and version control.

Software: Microsoft Excel, MATLAB, NumPy, Pandas, and GitHub.

Chemical engineering specific skills: quantum calculations, molecular geometry and frequency visualization, generating reaction and flow profiles, and process design.

Software: RMG, Gaussian 03/09/16, Gaussview, Q-Chem, Avogadro, ANSYS CHEMKIN-Pro, COMSOL Multiphysics, and ASPEN Plus.

Languages: Python, MATLAB, C++, HTML 5

Environment: MS-DOS/Windows, UNIX, X-Windows

# Lawrence Lai

+1 (626)-202-2052 | laitcl@mit.edu | <http://laitcl.mit.edu/>

## Leadership

### **President of MIT Sport Taekwondo**

September 2018 – Present

- Communicated student needs to instructors to better deliver towards student expectations
- Improved club operation leading to more efficient club management, better hygiene, and reduce injury risk

### **Teaching Assistant, 10.26 (Chemical Engineering Lab)**

December 2015 – May 2016

- Managed team of 3 students to construct new lab technique for nanoparticle sizing; eliminated infeasible sizing methods for industrial sponsor
- Intermediary for better communication between students and instructors

### **President of Hong Kong Student Society of MIT**

September 2014– August 2017

- Restructured student organization through constitutional changes to become more inclusive

### **Secretary of Omega Chi Epsilon – University of Michigan Chapter**

August 2012– December 2017

- Expanded student organization from 6 to 30 members
- Constructed new system and documented transition document to ease barrier to entry of secretary role

### **University of Michigan Engineering Council Director of Social Affairs**

January 2011– December 2011

- Hosted 6 events throughout calendar year to improve student well-being and connect unlikely contacts
- Formed new relationships between student government and school administration for future interaction

## Languages

- Fluent in Cantonese Chinese
- Intermediate in Mandarin Chinese

## Presentations

**L. Lai**, A. G. Carr, C. A. Class, S. Gudiyella, T. Monroe, M. Liu, and W. H. Green, “Supercritical Water Treatment of Alkyl Aromatics: Observations Beyond Model Predictions”, American Institute of Chemical Engineers Annual Meeting, **2015**, Salt Lake City, UT.

**L. Lai**, S. Gudiyella, and W. H. Green, “Mechanisms of Consumption of Alkenes in Supercritical Water Treatment and Pyrolysis Of Hexylbenzene”, International Symposium of Chemical Reaction Engineering, **2016**, Minneapolis, MN.

**L. Lai** and W. H. Green, “Thermochemistry of alkylaromatics reconsidered”, American Institute of Chemical Engineers Annual Meeting, **2017**, Minneapolis, MN.

**L. Lai** and W. H. Green, “Modelling the formation of Two Ring Aromatics in Alkylaromatics Pyrolysis: Importance of Thermochemistry”, International Symposium of Chemical Reaction Engineering, **2018**, Florence, Italy.

**L. Lai** and W. H. Green, “Elucidation of Hexylbenzene Pyrolysis Mechanism using 2-Dimensional Gas Chromatography with Quadrupole Mass Spectrometry (GCxGC-qMS) and Quantum Chemistry Model”, American Institute of Chemical Engineers Spring Meeting, **2019**, New Orleans, LA.

## Publications

**L. Lai**, W. H. Green, “Thermochemistry and Kinetics of Intermolecular Addition of Radicals to Toluene and Alkylaromatics”, [J. Phys. Chem. A. 2019, Accepted.](#)

**L. Lai**, S. Khanniche, W. H. Green, “Thermochemistry and Group Additivity Values for Fused Two Ring Aromatic Species and Radicals”, [J. Phys. Chem. A. 2019, Accepted.](#)

**L. Lai**, S. Gudiyella, M. Liu and W. H. Green, “Chemistry of Alkylaromatics Reconsidered”, [Energy Fuels, 2018, 32 \(4\), 5489-5500.](#)

L. Lai, H. Pang, and W. H. Green, “Formation of 2-Ring Aromatics in Hexylbenzene Pyrolysis”, **2019**, in preparation.

S. Gudiyella, **L. Lai**, I. H. Borne, G. A. Tompsett, M. T. Timko, K. Choi, M. H. Alabsi, W. H. Green, “An Experimental and Modeling Study of Vacuum Residue Upgrading in Supercritical Water”, [AIChE J. 2018, 64 \(5\), 1732-1743.](#)

A. G. Carr, C. A. Class, **L. Lai**, Y. Kida, T. Monroe, W. H. Green, “Supercritical Water Treatment of Crude Oil and Hexylbenzene: An Experimental and Mechanistic Study on Alkylbenzene Decomposition”, [Energy Fuels, 2015, 29 \(8\), 5290-5302.](#)