Charlie Tsai

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Education

2012–17 **Ph.D. in Chemical Engineering**, *Stanford University*, Stanford, CA, USA.
GPA: 3.78
Coursework: Machine Learning, Convolutional Neural Networks, Databases

2012–14 **M.S. in Chemical Engineering**, *Stanford University*, Stanford, CA, USA.

2008–12 **B.S. in Chemical Engineering**, *Northwestern University*, Evanston, IL, USA.
Minor in Philosophy, GPA: 3.9 (*magna cum laude*)

Research

2012– **Predicting Novel Catalysts for Renewable Energy**, *Stanford University*, Prof. Jens K. Nørskov.

- Predict chemical activity of catalytic materials using data from quantum simulations. Identified several state-of-the-art catalysts for renewable energy applications.
- Used Python for modeling, R and SQL for data analysis.
- Initiated collaborations with 6 research groups, co-authored 2 grant proposals, published 15+ peer-reviewed publications in top journals (e.g. *Nature Materials*), received 240+ citations.
- Publication list: `https://goo.gl/l6NqWR`

2009–11 **Classification of Fossilized Resins**, *Northwestern University*, Prof. Joseph B. Lambert.

- Used principal component analysis and hierarchical clustering to distinguish and predict the geographical origins of fossilized resins using NMR spectroscopy data.

Personal Projects and Teaching

2016– **Japanese Handwriting Recognition Using Deep Learning**.

- Used deep convolutional neural networks to discriminate and classify handwritten Japanese characters.
- Extracted 224,411 images from 2GB database.
- Using Keras/Tensorflow, studied network depth, number of filters, achieving >99% classification accuracy.

2015– **Learning Chemical Trends in Heterogeneous Catalysis**.

- Used ensemble methods to predict the chemical activity of heterogeneous catalysts (1000+ systems) *without* quantum simulations, achieving state-of-the-art prediction accuracy.
- Used Python and SQL to extract, clean data from multiple chemical databases.
- Created webapp for searching and visualizing data (`catapp.stanford.edu`), using web.py, Jinja2, SQLite.

2015, 2016 **Lead Teaching Assistant: "Electronic Structure Theory and Applications"**, *Stanford University*.

- Designed and led 2 class-wide projects involving quantum simulations. Wrote 6 problem sets and 2 exams.
- Created a course website (`chemeng444.github.io`), wrote tutorials, and published project results in a peer-reviewed journal.

Skills

Python (sklearn, IPython, web.py), TensorFlow, SQL, R, C++, MATLAB, JavaScript (c3.js), LaTeX

Honors & Awards

2013–16 National Science Foundation Graduate Research Fellowship (full funding for 3 years)
2012 AIChE Harry McCormack Outstanding Senior Student Award
2011 Research Fellowship – Initiative for Sustainability and Energy at Northwestern
2010 Research Fellowship – National Science Foundation REU at Dartmouth College

Languages

Native: English, Chinese (Mandarin). *Fluent*: Chinese (Cantonese). *Limited*: Japanese, French