Lucy Chai

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Education

University of Cambridge, Churchill College   Cambridge, UK
Department of Engineering   September 2018
MPhil in Machine Learning, Speech and Language Technology
Thesis: Uncertainty Estimation in Bayesian Neural Networks
               and Links to Interpretability

University of Pennsylvania   Philadelphia, PA
School of Engineering and Applied Science   Fall 2013 – Spring 2017
Bachelor of Science in Engineering, *Summa Cum Laude*
Majors: Bioengineering, Computer Science | Minor: Mathematics

Awards

NSF Graduate Research Fellowship Program, 2017
Churchill Scholarship Recipient, 2017
Biomedical Engineering Society Annual Meeting Outstanding Poster Award, 2016
Delaware Valley Engineers Week Undergraduate Student Paper Award Recipient, 2016
Pinkel Fund Award Recipient, 2016
Manfred Altman Memorial Award, 2015
Chemical Rubber Company Chemistry Award, 2014
Dean's List, 2013-2017
Thomas J. Watson Memorial Scholarship, 2013-2017

Memberships

Tau Beta Pi
Rachleff Scholars Program

Research Experience

Machine Learning Group, Computational and Biological Learning Lab, 2018
Department of Engineering, University of Cambridge, Cambridge, UK
Project title: Uncertainty in Bayesian Neural Networks and Links to Interpretability
- BNNs provide uncertainty estimates with model predictions. This project investigates what pixels of an image make predictions uncertain by seeing how predictive, epistemic, and aleatoric uncertainty change when pixels of an image are known versus unknown.

Undergraduate Researcher in Dr. Danielle Bassett's Complex Systems Group, 2014-2017
Department of Bioengineering, University of Pennsylvania, Philadelphia, PA
Project titles:
- Functional network dynamics of the language network
  - Analyzed network properties of language related brain regions by modeling the brain as a dynamic graph using statistical null models and network science algorithms
- Evolution of brain network dynamics in neurodevelopment
  - Combining tools from network science and machine learning – specifically nonnegative matrix factorization – to study how brain structure flexibly adapts to enable increasing cognitive function in 200 participants through childhood and adolescence
- Network dynamics in the development of scientific literature
  - I am currently interested in understanding how the structure of scientific literature evolves in a dynamic networks sense, from the time when it was first written to the time that it is accepted for publication. I aim to see whether the network structure of these bodies of text can adapt in such a way that enables better transfer of information. As part of this project, I am learning about word embeddings, latent semantic analysis, and Rentian scaling.
- Mentor for Yueqi Ren, Language and Multiple Demand Cognitive System Interactions
  - Studying how language-specific brain regions interact with domain-general brain regions to form dynamic networks during a synonym and number comparison task

Publications

Chai, L. R., Mattar, M. G., Blank, I. A., Fedorenko, E., and Bassett, D. S. Functional network dynamics of the language system. Cerebral Cortex.

Chai, L. R., Khambhati, A. N., Ciric, R., Moore, T., Gur, R. C., Gur, R. E., Satterthwaite, T. D., Bassett, D.S. Evolution of brain network dynamics in neurodevelopment. Network Neuroscience.

Presentations

Chai, L. R., Mattar, M. G., Blank, I. A., Fedorenko, E., and Bassett, D. S. Functional network dynamics of the language system.
- Poster presented at Biomedical Engineering Society Annual Meeting (BMES), Oct 7-10, 2015, Tampa, FL, USA, 2015.
- Poster presented at Society for Neuroscience (SfN), Oct 17-21, 2015, Chicago, IL, USA, 2015.
- Poster presented at Penn Science Student Research Symposium sponsored by the Biomedical Graduate Students Association, March 2015.

Chai, L. R., Khambhati, A. N., Ciric, R., Moore, T., Gur, R. C., Gur, R. E., Satterthwaite, T. D., Bassett, D.S. Evolution of brain network dynamics in neurodevelopment.
- Poster presented at Rachleff Summer Symposium, August 7, 2015.

- Poster presented at Penn Bioengineering Graduate Recruiting, February 2016.
- Talk at Brain Behavior Laboratory Imaging Meeting, March 17, 2016.
- Poster presented at Biomedical Engineering Society Annual Meeting, 2016.

Dynamic Brain Networks. 60-second lecture at Quaker Days Research Conference for Penn Center for Undergraduate Research and Fellowships. April, 2015.

Work Experience

Software Developer Intern, Summer 2016
athenahealth, Watertown, MA
- Built an interactive web map for the athenahealth campus in the style of Google maps, with a custom map tile cutting utility and a fuzzy string comparison search feature to search up to desk-level granularity

Teaching Assistant for Prof. Aaron Roth, CIS 262, Fall 2016
Department of Computer Science, University of Pennsylvania, Philadelphia, PA
- Finite automata and regular languages, Turing machines, undecidability, tractability and NP-completeness

Teaching Assistant for Prof. Dan Huh, BE 350, Spring 2017
Department of Bioengineering, University of Pennsylvania, Philadelphia, PA
- Fluid mechanics, Navier Stokes equations, thermodynamics, and energy and mass transport

Data Science Intern, Summer 2017
MITRE, Bedford, MA
- Built deep learning models for image to text matching using Python, Keras, and Tensorflow

Other Projects

- Github page: https://github.com/chail
- *CalPal*: an iOS application using computer vision, optical character recognition, and natural language processing to detect details on an event poster and automatically populate a calendar event
  - Top 10 finalist at PennApps XIV (Fall 2016)
- *SetSolver:* iOS application built using the computer vision platform OpenCV and Swift to solve the card game Set from an image
- *ResolVe:* (Fourth Year Project) an Arduino program and circuit to coordinate an Xray generator, Xray detector, motion controller, and manual switch to take xray images in a customized pattern over a 2-D plane

Volunteering

Miracle League Baseball—assist children with various cognitive disabilities in playing modified baseball games

Access Engineering—assist in teaching introductory engineering topics for high school students

We Can Swim Philadelphia—free swimming lessons to local underprivileged children between 6 and 15 years of age

GEARS Day—activities to introduce high school-aged girls to topics in engineering