Jeffrey Chiou

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Employment

National Science Foundation (NSF) Graduate Fellow

Apr. 2013 - Sep. 2016
University of Pittsburgh, Carnegie Mellon University

Collaborated with Pitt and CMU labs to investigate primary motor cortex and dorsal premotor cortex using brain-computer interfaces (BCIs).

- Used various engineering and machine learning techniques, such as dimensionality reduction, Kalman filtering, and clustering, to process and analyze neural data from electrode array-based BCI experiments.
- Spearheaded lab code refactoring effort emphasizing reuse, consistent style, documentation, and organization.
- Automated setup of experiments and repetitive lab tasks using Autohotkey, PowerShell, and IFTTT.
- Effectively communicated complex ideas through data visualization, presenting at journal clubs, teaching review sessions as a TA, and volunteering for a high school science outreach program.

Tutor

Aug. 2015 - Dec. 2015

- Tutored a Pitt undergraduate student in Physics for Science & Engineering II, and Analytic Geometry & Calculus II.
- Raised student's grades at least a letter grade above previous average.
- Applied knowledge of educational psychology and neuroscience to teaching, such as scaffolding, mnemonics, spaced repetition, and the testing effect.

Graduate Student Researcher

Aug. 2012 - Apr. 2013
University of Pittsburgh, Carnegie Mellon University

- Quantified the effect of vibrotactile feedback for assisting BCIs by analyzing hand reaching trajectories.
- Implemented Gaussian fits for receptive fields and mapped contrast, spatial frequency, and temporal frequency tuning in a visual cortex experiment.
- Performed cross-correlation analyses on neural spike train data with jitter correction and normalization.

Skills

AI & Machine Learning

- PyTorch, Keras, Tensorflow, ml5.js
- Evolutionary algorithms
- Preprocessing: data cleaning and feature engineering

Math

- Probabilistic graphical models and variational inference
- Dynamical systems and computational neuroscience
- Causal inference and Granger causality
- Classical statistics: tests as linear models, regression
- Information theory
- Circular statistics

Development

- Python: pandas, numpy, scipy, scikit-learn, statsmodels
- R: ggplot2, JAGS, Tidyverse, R Markdown
- MATLAB / Octave
- HTML, CSS / Sass, JS / JSX
- React, GraphQL, Gatsby, Styled Components
- SQL: PostgreSQL, SQLite
- Processing / p5.js

Tooling

- Ubuntu, Raspbian, WSL
- VS Code
- Git
- LaTeX
- Jupyter Notebooks

Awards

NASA International Space Apps Challenge Global Nominee

2016

Created Dagu, an app prototype providing pastoral communities with networking capabilities and information about water availability, grassland, market prices, and safe routes.

NSF Graduate Research Fellowship

2013

Designed a brain-to-brain interface experiment in 2012 proposal, predating the first paper published by another group (Pais-Vieira, Lebedev, Kunicki, Wang, & Nicolelis 2013) . Also proposed intra-brain artificial circuits.

C-SURE Fellowship

2010

Performed research on and wrote undergraduate thesis about the neuronal control of eye movements, at Pablo Blazquez's lab at Washington University in St. Louis. C-SURE acronym: Cognitive, Computational and Systems Neuroscience Summer Undergraduate Research Experience.

Education

University of Pittsburgh

Aug. 2012 - Dec. 2016

M. S. Neurobiology, with thesis

Relevant Coursework

- Computational Neuroscience Methods (Pitt Math 3375) - Numerical methods, neuron models
- Neural Data Analysis (CMU 86-631) - Information theory, estimation, classification, signal detection theory, and continuous decoding
- Neural Signal Processing (CMU 18-698) - Derived and implemented algorithms and models from equations. Expectation-maximization, PCA, factor analysis, Kalman filters, log-exp-sum, cross-validation, Gaussian mixture models, stochastic processes, probabilistic graphical models... etc.

Washington University in St. Louis

Aug. 2008 - May 2012

B. A. Biology, Neuroscience Track
B. A. Philosophy-Neuroscience-Psychology, Cognitive Neuroscience Track

Projects

Genetic Algorithms on Spiking Recurrent Neural Networks

Used genetic algorithms to induce oscillatory behavior in a population of Izhikevich neurons.

Flexible and Fast Spike Raster Plotting

Wrote a popular 5/5 rated MATLAB neural spike train graphing function with a demo simulation utilizing inhomogeneous Poisson processes.
mathworks.com/matlabcentral/fileexchange/45671-flexible-and-fast-spike-raster-plotting

Home Automation

Flashed ESP8266 to control cheap smart bulbs without a hub using the MQTT protocol, reprogrammed Amazon Dash buttons to control lights and garage, created automations using YAML and Node-Red.