

Yusi Chen

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Education

University of California, San Diego (UCSD)

Ph.D. candidate in Computational Neuroscience

Advisor: Dr. Terrence Sejnowski

09/2017 – 06/2023 (Expected)

M.S. in Electrical Engineering

Track: Intelligent Systems, Robotics & Control

09/2017 – 02/2021

Equivalent M.S. in Applied Mathematics

Track: Probability Theory & Applied Statistics

09/2017 – 06/2022

Tsinghua University

B.S. in Pharmaceutical Sciences; Graduated with honors

09/2013 – 07/2017

Courses and Skills

- Theoretical courses: Probability Theory; Applied Statistics; Nonlinear Theory; Stochastic Dynamical System; Convex Optimization; Cooperative Control; Statistical Learning; Information Theory.
- Neuroscience courses: Systems Neuroscience; Models of Neurons and Networks; Predictive Mind.
- Computational skills: Python (PyTorch, Scipy, Matplotlib, Keras and Scikit-learn), MATLAB, R

Publications

- [Chen, Y.](#), Zhang, H. & Sejnowski, T.J. Hippocampus as a generative circuit for predictive coding of future sequences. *BioRxiv* 2022; *Poster, CSHL-NAISys 2022*; *Invited talk, Swartz foundation retreat 2022*.
- [Chen, Y.](#), Rosen, B. Q., & Sejnowski, T. J. (2022) Dynamical differential covariance recovers directional network structure in multiscale neural systems. *Proceedings of the National Academy of Sciences* 119.24: e2117234119
- [Chen, Y.](#), Bukhari, Q., Lin, T.W. & Sejnowski, T.J. (2022) Differential covariance of fMRI predicts structural connectivity and behavior. *Network Neuroscience*, 6.2: 614-633.
- Lin, T. W.*, [Chen, Y.*](#), ... & Sejnowski, T. J. (2020). Differential covariance: A new method to estimate functional connectivity in fMRI. *Neural Computation*, 32(12), 2389-2421.
- Zhou, J.*, Ma, J.*, [Chen, Y.*](#), ..., & Ecker, J. R. (2019). Robust single-cell Hi-C clustering by convolution-and random-walk-based imputation. *Proceedings of the National Academy of Sciences*, 201901423.
- [Chen, Y.](#), ..., & Ji, J. (2020). Dynamics of HBV surface antigen related end points in chronic hepatitis B infection: a systematic review and meta-analysis. *Antiviral Therapy*, 25(4), 203-215.
- [Chen, Y.](#), ..., & Ma, P. (2017). Population pharmacokinetic analysis of tacrolimus in Chinese myasthenia gravis patients. *Acta Pharmacologica Sinica*, 38(8), 1195.

Awards

Kavli-Helinski Fellowship, Division of Biological Sciences, UCSD

08/2021; 08/2022

National Scholarship of China

09/2016

Teaching and Service

- Teaching assistant for Computational Neuroscience 03/2019-06/2019 & 03/2021-06/2021
- Mentor for graduate students/undergraduates 02/2021-Present
- Reviewer for *Proceedings of the National Academy of Sciences*, *Neural Computation*
- Organizer of student research seminar

Project Experiences

Representational learning through network architecture based on hippocampal formation:

- Reproduced characteristic hippocampal place cell features such as one-shot plasticity, replay, phase precession and spatial localization.
- Designed a recurrent auto-encoder with a predictive loss function based on hippocampal cortical interactions; Successfully compressed high dimensional input and extracted interpretable representations (e.g. image label, rotation operation and action types) of MNIST sequences and Sprites action sequences.

Analysis of high-dimensional neural signals:

- Developed a novel algorithm (Dynamical Differential Covariance) to infer causality from multi-unit neural recordings; Incorporated robust PCA for sparse matrix recovery; Exhibited superior performance than Granger causality, probabilistic graphical modeling and manifold inference.
- Processed resting-state functional Magnetic Resonance Imaging data from 1003 subjects through group PCA and ICA; Linked behavioral/physiological measurements to the inferred interaction network structure through topological analysis.
- Performed time-frequency analysis and wavelet transformation to Local Field Potential (LFP) recorded from running rodents to decode their physical location; Performed location decoding and navigation based on preprocessed LFP features and neural spike train.

Prediction of high profitable advertisements:

- Prediction of click through rate (CTR) and conversion rate (CVR) of Walmart commercial advertisements posted on Google;
- Implemented a hybrid model of decision trees (LGBM) and recurrent neural networks (LSTM).
- Proposed an event based evaluation of profitable advertisements to account for data sparsity.

Visual-inertial simultaneous localization and mapping (SLAM):

- Implemented SLAM based on camera and IMU data through extended/unscented Kalman filter.
- Traced visual landmarks from videos recorded on a high-speed vehicle; Texture mapping through a RGBD camera model and coordinate transformation (OpenCV).

