

Latent Variable Modeling of Neural Population Dynamics - Where Do We Go From Here?

February 1

Tuesday, 12:30pm

Online Webinar

For Researchers



Speaker:

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Host: Yutaka Yoshida, Ph.D.

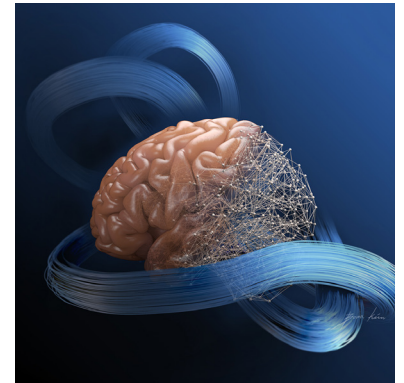
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Abstract

Large-scale recordings of neural activity are providing new opportunities to study network-level dynamics with unprecedented detail. However, the sheer volume of data and its dynamical complexity are major barriers to uncovering and interpreting these dynamics. I will present machine learning frameworks that enable inference of dynamics from neuronal population spiking activity on single trials and millisecond timescales, from diverse brain areas, and without regard to behavior. I will then demonstrate extensions that allow recovery of dynamics from two-photon calcium imaging data with surprising precision. Finally, I will discuss our efforts to facilitate comparisons within our field by curating datasets and standardizing model evaluation, including a currently active modeling challenge, the 2021 Neural Latents Benchmark [neurallatents.github.io].



1. Pandarinath C, O'Shea DJ, Collins J, Jozefowicz R, Stavisky SD, Kao JC, Trautmann EM, Kaufman MT, Ryu SI, Hochberg LR, Henderson JM, Shenoy KV, Abbott LF, Sussillo D. (2018) **Inferring single-trial neural population dynamics using sequential auto-encoders.** Nature Methods. Sept;15(10). doi: 10.1038/s41592-018-0109-9
2. Keshtkaran MR*, Sedler AR*, Chowdhury RH**, Tandon R**, Basrai D, Nguyen SL, Sohn H, Jazayeri M, Miller LE, Pandarinath C. **A large-scale neural network training framework for generalized estimation of single-trial population dynamics.** (2022) Nature Methods, in press. Preprint on BioRxiv: 10.1101/2021.01.13.426570, posted Jan 15, 2021.
3. Zhu F, Grier HA, Tandon R, Cai C, Giovannucci A, Kaufman MT*, Pandarinath C*. **A deep learning framework for inference of single-trial neural population activity from calcium imaging with sub-frame temporal resolution.** In revision. Preprint on BioRxiv: 10.1101/2021.11.21.469441, posted Nov 21, 2021.