Contribution ID: **83** Type: **Poster**

Multi-block RNN Autoencoders Enable Broadband ECoG Signal Reconstruction

Monday 10 July 2023 19:00 (2 hours)

Neural dynamical models reconstruct neural data using
dynamical systems. These models enable direct reconstruction and estimation of neural time-series data as well as estimation of neural latent states. Nonlinear neural dynamical models using recurrent neural networks in an encoder-decoder architecture have recently enabled accurate single-trial reconstructions of neural activity for neuronal spiking data. While these models have been applied to neural field potential data, they have only so far been applied to signal feature reconstruction (e.g. frequency band power), and have not yet produced direct reconstructions of broadband timeseries data preserving signal phase and temporal resolution. Approach. Here we present two encoder-decoder model architectures - the RNN autoencoder (RAE) and multi-block RAE (MRAE) for direct time-series reconstruction of broadband neural
data. We trained and tested models on multi-channel microElectricorticography (μECoG) recordings from non-human primate motor corticies during unconstrained behavior. Main Results. We show that RAE reconstructs micro-electrocorticography recordings, but has reconstruction accuracy that is band-limited to model scale. The MRAE architecture overcomes these time-bandwidth restrictions, yielding broadband (0-100 Hz), accurate reconstructions of μECoG data. Significance. RAE and MRAE reconstruct broadband μECoG data through multiblock dynamical modeling. The MRAE overcomes time-bandwitdh restrictions to provide improved accuracy for long time duration signals. The reconstruction capabilities provided by these models for broadband neural signals like μECoG may enable the development of improved tools and analysis for basic scientific research and applications like brain-computer interfaces.

Authors: NOLAN, Michael; Dr PESARAN, Bijan (New York University); LI, JINGYUAN; SHLIZERMAN, Eli; ORSBORN, Amy

Presenter: LI, JINGYUAN

Session Classification: Working dinner