Summary LFADS Nature

Single trial analyses are challenging due to incomplete sampling of neuronal population, trial-trial variability, fluctuations in action potential timing.

Aim: infer latent dynamics using single trial - based data

Objectives:

* Predict observed behavioural variables
* Extract precise estimates of neuronal dynamics on single trials
* Infer perturbations to those dynamics that correlate with behavioural choices
* Combine data from non-overlapping recording sessions to improve the performance

Summary

Neural activity is often described by low dimensional dynamics. Previous methods assume the underlying dynamics are linear.

Assumptions of LFADS for a task on single trial depends on:

* Underlying brain dynamics
* Trial-specific initial conditions
* Unmeasured inputs from other brain areas
* Poisson spiking variability

Data

Rhesus monkey motor and premotor cortices and human motor

Working

The units of generator RNN depends on:

1. G0, initial state for each trial
2. Ut, time varying inputs for each trial

When generating data for any trial LFADS has access to both before and after t. As encoders run both backward and forward in time while go and ut computation.

LFADS is capable to uncover slow oscillations on a single trial basis. LFADS combines different sessions to improve its performance on each session

Inferred inputs are a estimate to the inputs of the LFADS, so if anything unmeasured occurs in the input side, we can see the effect in ut. The inferred inputs cluster according to perturbation types.