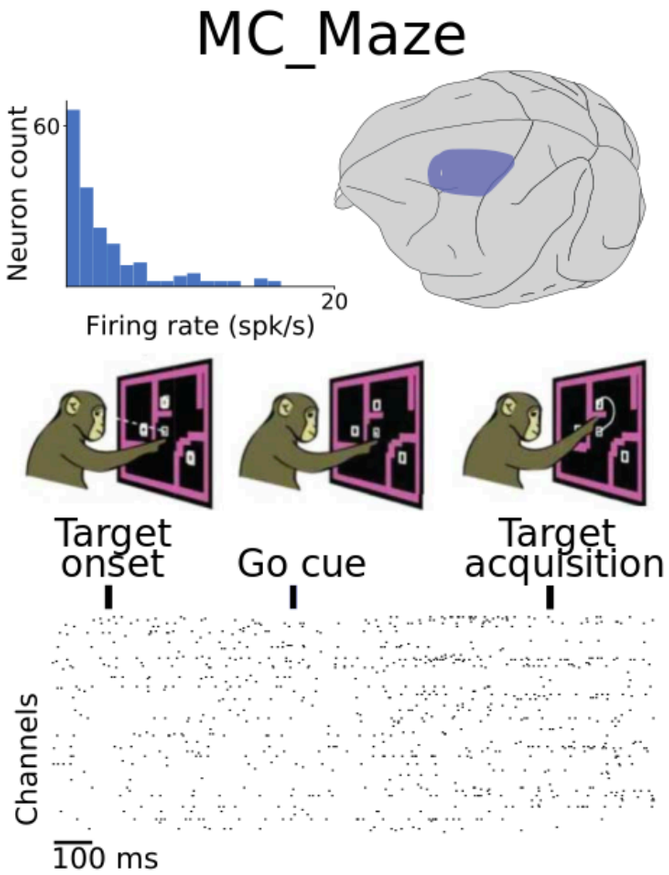
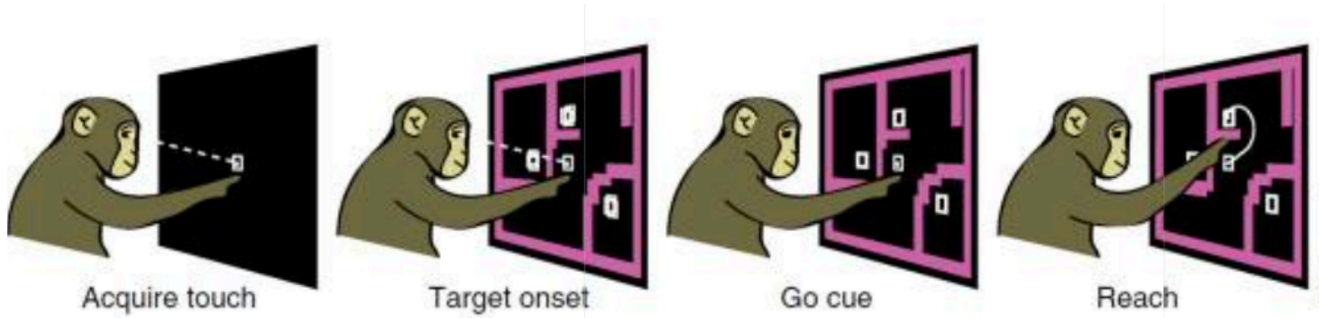
MC_Maze - Delayed Arm-Reaching Task Dataset



Paper: *Cortical preparatory activity: representation of movement or first cog in a dynamical machine?*

Experimental Task Structure

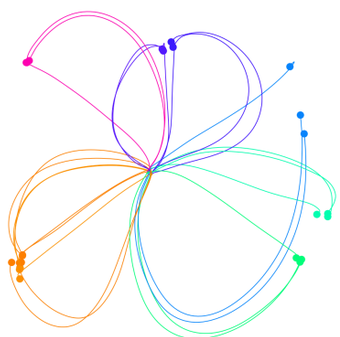


Subject reached repeatedly within a maze (each maze configuration specified by the target location x barrier location)

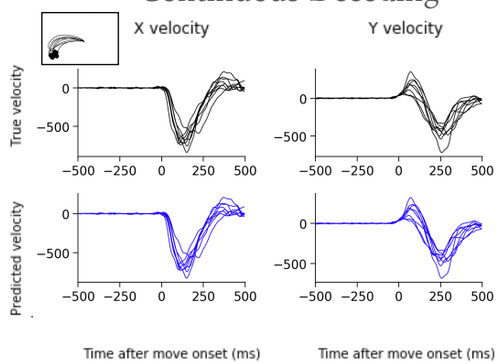
➤ Rich set of "straight" and "curved" reaching, all start at the center (0, 0)

Neural Decoding Problem

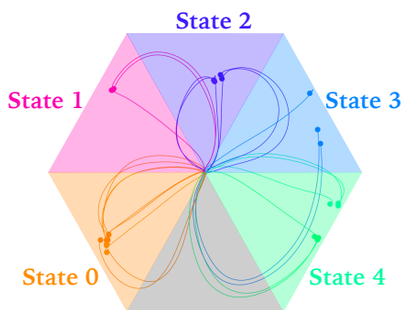
Reaching Trajectories



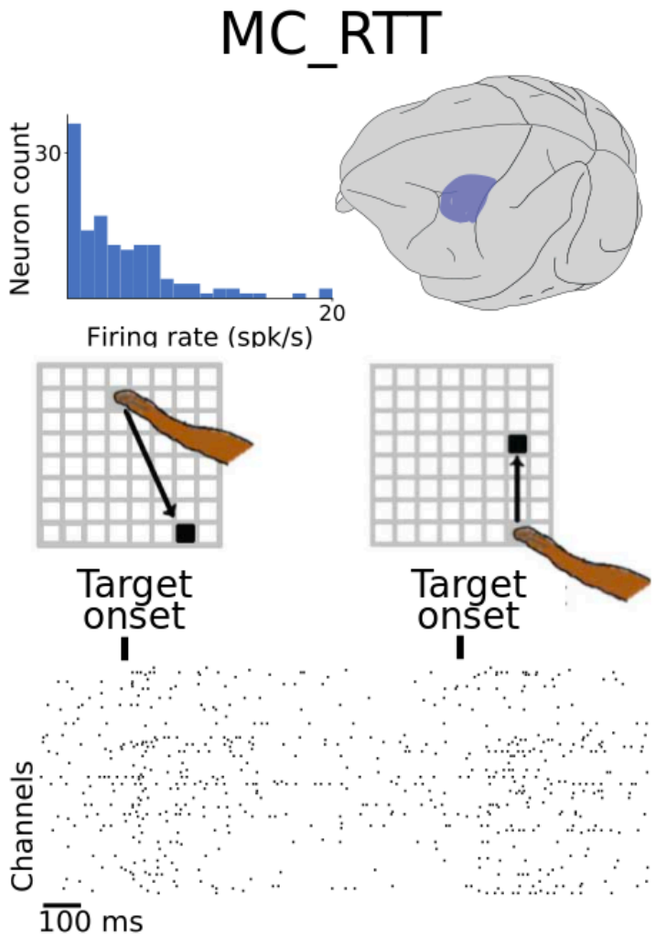
Continuous Decoding



Discrete Decoding

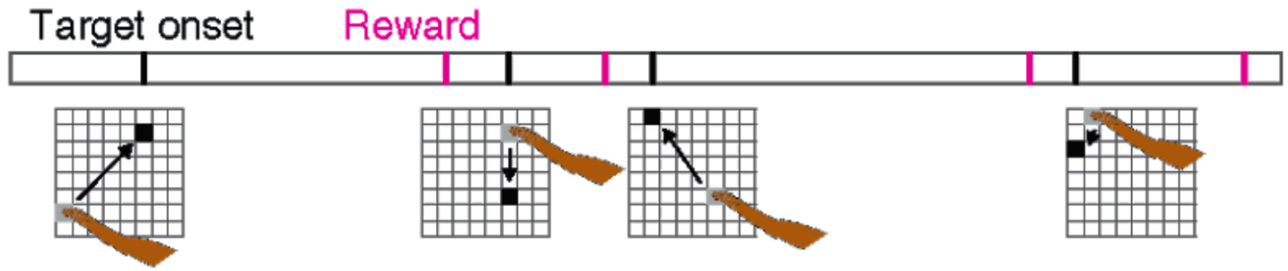


MC_RTT - Random Target Task Dataset



Paper: ***Superior arm-movement decoding from cortex with a new, unsupervised-learning algorithm***

Experimental Task Structure

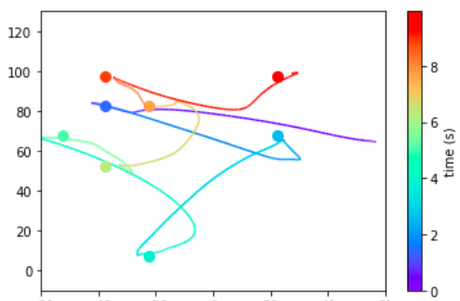


Subject reached continuously between randomly selected elements of an 8x8 grid. This task design differs significantly from typical reaching task (e.g. MC_Maze)

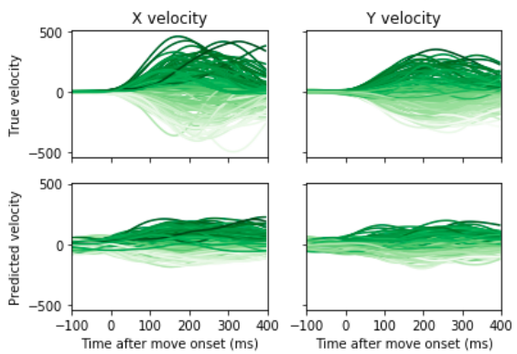
- Rich set of "straight" reaching: reach may be initiated from any location on the 8x8 grid
- Lacking clear trial structure, pre-movement delay periods for preparation

Neural Decoding Problem

Reaching Trajectories

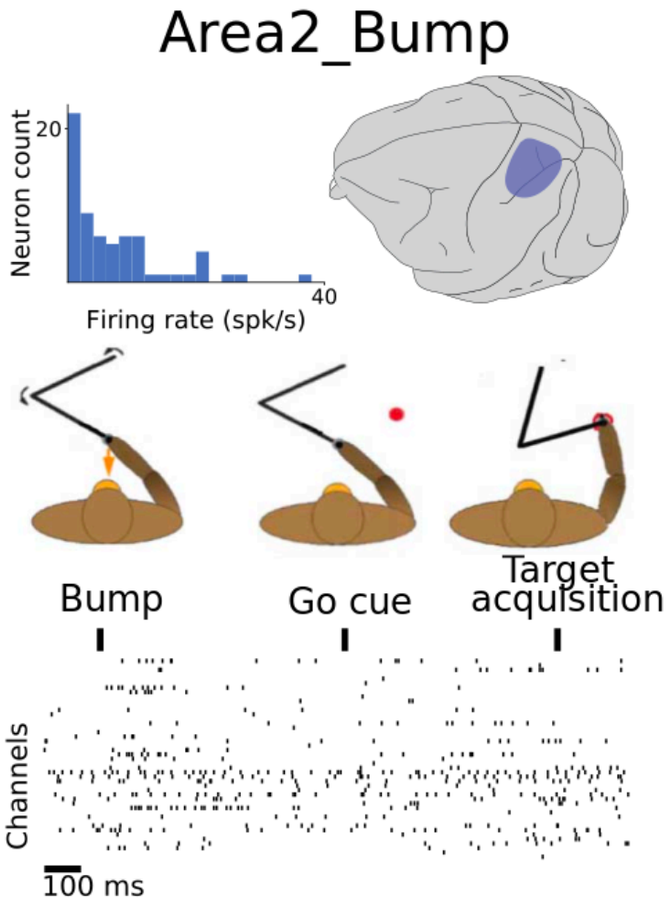


Continuous Decoding



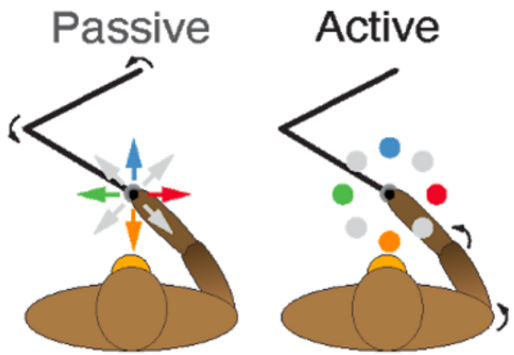
Discrete Decoding

Area2_Bump - Arm Reach With Perturbation Task Dataset



Paper: *Area 2 of primary somatosensory cortex encodes kinematics of the whole arm*

Experimental Task Structure

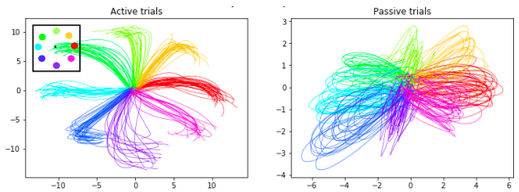


Subject performed 8 target center out reach with perturbation. This task design differs from typical reaching task (e.g. MC_Maze) in passive condition

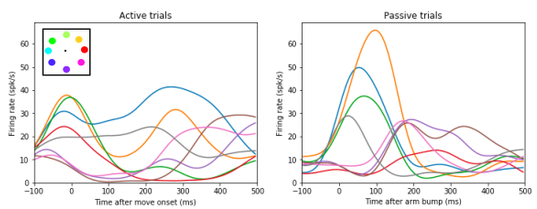
- In the passive trials, the manipulandum bumped the monkey's arm in the direction of one of the targets, forcing the monkey to correct and return the cursor to the center
- In the active trials, the monkey are performing the usual center-out reach

Neural Decoding Problem

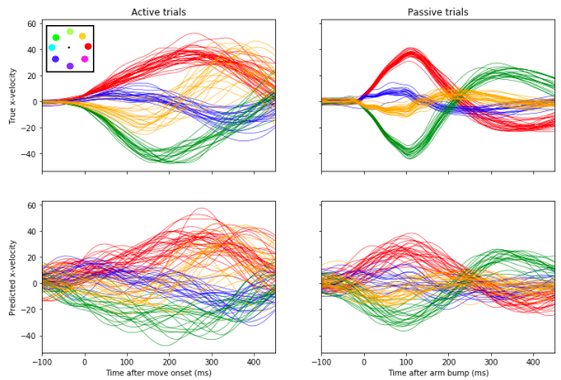
Reaching Trajectories



Neural PSTH

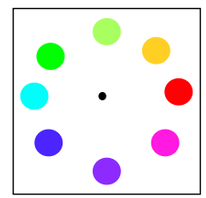


Continuous Decoding

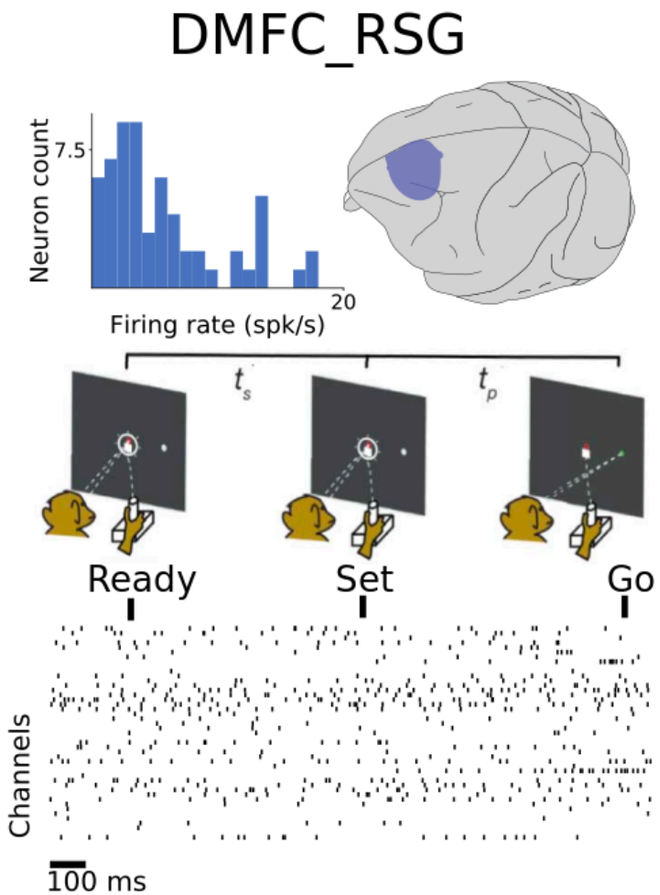


Discrete Decoding

1) **Active vs. Passive State**
2) **Reach target separate for active / passive state**
3) **Reach target for combined active and passive state**

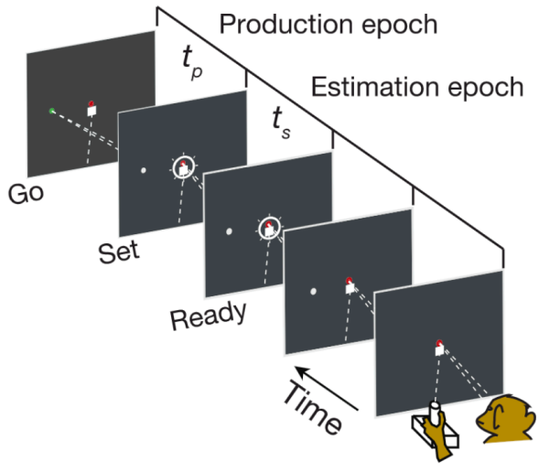


DMFC_RSG - Cognitive Timing Task Dataset



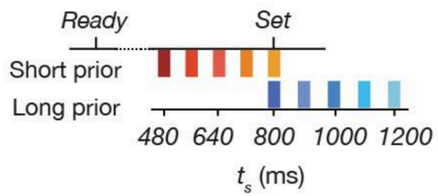
Paper: ***Bayesian computation through cortical latent dynamics***

Experimental Task Structure

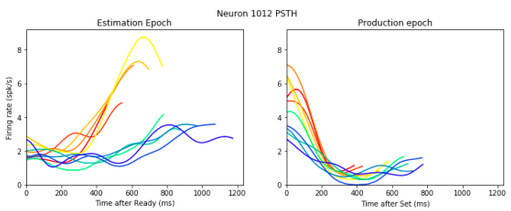


Neural Decoding Problem

Timing (t_s) conditions



Neural PSTH

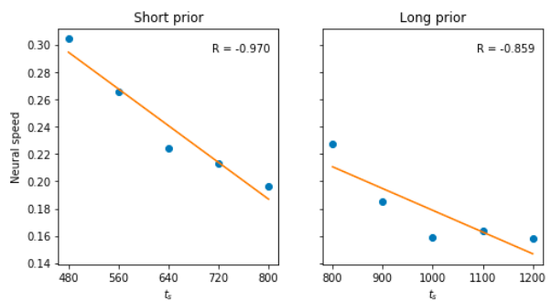


Subject performed time interval reproduction task (ready-set-go).

- Monkey is rewarded by how close t_s (sampling interval) is to t_p (response interval)
- **Sapling interval t_s**: monkey resent with two visual cues ('Ready' and 'Set') separated by time interval t_s
- **Response interval t_p**: Performing action (joystick movement or eye saccade) after the 'Go' cue.

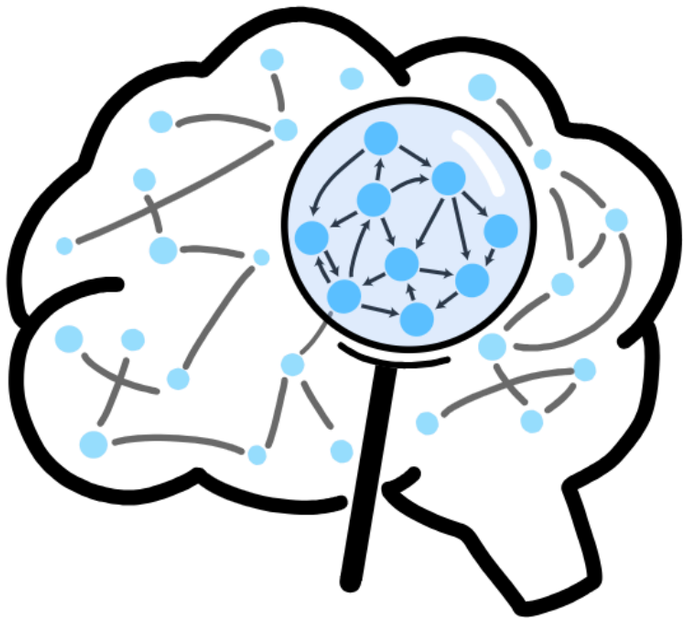
Discrete Decoding

1) **Predict 8 t_s state with neural speed (average rate of change)**
2) **Predict 8 t_s state with neural firing rate (FR)**
3) **Predict 2 action state (joystick movement / eye saccade) with FR**



Acknowledgement

Neural Latents Benchmark



A Benchmark for Models of Neural Data

Neural Latent Challenge

https://neurallatents.github.io/challenge

Neural Latents Benchmark '21: Evaluating latent variable models of neural population activity

Felix Pei[1]*, Joel Ye[1,2]*, David Zoltowski[4], Anqi Wu[1,5], Raeed H. Chowdhury[6], Hansem Sohn[7], Joseph E. O'Doherty[8], Krishna V. Shenoy[9], Matthew T. Kaufman[10], Mark Churchland[5], Mehrdad Jazayeri[7], Lee E. Miller[11], Jonathan Pillow[4], Il Memming Park[12], Eva L. Dyer[1,3], Chethan Pandarinath[1,3]†

[1]Georgia Institute of Technology,[2]Carnegie Mellon University, [3]Emory University, [4]Princeton University,[5]Columbia University,[6]University of Pittsburgh, [7]Massachusetts Institute of Technology,[8]Neuralink Corp.,[9]Stanford University, [10]University of Chicago,[11]Northwestern University, [12]Stony Brook University