Neural representation of allocentric and egocentric positions in a dynamic foraging task

Jiaxin Cindy Tu (tu000030@umn.edu), Seng Bum Michael Yoo, Benjamin Y. Hayden

Department of Neuroscience, University of Minnesota, Minneapolis, MN

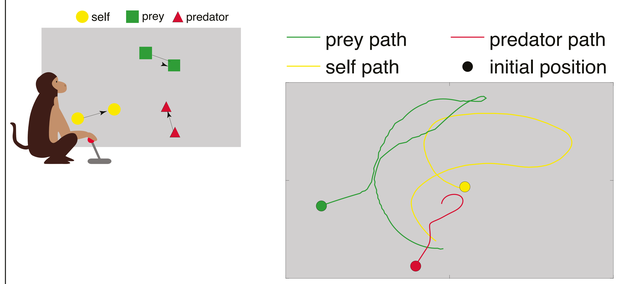
Introduction

- Dorsal anterior cingulate cortex (dACC) has been suggested to involve in mapping context to strategy and monitoring short-term goals (Helibronner & Hayden, 2016).

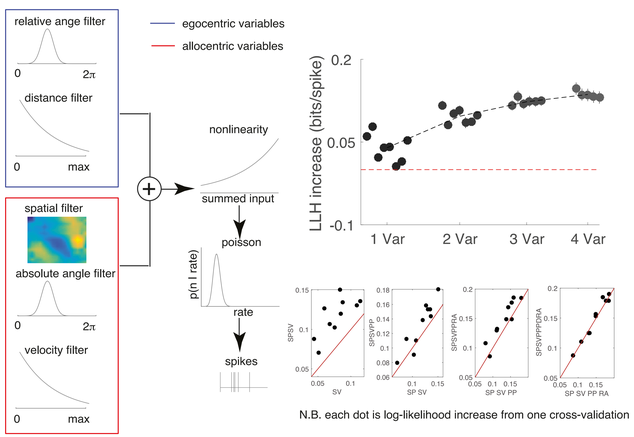
- We used a virtual pursuit task, where multiple variables have to be simulataneously monitored, to investigate the spatial representation of dACC in allocentric and egocentric frames.

- We also asked the whether position in future was signalled in dACC.

Virtual Pursuit Task



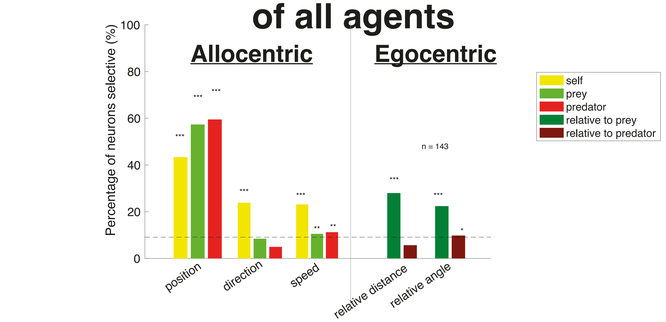
Generalized Linear Model

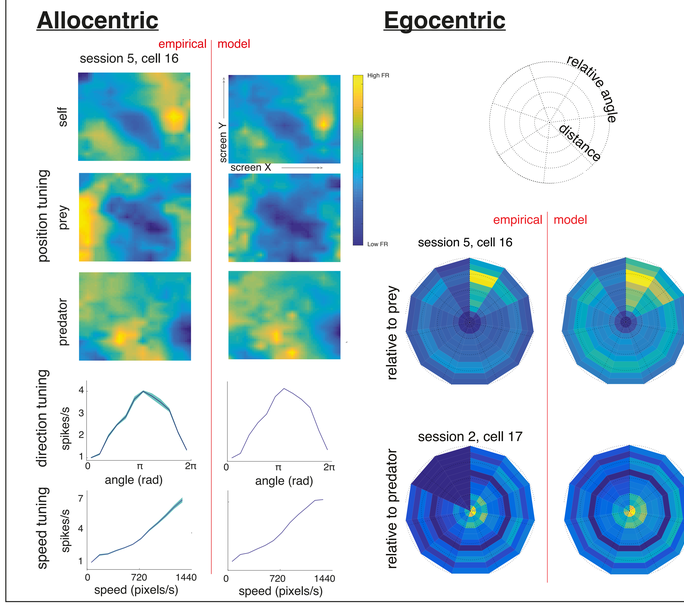


N.B. each dot is log-likelihood increase from one cross-validation

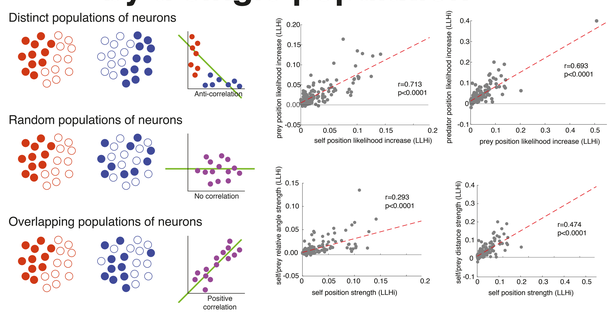
Pillow, J. W. et al. Nature 454, 995 (2008).

dACC neurons tracks spatial position of all agents



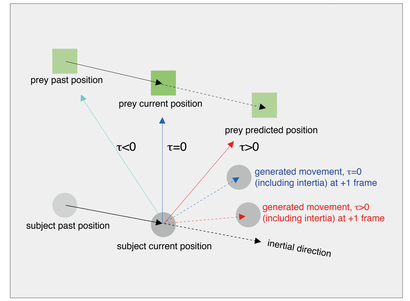


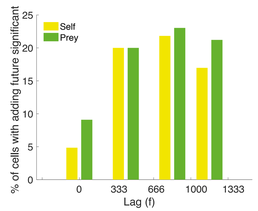
Multiple positional variables are encoded by a single population

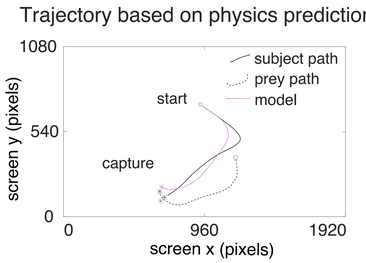


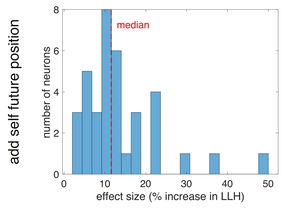
Azab, H. & Hayden, B. Y. PLOS Biology (2017).

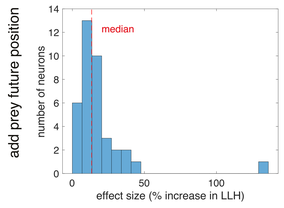
monkey and dACC neurons anticipate future position











Yoo, S. B. M., Piantadosi, S. T. & Hayden, B. Y. bioRxiv (2018).

Summary

- We found dACC neurons tracking allocentric and egocentric representation of agent positions in a virtual pursuit task.

- An overlapping population of neurons encode multiple positional variables.

- dACC neurons signal about the future position, in addition to the current position.