

Kyle Dunovan

COMPUTATIONAL COGNITIVE NEUROSCIENTIST

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“Shout your own name” - James Acaster

Summary

I am currently a Postdoctoral fellow in the Verstynen Cognitive Axon Lab at Carnegie Mellon University. My overarching goal is to understand the cognitive algorithms that drive adaptive behavior, as well as the neural circuits from which they emerge. I use a variety of tools to explore these questions but am a theoretician in my heart of hearts with a fondness for neural networks, reinforcement learning, and drift-diffusion models. If I'm not in the lab I'm either writing/recording music or messing with UI design.

Training

Postdoctoral Researcher

CARNEGIE MELLON UNIVERSITY

Pittsburgh, PA

2017 - PRESENT

PhD in Cognitive Neuroscience

UNIVERSITY OF PITTSBURGH

Pittsburgh, PA

2011 - 2017

BS in Neuroscience

UNIVERSITY OF NEBRASKA AT OMAHA

Omaha, NE

2009 - 2011

Publications

2018

1. **Dunovan, K**, Vich, C., Clapp, M., Verstynen, T. & Rubin, J. *Reward-driven changes in striatal pathway competition shape evidence evaluation in decision-making*. *bioRxiv* (2018).
2. Peterson, E. J., Müyesser, N. A., Verstynen, T. & **Dunovan, K**. *Keep it stupid simple*. *arXiv:1809.03406* (2018).
3. **Dunovan, K** & Wheeler, M. E. *Computational and neural signatures of pre and post-sensory expectation bias in inferior temporal cortex*. *Scientific reports* **8**, 13256 (2018).
4. Agarwal, A., Kumar, A., **Dunovan, K**, Peterson, E., Verstynen, T. & Sycara, K. *Better Safe than Sorry - Evidence Accumulation Allows for Safe Reinforcement Learning*. *arXiv:1809.09147* (2018).
5. Müyesser, N. A., **Dunovan, K** & Verstynen, T. *Learning model-based strategies in simple environments with hierarchical q-networks*. *arXiv:1801.06689* (2018).

2017

6. **Dunovan, K** & Verstynen, T. *Errors in action timing and inhibition facilitate learning by tuning distinct mechanisms in the underlying decision process*. *bioRxiv*, 204867 (2017).
7. **Dunovan, K**. *A biologically motivated synthesis of accumulator and reinforcement-learning models for describing adaptive decision-making*. *PhD thesis, Univ. of Pittsburgh* (2017).

2016

8. **Dunovan, K** & Verstynen, T. *Believer-Skeptic meets Actor-Critic: Rethinking the role of basal ganglia pathways during decision-making and reinforcement learning*. *Frontiers in neuroscience* **10**, 106 (2016).

2015

9. **Dunovan, K**, Lynch, B., Molesworth, T. & Verstynen, T. *Competing basal ganglia pathways determine the difference between stopping and deciding not to go*. *eLife* **4**, e08723 (2015).

2014

10. **Dunovan, K**, Tremel, J. J. & Wheeler, M. E. *Prior probability and feature predictability interactively bias perceptual decisions*. *Neuropsychologia* **61**, 210–221 (2014).

Posters

Cognitive Computational Neuroscience (CCN)

Philadelphia, PA

PRESENTER* & CO-AUTHOR

2018

- Dopaminergic changes in striatal pathway competition modify specific decision parameters*
- Combining heuristics with counterfactual play in reinforcement learning
- Value-conflict and volatility influence distinct decision-making processes

Computational & Systems Neuroscience (COSYNE)

Denver, CO

PRESENTER* & CO-AUTHOR

2018

- Dopaminergic changes in striatal pathway competition modify specific decision parameters*
- Interpretable model-based strategies arising from hierarchical neural networks

Society for Neuroscience (SfN)

LA · CA · DC

PRESENTER*

2014-2016

- A biologically-constrained hybridization of reinforcement learning and accumulator models for adaptive decision-making*
- The difference between stopping and deciding not to go: behavioral, imaging and modeling evidence*
- Prior expectations bias hemodynamic activity before and during perceptual decisions: DDM and fMRI*
- Transient prior probabilities affect choice bias during temporally extended perceptual decision-making*

Software

Race Against Drift-Diffusion Model (RADD)

PYTHON PACKAGE FOR FITTING COGNITIVE MODELS OF CONTROL

- Github Repo
- Binder Demo

Jupyter-Themes

PYTHON PACKAGE FOR CONTROLLING JUPYTER NOTEBOOK AESTHETICS

- Github Repo
- Binder Demo

Teaching

Neural and Cognitive Models of Adaptive Decision Making

Carnegie Mellon

CO-INSTRUCTOR

Fall 2018

- Course code and resources

Cognitive Psychology Lab

University of Pittsburgh

INSTRUCTOR

Spring 2014

Mentoring

Matthew Clapp

University of S. Carolina

BIOENGINEERING

2017 - PRESENT

- Advised student while working on this **co-authored paper**
- Co-sponsored student's **uPNC** fellowship (**poster**)

Alp Muyesser

Carnegie Mellon

MATHEMATICS

2016 - 2018

- Served as primary advisor on the student's first-authored **pre-print**
- Co-sponsored student's **uPNC** fellowship and research project (**poster**)

Jaqueline Hon

Carnegie Mellon

NEUROSCIENCE

2017

- Advised student on several data collection and analysis projects

Jeremy Huang

Carnegie Mellon

COMPUTER SCIENCE

2016

- Advised student on a model-fitting optimization project (**Github Repo**)

Brian Krainer

Carnegie Mellon

COGNITIVE & COMPUTER SCIENCE

2014-2016

- Co-sponsored student's **uPNC** fellowship and research project
- Advised student on several data analysis and modeling projects

Honors & Awards

CNBC McClelland Award

BEST STUDENT PAPER

Pitt & CMU

2016

Graduate Student Representative

PSYCHOLOGY DEPT.

Pitt

2012

Multimodal Neuroimaging Training Program

INTENSIVE FMRI TRAINING PROGRAM

Pitt

2011