Erik J. Peterson, PhD

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About me

I'm a scientist with machine learning expertise. I've worked in both industry and academia. I have experience studying curiosity, play, and open-endedness in reinforcement learning. I am presently focused on designing new systems for automated causal reasoning in complex systems.

Recent Experience

Pastuer Labs - New York, NY
Senior Research Scientist **2022 - Present**
I am a technical lead building systems for automated causal reasoning on complex, multi-part, problems in physical science.

Carnegie Mellon University - Pittsburgh, PA
Research Fellow (Research Scientist) **2018 - 2022**
I developed a mathematical accounts of play and curiosity for use in reinforcement learning (Github) and multi-agent systems (Github). I also established new fundamental limits for astrocyte computation.

Kernel, LLC - Los Angeles, CA
Research Scientist **2017 - 2018**
I was the technical lead building a system for complex spatio-temporal field shaping in deep brain stimulation. This project blended biophysical modeling with deep neural networks and led to 400,000 fold speed up – a key requirement for *real-time* use.

U.C. San Diego - San Diego, CA
Postdoctoral Fellow **2014 - 2017**
I conducted theoretical research on the coding properties of neural oscillations. I also co-lead development of a python tool to analyze electrophysiological data which has found widespread use in the neuroscience community.

Education

Colorado State University, Fort Collins, CO
Ph.D, Psychology **2012**
California Polytechnic State University, San Luis Obispo, CA
B.S., Chemistry and Biochemistry; Minor, Philosophy **May 2004**

Programming

Python
Core ML - Linear methods to deep neural nets - {*pytorch*, *ray*, *sklearn*} **Expert**
R
Core DS - Visualization, analysis, and statistical testing - {*tidyverse*} **Expert**

Projects

The Exploration Book (Github)
Authoring a book on exploration in biology, ranging from random search, to reinforcement learning, to curiosity, imagination, and reasoning. I developed a python package (Github) to make it easy to explore exploration.

Press & Public Talks

Brain's 'Background Noise' May Hold Clues to Persistent Mysteries, *Quanta Magazine*, 2021.
Build Your Own Brainwaves, *Nerd Nite*, Los Angeles, Feb 2018.
Conflicted Data Science, *Open San Diego*, San Diego, Feb, 2016.
In Theory You're Paying Attention, *Ignite*, San Diego, Nov 2016.

Select publications

Donoghue T*, Haller M*, **Peterson EJ***, et al, Parameterizing Neural Power Spectra into Periodic and Aperiodic Components, *Nature Neuroscience* 23 1655-1665 (2020). [*]: Co-first.

Peterson EJ & Verstynen T, Curiosity eliminates the exploration-exploitation dilemma, *bioRxiv* 671362v8 (2020).