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'm currently interested in curiosity and causality for use in artificial intelligence, and as mathematical ideas. I'm also very interested in unconventional kinds of computation in biology.

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).