Erik J. Peterson, PhD

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About me

I study curiosity as a mathematical idea, for use in machine learning, and to predict and influence human behavior. I am interested in physical applications as well, using curiosity and reinforcement learning in robots, drones, and design. Academically I study computation in the brain's other electrically active cells, astrocytes.

I am looking for a leadership role – in industry or academia.

Recent Experience

Carnegie Mellon University - Pittsburgh, PA
Research Fellow (Research Scientist) **2018 - Present**
I developed a theoretical account of curiosity, and applied it to both machine learning applications (Github), and used it to predict human (and other animal's) behavior. This work has applications in aiding human-agent teams, multi-agent systems (Github), robotics, automated drone flight, and in automated design.

Kernel, LLC - Los Angeles, CA
Senior Research Scientist **2017 - 2018**
I was the technical lead building a *real-time* system for complex spatio-temporal field shaping, in deep brain stimulation. This project blended biophysical modelling 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 verified theoretical predictions using biophysical modelling, and experimental data. This project required extensive use of information and compression theory. 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 - {*pytorch*, *ray*, *sklearn*} **Expert**

R
Core DS - {*tidyverse*} **Expert**

Projects

The Exploration Book (Github)
Authoring a book on exploration in biology, ranging from random search, to reinforcement learning, to curiosity, imagination, to 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).