

Academic Goals and Research Direction Statement

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Aug 29, 2026

Plans and motivations: I seek to understand intelligence, both natural and artificial, and to apply that understanding to the development of technologies and scientific discoveries that have a positive influence on people's lives. I graduated this Spring from the College of William and Mary, and am spending the coming months preparing for and applying to MS & PhD programs for admission in Spring or Fall 2027, where I will study AI, neurobiology, and computational neuroscience. I intend to complete a PhD and perform research on intelligence from a biological and computational perspective.

Research direction: My intended thesis/dissertation work is in biologically plausible artificial intelligence. Specifically, I'll research spiking neural networks (SNNs) trained with reinforcement learning, investigating the extent to which they can emulate (or fail to emulate) the activity of real neurons—I believe topological data analysis is a rigorous and promising quantitative means of comparison between the two. (*tentative*)

Background: BS in computer science, with a concentration in machine learning and AI and a minor in biochemistry from the College of William and Mary. Coursework most relevant to my research direction was *Neural Networks for Machine Learning*, *Neurobiology*, and *Topological Data Analysis*.

Prior work: In my neural networks class I led a team of 7 classmates consulting for Kenai National Wildlife Refuge on a computer-vision system to identify individual brown bears from camera-trap footage. I directed development of a pose-estimation model to create a profile of a bear's walking gait, which could subsequently be used by a classification model to identify the bear. Our model did not reach usable accuracy, but quantitative analysis of the footage identified the key bottlenecks to be the quantity and diversity of labeled training examples rather than the model architecture. I delivered a report to the Kenai team with recommendations for future work and a custom script to enable remote collaboration on data labeling. Diagnosing why the model failed, and communicating this to the Kenai researchers taught me what real progress on a complicated problem looks like.

What I'm looking for: A MS program providing an on-ramp to real research and an eventual PhD, or to go directly to a PhD program. My primary considerations are the fit of the program with my interests—primarily AI and computational neuroscience—and opportunities to contribute to research related to my intended research direction or neuroAI in general.

What I can do: Programming with Python, Pytorch, Tensorflow, C, C++, CUDA, and much more. I have experience building and debugging AI training pipelines, data cleaning, and reproducing published results. I can read and interpret technical literature, have a strong background in chemistry and biology, and can work independently as well as collaborate on complex projects. Visit my website where you can find my CV and github page to learn more.