

Evolutionary and Adaptive SYstems (EASY) Research Lab - Dr. Jason Yoder

My research interests lie in the interaction between cognitive science, biology, and computer science. Specifically, I am interested in computer models of biological phenomena, especially those applied to imitating intelligent or lifelike behaviors both in the pursuit of knowledge (science) and problem-solving (engineering). In many of these areas of research, evolutionary algorithms (EAs) are utilized, which imitate key elements of the process of biological evolution such as mutation, selection, and inheritance across a population of individuals. Artificial Neural Networks (ANNs) are another primary component in many of my research projects. I have ongoing research projects and interests in modeling [evolutionary development](#), [evolvable hardware](#), and [developmental neural networks](#). I also have broader interests in many subdomains of [artificial life](#).

CSSE220 - Genetic Algorithm Research Project (GARP)

In the course CSSE220, there is an option for a final project in which you create your own Genetic Algorithm simulator which you can use to try to evolve solutions to problems as encoded as bitstrings (sequences of 1s and 0s). Many students who chose to work on this project later pursued research with me in related areas. If you have not yet taken CSSE220, I would strongly encourage you to consider selecting the GARP (Genetic Algorithm Research Project) when you do, if you are interested in any of my research.

- Introductory/Motivational Resources
 - [Introduction to Artificial Life for People who Like AI](#)
 - [Computers Evolve a New Path Toward Human Intelligence](#)
 - [Open-endedness: The last grand challenge you've never heard of](#)
 - [Quality-Diversity optimization algorithms](#)
- Recent/Active Research Areas:
 - Video: [Resurrecting FPGA Intrinsic Evolvable Hardware \(ALIFE 2021\)](#)
 - Paper: <https://direct.mit.edu/isal/proceedings/isal/106/102975>
 - Video: [Modeling Evolutionary Development with Indirect Encodings on Dynamic NK Fitness Landscapes \(ALIFE 2023\)](#)
 - Paper: https://direct.mit.edu/isal/proceedings-pdf/isal/35/113/2149142/isal_a_00679.pdf
 - Poster: [Poster](#)
 - Video: [Evolution of Developmental Strategies in NK Fitness Landscapes - \(ALIFE 2022\)](#)
 - Paper: <https://direct.mit.edu/isal/proceedings/isal/34/59/112288>
 - Video: [Biology Inspired Growth in Meta-Learning - \(GECCO 2022\)](#)
 - Late Breaking Abstract: <https://dl.acm.org/doi/abs/10.1145/3520304.3533945>
 - Paper: [Reinforcement Learning for Central Pattern Generation in Dynamical Recurrent Neural Networks](#) (Frontiers: Computational Neuroscience 2022)
- Additional Research Projects with Undergraduate Students
 - Algorithmic Generation of Pots for DNA Self-Assembly (Jacob Ashworth, 23-24)
 - Self-Aware Developmental Neural Networks (D. Gottlieb, D. Luttrell, J. Fiorito, H. Wang, 23-24)
 - Multitasking Artificial Neural Networks with Evolved Activity Dependence (Y. Zhang, 22-23)
 - Co-Development of Brain and Body (Cooper Anderson, 21-23)
 - Quality Diversity for Generative Adversarial Networks (Mingyang Cai, 21-23)
 - An Agent-Based Model of Loneliness (David Gottlieb, 21-22)
- Google Scholar Profile
 - [Jason Yoder - Google Scholar](#)