Matthew Retchin

mhr2145@columbia.edu | 804.339.7760

Education

Columbia University
MS in Computer Science
Feb 2021 - Present | New York, NY
Cum. GPA: 3.76/4.00

BA in Computer Science
Dec. 2020 | New York, NY
Cum. GPA: 3.66/4.00

Columbus Academy
May 2016 | Columbus, Ohio

Links

https://mhr.github.io
GitHub:// **mhr**

Coursework

Graduate
Thesis Writing
Robot Learning
Analysis of Algorithms
Parallel Functional Programming

Undergraduate
Robotics
Computer Science Theory
Natural Language Processing
Artificial Intelligence

Skills

Programming Languages
Python • Java • JavaScript/Node.js •
Haskell • C/C++ • Bash/Shell • SQL •
HTML • CSS • C#/Unity • HLSL
Shader Language • LaTeX

Libraries
PyTorch • JAX • NumPy/SciPy •
Matplotlib • Scikit-Learn • Keras

Software
Unity3D • Blender

Interests

Piano • Guitar • Creative Writing •
Cycling • Kayaking

Research Experience

COLUMBIA ARTIFICIAL INTELLIGENCE AND ROBOTICS LAB
Koopman Differentiable Model Predictive Control
Feb. 2021 - Present | New York, NY

- Developing a novel neural network architecture in PyTorch for box-constrained model predictive control using Koopman operator theory.
- Unlike prior baselines, training provably converges and can swap constraints at test time without any retraining necessary.
- Researching the use of this architecture with classic control tasks such as Actuated Pendulum and Differential Drive where system dynamics are completely unknown to the controller.

KRIEGESKORTE VISUAL INFERENCE LAB
Visual Concept Learning in Artificial Neural Networks
Feb. 2019 - Nov. 2019, Aug. 2020 - Jan. 2021 | New York, NY

- Created Flying Objects, an interactive psychophysics video game framework that tests object permanence / working memory. Humans can interact using mouse and keyboard, neural net via API.
- Published in the Conference on Cognitive Computational Neuroscience.
- Currently a foundation for a major research direction in the Kriegeskorte lab.
- Reviewed and presented literature on neural network architectures with object oriented inductive biases.

PHILIPS RESEARCH NORTH AMERICA
Natural Language Processing & Computer Vision
June 2018 – Aug 2018 | Cambridge, MA

- Created neural image captioning algorithm for radiology using PyTorch.
- Built pipeline to extract textual, image features via sentence parsing, word embedding, and image augmentation with NLTK, Gensim, NumPy/SciPy.

MIT DEPARTMENT OF BRAIN AND COGNITIVE SCIENCES
Speech Recognition
Jul 2017 – May 2018 | Cambridge, MA

- Implemented algorithms for statistical analysis, monkey speech recognition, and an ETL pipeline using Keras, SciPy, and the HDF5 serialization format.

Awards

Spring 2017, Spring 2019, Fall 2019, Fall 2020 | Dean's List
2020 | Columbia Engineering Ignition Grant for COVID-19 Tracing App

- Ignition Grants are financial grants to assist Columbia University students in launching new businesses, social and not-for-profit ventures.

2017 | Hult Prize Regional Finalist

- Chosen as one of 300 Regional Finalists of over 50,000 team applicants (Undergraduates, MBAs, and Graduates) from around the world.
- Created a social enterprise to provide opportunities to refugee populations, competing for $1 million in seed funding.

2015 | Best of Category, Computational Biology at International Science and Engineering Fair (ISEF)

- Placed overall top 20 of over 1300 projects at the largest international science competition.