Braden Hoagland

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EDUCATION

Duke University (expected May 2022)
GPA: 3.98/4.0, B.S. Mathematics with Distinction

Undergraduate courses: Advanced Probability, Data Structures and Algorithms, Dynamic Graph Percolation (Indepenent Research Study), Differential Geometry, Geometry, Mathematical Numerical Analysis, Mathematical Disease Modeling, Topology, Topological Data Analysis

Graduate courses: Algebraic Structures, Algebraic Topology, Real Analysis, Theory and Algorithms for Machine Learning

WORK EXPERIENCE

Duke Program for Research for Undergraduates (PRUV) *Summer 2021*
Paid Student Researcher

- Collaborated with Professor Rick Durrett, using scaling theory to determine percolation behavior of graphs in which edges are added stochastically.
- Computed explicit quantities and variance estimates for a general class of edge selection processes called two-choice rules.

MKGCS, Inc. *Summer 2020 - Spring 2021*
Data Analyst

- Created a predictive Markov model of U.S. Army Reserve retention, promotion, and relocation in order to forecast personnel changes and mission readiness status.
- Used model to consult the U.S. Army G-3 about future batallion deployments.

Decipher Technology Studios *Summer 2018 - Summer 2019*
Machine Learning Intern

- Developed a reinforcement learning pipeline to predict and manage cloud microservice performance.

PROJECTS

Mathematics

Spectral Sequences:

- Constructed spectral sequences from exact couples and filtered complexes of modules.
- Derived convergence results for the case of filtered complexes and applied them to the calculation of homology groups.

The Natural Gradient and Reinforcement Learning:

- Derived the natural gradient for metric spaces, realizing it as the Fisher Information Matrix in probability space.
- Applied the natural gradient to policy improvement in reinforcement learning, empirically showing greater efficiency.

Machine Learning

ChaRLes:

- Created a reinforcement learning library for both discrete and continuous simulated environments.
- Implemented deep Q-networks, policy gradients, advantage actor-critic, proximal policy optimization, (twin dueling) deep deterministic policy gradient, and soft actor-critic.

Gandalf:

- Designed various generative adversarial network schemes to create generative models for custom datasets.

Glados:

- Formulated a deep recurrent neural network to generate artificial extensions of sample text.

SKILLS

Mathematical: Category theory, homological algebra, probabilistic modeling and analysis, topology and geometry
Programming: Git, HTML, Javascript, MATLAB, Python, React.js