Owen Hughes

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EDUCATION

B.S. IN MATHEMATICS

University of Michigan
Expected Apr. 2021 | University of Michigan, MI
GPA: 3.84

PIONEER HIGH SCHOOL

Grad. May 2016 | Ann Arbor, MI

COURSES

GRADUATE

Math 602: Real Analysis II
Math 558: Advanced Ordinary Differential Equations and Dynamical Systems
Math 547: Probabilistic Models in Bioinformatics: The 4D Nucleome
Math 568: Mathematical & Computational Neuroscience

NON-COURSEWORK TRAINING

ROAHM Lab Summer Group Meeting Lectures on Differential Geometry (2017)

Using *Smooth Manifolds* by John Lee as source material, the Ph.D. students and I alternated giving lectures on elementary differential geometry, with a particular emphasis on Lie Groups and Algebras.

ROAHM Lab Summer Group Meeting Lectures on Numerical Optimization (2018)

Using *Numerical Optimization* by Nocedal and Wright as a source text, the Ph.D. students and I alternated giving lectures and jointly doing exercises from the book, with particular emphasis on Interior Point methods.

ROAHM Lab Summer Group Meeting Lectures on Deep Learning (2018)

During the latter half of the summer, the Ph.D. students and I implemented different kinds of neural networks (including RNNs, CNNs, and LSTM networks) using tensorflow and alternated giving lectures on the mathematics behind them.

SKILLS

PROGRAMMING

Significant Experience:
Python • MATLAB • C++ • Java
Unix/Linux • LaTeX
Familiar:
Javascript • Ruby • Haskell • OCaml

I am readily able to learn a new programming language if a project requires it.

MATHEMATICS

Dynamical Systems
Optimization
Computational Modeling

RESEARCH EXPERIENCE

ROAHM LAB| | Research Assistant

May 2016-Current | University of Michigan

- I work as a research assistant under Professor Ramanarayan Vasudevan in the Mechanical Engineering Department.

RESEARCH PROJECTS

PEDESTRIAN PREDICTION (2016-2017)

- I wrote a python implementation of a mathematical model which leverages Probabilistic Graphical Models to forecast pedestrian movement with limited data.
- I optimized the code to show that the algorithm scales sufficiently well to be used in real time. I ran analyses to compare our model's implementation against the existing state of the art, and generated figures for the paper.
- I participated significantly in the revision process of the paper.
- The code can be found here.

MAXIMUM ENTROPY IN LOCOMOTION (2017-2018)

- I Designed mechanical systems and worked with the Pozyx (pozyx.io) sensors to design a mechanical system that could generate spatial trajectories that replicate the entropy distributions that come from different types of small mammals. The system will be used by the postdoctoral fellow I am collaborating with to test a hypothesis in evolutionary biology.
- I used gradient-free optimization to inform the types of motion that my mechanical system needed to generate in order to replicate the required trajectories.

ALFONSLESS PROJECT (2018)

- I wrote MATLAB code to translate human-readible Sums-of-Squares optimization problems into a form that can be solved by the Alfonso solver similar to the Spotless software package.
- My code can be found here

PUBLICATIONS

H. O. Jacobs, **O. K. Hughes**, M. Johnson-Roberson, and R. Vasudevan, "Real-Time Certified Probabilistic Pedestrian Forecasting" in *IEEE Robotics and Automation Letters*, vol. 2, no. 4, pp. 2064–2071, 2017.

TECHNICAL TALKS

- Michigan Robotics Colloquium (9/18/2017)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (9/26/2017)
  I created and the gave the presentation based on our RA-L paper on pedestrian prediction at the 2017 IROS conference.