

Education

University of Michigan

Ann Arbor, MI

Bachelor of Science in Engineering in Computer Science; GPA:3.48 Sep. 2013 – May 2017

- Notable Courses: Machine Learning, Artificial Intelligence, Computational Neuroscience, Agent Based Modeling, Game Theory, Theory of Complex Systems, Cryptography, Computer and Network Security, Computer Architecture and Organization, Theory of Computation, Programming and Data Structures, Data Structures and Algorithms
- Minor in Complex Systems; *GPA:4.0*

Publications

Control of Memory, Active Perception, and Action in Minecraft

ICML '16

Junhyuk Oh, Valliappa Chockalingam, Satinder Baveja, Honglak Lee

Experience

Preferred Networks

Tokyo, Japan

*Research Intern**Jul. 2017 - Oct. 2017*

Supervised by: Toshiaki Kataoka and Brian Vogel

- Read up on Multiagent and Multitask Deep Reinforcement Learning
- Focused on generalization of Multitask Deep RL agents in a setting where Language acts as an Inductive Bias
- Conducted experiments with novel agents in various procedurally generated environments

University Of Michigan

Ann Arbor, MI

*Directed Independent Study Researcher**Sep. 2016 – Dec. 2016*

Supervised by: Professor Satinder Singh Baveja

- Read papers in hierarchical reinforcement learning and planning
- Developed novel agents that can act and plan at different temporal scales
- Wrote a report for possible later publication

*EECS 445 (Machine Learning) Instructional Aide**Sep. 2016 – Dec. 2016*

- Constructed programming assignments for homework and hands-on lecture sections
- Taught weekly discussion sections and hands-on lecture sections

Microsoft Research

Cambridge, UK

*Research Intern**May 2016 – Aug. 2016*

- Helped with developing the Minecraft AI Platform, Project Malmö, with a focus on building a range of tasks
- Implemented a variety of RL agents (primarily in TensorFlow and Chainer), from traditional RL agents like SARSA- λ to more complex state-of-the-art Deep RL agents like Dueling DQN
- Looked at generalization performance of agents using a difficulty metrics based approach

University Of Michigan

Ann Arbor, MI

*EECS 545 (Graduate Machine Learning) Instructional Aide**Jan. 2016 – Apr. 2016*

- Created Jupyter notebook based lecture slides using Markdown and LaTeX
- Wrote Python programs to demonstrate various Machine Learning concepts

*Machine Learning Research Assistant**Jun. 2015 – Present*

Working with: Professor Honglak Lee, Professor Satinder Singh Baveja, Junhyuk Oh

- Constructing memory based Deep Q-Network architectures: Memory Q-Networks (MQNs), Recurrent Memory Q-Networks (RMQNs), & Feedback Recurrent Memory Q-Networks (FRMQNs)
- Developing agents that can learn to traverse “real-world” like 3-Dimensional environments and perform complex tasks with good generalization capabilities
- Deepening understanding of Deep Learning and Reinforcement Learning research by reading relevant papers
- Gaining experience with programming languages such as Java, Python, and Lua, and Deep Learning packages such as Torch

*EECS 203 (Discrete Mathematics) Instructional Aide**Jan. 2014 – May 2015*

- Managed and answered questions on the online Piazza forum
- Conducted weekly office hours and discussion sections
- Created “challenge” problems for students keen on going “beyond the syllabus”

EdGE Networks

Intern

Bangalore, India

Apr. 2014 - Jun. 2014

- Learned Natural Language Processing techniques
- Worked on developing recommender systems that match résumés to companies through web scraping
- Gained experience with Python packages such as Scikit-Learn, PyBrain, NLTK, and BeautifulSoup

iVista Solutions

Intern

Bangalore, India

Jun. 2012 - Aug. 2012

- Learned to create and manage simple web servers
- Worked with PHP, MySQL, HTML, CSS, and Wordpress as a CMS
- Used what was learned to create and manage a website for a cancer fundraiser marathon

Taneja Aerospace

Intern

Hosur, India

Apr. 2012 - Jun. 2012

- Constructed models for remote controlled airplanes using CAD software
- Used wind tunnels and computer simulations to test the aerodynamics of different models
- Built and tested a RC plane model on an actual runway

Languages

Programming and Markup Languages, and Frameworks: Python, Chainer, PyTorch, TensorFlow, Keras, NumPy, SciPy, Matplotlib, Java, C++, C, LaTeX, Markdown, NetLogo, Lua, Torch, MATLAB, PHP, MySQL, HTML, XML, CSS, JavaScript, Swift, Objective-C, R, Verilog

Languages: English, Tamil, Japanese, Spanish, French, Kannada

Projects

General Video Game Playing with Descriptions: Used Recurrent Deep RL architectures to facilitate feature extraction from game descriptions with an asynchronous advantage actor-critic training scheme for fast multitask learning with language as an inductive bias

Hierarchical Differentiable Planning Networks: Extended on Value Iteration Networks with Options and analyzed inferred reward and value functions with the aim of getting interpretable Markov Decision Process models.

Studying depression and reward processes through Serotonergic neurons: Implemented computer models of Serotonergic neurons using experimental data and past literature, and studied how various parameters affect reward processing and could cause or cure depression.

Anomaly detection in Controller Area Network messages: Looked at how anomalies in the messages traversing vehicles through CAN buses can be detected through stateless one-class Support Vector Machines and stateful time-series based Long Short Term Memory neural networks.

Deep Q-Network based agents with external memory in Minecraft: Used Minecraft Forge, Lua and Torch, to implement memory based DQN agents that can learn to solve different tasks, and a Minecraft Forge Mod that can interact with the agents by providing appropriate visual inputs and reward signals.

Incentivizing exploration with denoising autoencoders for learning to play Atari Games: Built Deep Q-Network agents that predict next state encodings conditioned on action and current state using denoising autoencoders to better handle random aspects of domains like enemies in Atari 2600's Seaquest.

MNIST handwriting recognition: Implemented, from first principles, a backpropagation multilayer perceptron in C++ and Python w/ NumPy to classify handwritten digits from the MNIST database with over 98% accuracy.

Search engine keyword popularity prediction: Used NetLogo to simulate system dynamics of a large network in conjunction with real world statistics obtained from Google Analytics to identify common patterns in keyword popularity.

Social network structure Analysis: Extended on Schelling's experiment using computer models to explain how social groups are formed and how the preferences of people affect underlying social network structure.

Sociopolitical opinion Analysis: Used different complex systems models such as Voronoi maps to find social and political scenarios where the opinions of a group do better than the opinion of a few experts.

Elliptic Curve Cryptosystem: Implemented a cryptographic protocol based on El-Gamal in C++.