Shotaro Ikeda

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Research Goals

I would like to address fundamental issues with reinforcement learning, such as the inadequacies of reward functions, instability in hyperparameter choice, reduction in state space, faster learning in deep methods, and creating a better exploration algorithm. In addition, I wish to apply reinforcement learning to include spatial and temporal awareness to improve existing policies.

Education

2014–Now **BS. Computer Science**, *University of Illinois at Urbana-Champaign*, Urbana, IL.

GPA 3.72/4.0

Graduation May 2018

Research Experience

2017–Now **Undergraduate Research Assistant**, *University of Illinois at Urbana-Champaign*, Urbana, IL.

- Attempted to include spatial awareness into reinforcement learning agents.
- Advised by Professor Alexander Schwing and Jian Peng
- Initially attempted to include Simulanteous Localization and Mapping (SLAM) as stated in *Playing Doom with SLAM-Augmented Deep Reinforcement Learning*. Found inadequacies in speed and flexibility.
- Implemented *Learning to Act by Predicting the Future* in PyTorch.
- Currently doing an in depth study on usefulness of maps.

Work Experience

2015–2017 **Course Assistant**, *CS 196*, Champaign, IL.

- Began as a project manager, overseeing various types of projects such as web, iOS, and machine learning applications.
- During my job as a project manager, I guided my students and mentored their progress.
- Starting from Fall 2016, I took an active leadership role by writing homework problems.
- Held office hours 1 hour every Monday, Tuesday, and Thursday. Engaged students to help them understand class concepts.
- Given lectures on Theory (Spring 2017, Fall 2017), Algorithms (Spring 2017, Fall 2017), Recursion (Spring 2017, Fall 2017), Artificial Intelligence (Spring 2016, Spring 2017), and Machine Learning (Spring 2016, Fall 2017).

Summer 2017 **TDP Intern**, *Capital One*, Richmond, VA.

- Worked as a data engineer.
- Did thorough statistical analysis on two different data collection services.
- Assisted proof of concept for logo recognition using Deep Learning with Keras.
- Provided mentorship to increase validation accuracy from 85% to 96%.

Winter 2016 **Intern**, *Double Sharp Plus Co. Ltd*, Hachiouji, Japan.

- Worked on Japanese Automated Number Plate Recognition (ANPR) system.
- Gained industry and real world computer vision experience.
- Mined custom dataset, using heavy data augmentation.
- Implemented approaches using histogram, Support Vector Machines (SVM) with Local Binary Pattern preprocessing, and Convolutional Neural Network (CNN) in Tensorflow.

2015–2017 **Systems Lead**, *HackIllinois*, Urbana, IL.

- Organizer for University of Illinois' hackathon, HackIllinois across two years.
- In the Spring 2016 hackathon, in charge of a clue-hunt application. Constructed iOS application from scratch and planned the clue hunt.
- In the Spring 2017 hackathon, in charge of iOS application and some backend development using NodeJS.

Projects

2017–Now **DFP-PyTorch**, *Undergrad Research Assistant*, Uni. of Illinois at Urbana-Champaign, Urbana, IL.

- State of the art agent that won ViZDoom AI Competition 2016 (Deathmatch).
- Implemented *Learning to Act by Predicting the Future* (Dosovitskiy, et. al) in PyTorch.
- Implemented general experimentation architecture for future research.

Summer 2017 **FCRN-PyTorch**, *Undergrad Research Assistant*, Uni. of Illinois at Urbana-Champaign, Urbana, IL.

- State of the art Depth Prediction Network.
- Implemented *Deeper Depth Prediction with Fully Convolutional Residual Networks* (Laina, et. al) in PyTorch.
- Provided additional base layers (ResNet-18, ResNet-34) for further experimentation.

Fall 2017 **Does WaveNet Dream of Acoustic Waves?**, Uni. of Illinois at Urbana-Champaign, Urbana, IL.

- Analysis on Google's *WaveNet* understanding speech.
- Found that it constructs a fundamental feature extractor.
- Implemented several patches to Vassilis Tsiaras' implementation of WaveNet, providing data for analysis.

Fall 2017 **LBFGS and Reinforcement Learning**, Uni. of Illnois at Urbana-Champaign, Urbana, IL.

- In depth study comparing *ADAM* and L-BFGS for convergence in deep reinforcement learning.
- Found that L-BFGS is not an in-place replacement for ADAM, and requires very different modules and hyperparameters for convergence.

Spring 2017 **CartPole-DQN**, *Personal*.

- Implemented a Deep Q-Network in PyTorch.
- Experimented with Reward Shaping to provide additional supervision and help convergence.
- Able to increase stability with convergence.

Spring 2017 **Wide Residual Network**, *Personal*.

- A variation of the cutting-edge ResNet architecture.
- Implemented *Wide Residual Networks* (Zagoruyko, et. al) in Tensorflow.
- Obtained 93.9% accuracy training on CIFAR-10.

Spring 2017 **Autoencoders**, *Personal*.

- Implemented a Variational Autoencoder (VAE) and Stacked Denoising Autoencoder in Tensorflow.
- Studied the effects of different activation functions and latent variable sizes affecting the convergence of these models.

Course Work

2014–Now **Undergraduate**, *Uni. of Illinois at Urbana-Champaign*.

- Spring 2015 – CS 125, CS 196-25
- Fall 2015 – CS 173, CS 225, CS 397
- Spring 2016 – CS 233, CS 241, CS 421
- Fall 2016 – CS 374, CS 427, CS 461, CS 498SL3
- Spring 2017 – CS 498AML, CS 473
- Fall 2017 – CS 598PS, CS 544