

ASHISH GAURAV

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Website: deepli.me

Google Scholar: scholar.google.ca/citations?user=5CqEn6YAAAAJ

EDUCATION

University of Waterloo, Canada

M. Math., Computer Science

Sep 2017 - Jan 2020

GPA: 89.75% (3.93/4.0)

Supervisor: Dr. Krzysztof Czarnecki, Professor, University of Waterloo

Thesis: Safety-Oriented Stability Biases for Continual Learning

Abstract: Continual learning is often confounded by “catastrophic forgetting” that prevents neural networks from learning tasks sequentially. In the case of real world classification systems that are safety-validated prior to deployment, it is essential to ensure that validated knowledge is retained. We propose methods that build on existing unconstrained continual learning solutions, which increase the model variance or weaken the model bias to better retain more of the existing knowledge. We investigate multiple such strategies, both for continual classification as well as continual reinforcement learning. Finally, we demonstrate the improved performance of our methods against popular continual learning approaches, using variants of standard image classification datasets, as well as assess the effect of weaker biases in continual reinforcement learning.

Thesis Link: uwspace.uwaterloo.ca/handle/10012/15579

Code: github.com/ashishgaurav13/stability-biases

Birla Institute of Technology Mesra, India

B. Engg., Computer Science

Sep 2013 - Apr 2017

GPA (absolute): 8.95/10.0

First Class with Distinction (Batch Rank: 3 in 137 CS students)

Thesis: A New Sorting Algorithm on OTIS-MOT

Chiranjiv Bharati School, Palam Vihar, India

Primary, Middle and High School

Apr 2001 - Mar 2013

EXPERIENCE

Visiting Researcher, Waterloo AI Group

Location: Waterloo, Canada

Conducted research in reinforcement learning.

March 2020 - current

Research Assistant, Waterloo Intelligent Systems Engineering Lab

Location: Waterloo, Canada

Conducted research in safe reinforcement learning, planning for autonomous driving, continual learning and out-of-distribution detection. Also designed the “high-level behavior planning” module (ROS/C++) for autonomoose, Waterloo’s self driving car project, which led to two successful self-driving demos.

News: uwaterloo.ca/engineering/news/autonomoose-self-drives-itself-past-100-km-mark

Sep 2017 - Feb 2020

Teaching Assistant & Instructional Apprentice, University of Waterloo

Location: Waterloo, Canada

Performed exam & assignment marking, exam proctoring and conducted tutorials for the following courses:

CS136: Elementary Algorithm Design and Data Abstraction

CS486: Introduction to Artificial Intelligence

CS145: Designing Functional Programs, Advanced Version

Sep 2017 - Aug 2019

Subject Matter Expert, University of Toronto (*part-time, remote*) *Jul 2018 - Oct 2018*
Supervisor: Dr. Steven Waslander, Associate Professor, University of Toronto
Designed content, including presentations, structure and scripts for three teaching modules in the Coursera Self-Driving Cars Specialization.
Link: coursera.org/specializations/self-driving-cars

Software Engineering Intern, Google *May 2016 - Jul 2016*
Location: Mountain View, United States
Supervisor: Andrew de los Reyes, Software Engineer, Google
(NDA) Worked on sandboxing technology for Chrome OS.

RESEARCH

Transfer RL for Autonomous Driving: From WiseMove to WiseSim

A Balakrishnan, J Lee, A Gaurav, K Czarnecki, S Sedwards
ACM Transactions on Modeling and Computer Simulation
(*Under review*)

Simple Continual Learning Strategies for Safer Classifiers

A Gaurav, S Vernekar, J Lee, V Abdelzad, K Czarnecki, S Sedwards
Workshop on AI Safety (SafeAI), AAAI 2020
ceur-ws.org/Vol-2560/paper6.pdf

Out-of-distribution Detection in Classifiers via Generation

S Vernekar, A Gaurav, V Abdelzad, T Denouden, R Salay, K Czarnecki
Safety & Robustness in Decision Making Workshop, NeurIPS 2019
arxiv.org/abs/1910.04241

WiseMove: A Framework to Investigate Safe Deep RL for Autonomous Driving

J Lee*, A Balakrishnan*, A Gaurav*, K Czarnecki, S Sedwards*
International Conference on Quantitative Evaluation of Systems 2019
link.springer.com/chapter/10.1007/978-3-030-30281-8_20

Design Space of Behaviour Planning for Autonomous Driving

M Ilievski, S Sedwards, A Gaurav, A Balakrishnan, A Sarkar, J Lee, F Bouchard, R Iaco, K Czarnecki
arxiv.org/abs/1908.07931

Analysis of Confident-Classifiers for Out-of-Distribution Detection

S Vernekar*, A Gaurav*, T Denouden, B Phan, V Abdelzad, R Salay, K Czarnecki
Safe Machine Learning Workshop, ICLR 2019
arxiv.org/abs/1904.12220

SELECTED PROJECTS

WiseMove, Hierarchical RL framework to investigate safety through runtime verification
git.uwaterloo.ca/wise-lab/wise-move

GridDriving, Gym simulator for RL experiments, based off CarRacing-v0
github.com/ashishgaurav13/GridDriving

FlappyBird, Applying UCB and Bootstrapped RL techniques to the popular android game
deepli.me/flappy_bird.pdf

SSH Scan, SSH based vulnerability scanner
As a part of: Mozilla Winter of Security 2016 - 2017
blog.mozilla.org/security/2017/10/16/mwos-improving-ssh-scan-scalability-feature-set

Porting Perl for Native Client, Getting Perl5 to compile for the NaCl browser architecture
As a part of: Google Summer of Code 2015
google-melange.com/archive/gsoc/2015/orgs/pnacl/projects/agaurav77.html

ACTIVITIES

Vice President, Data Science Club, University of Waterloo *Jan 2019 - Dec 2019*
Conducted several talks and tutorials (deepli.me/talks) on machine learning frameworks, reinforcement learning, autonomous driving. Also conducted a reading group on reinforcement learning.

Student Network Administrator, Birla Institute of Technology Mesra *Sep 2016 - Apr 2017*
Administrator for data sharing Peer-to-Peer network. Also coordinated student projects, gave talks on Linux and open source software and conducted a multi-college hackathon.

SKILLS

Programming Languages and Frameworks

Proficient: Python, C, C++

Moderate proficiency: Ruby, JavaScript

Frameworks: Pytorch, Tensorflow, Keras

Languages

English & Hindi

AWARDS, SCHOLARSHIPS & ACHIEVEMENTS

NSERC CREATE, Student Grant *May 2018 - Dec 2019*
University of Waterloo Graduate Scholarship *Sep 2017 - Aug 2018*
International Masters Student Award *Sep 2017 - Dec 2019*
India Finalist, Microsoft Build the Shield (Hyderabad) *March 2016*
Academic Scholar, Chiranjiv Bharati School, Palam Vihar *2009 - 2012*
All India Rank 37, EduHeal Cyber Olympiad *2008*