

Boris Ivanovic

PHD CANDIDATE IN AERONAUTICS AND ASTRONAUTICS · DEEP LEARNING AND ROBOTICS

Stanford, California, USA

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Education

Stanford University

Doctor of Philosophy (PhD) - Aeronautics and Astronautics

September 2018 - Present

Stanford, CA - USA

- Conducting research at the intersection of robotics and deep learning under Prof. Marco Pavone.
- Head Course Assistant for AA 274A: *Principles of Robot Autonomy I*.

Stanford University

Master of Science (MS) - Computer Science

September 2016 - June 2018

Stanford, CA - USA

- Conducted research in machine learning, computer vision, robotics, and data science.
- Course Assistant for CS231A: *Computer Vision From 3D Reconstruction to Recognition*.

University of Toronto

Bachelor of Applied Science (BASc) with High Honours - Engineering Science - GPA: 3.93

September 2012 - June 2016

Toronto, ON - Canada

- Undergraduate thesis with Professors Raquel Urtasun and Sanja Fidler in Visual SLAM and 3D Scene Segmentation.
- Award-winning TA for CSC411: *Introduction to Machine Learning*.
- Won the final AER201: *Engineering Design* competition.
- Ranked in the top 10% of Engineering Science students.

Publications

Preprints

Multimodal Deep Generative Models for Trajectory Prediction: A Conditional Variational Autoencoder Approach

B. Ivanovic*, K. Leung*, E. Schmerling, M. Pavone (* denotes equal contribution)

arXiv, 2020

International Peer-Reviewed Conference Proceedings

MATS: An Interpretable Trajectory Forecasting Representation for Planning and Control

B. Ivanovic, A. Elhafs, G. Rosman, A. Gaidon, M. Pavone

Conference on Robot Learning (CoRL), 2020

Evidential Sparsification of Multimodal Latent Spaces in Conditional Variational Autoencoders

M. Itkina, **B. Ivanovic**, R. Senanayake, M. J. Kochenderfer, M. Pavone

Advances in Neural Information Processing Systems (NeurIPS), 2020

Risk-Sensitive Sequential Action Control with Multi-Modal Human Trajectory Forecasting for Safe Crowd-Robot Interaction

H. Nishimura, **B. Ivanovic**, A. Gaidon, M. Pavone, M. Schwager

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020

Trajectron++: Dynamically-Feasible Trajectory Forecasting With Heterogeneous Data

T. Salzmann*, **B. Ivanovic***, P. Chakravarty, M. Pavone (* denotes equal contribution)

3rd place in the ICRA 2020 nuScenes Prediction Challenge

European Conference on Computer Vision (ECCV), 2020

Map-Predictive Motion Planning in Unknown Environments

A. Elhafs, **B. Ivanovic**, L. Janson, M. Pavone

IEEE International Conference on Robotics and Automation (ICRA), 2020

The Trajectron: Probabilistic Multi-Agent Trajectory Modeling with Dynamic Spatiotemporal Graphs

B. Ivanovic, M. Pavone

IEEE/CVF International Conference on Computer Vision (ICCV), 2019, Seoul, South Korea

BaRC: Backward Reachability Curriculum for Robotic Reinforcement Learning

B. Ivanovic, J. Harrison, A. Sharma, M. Chen, M. Pavone

IEEE International Conference on Robotics and Automation (ICRA), 2019, Montreal, Canada

Generative Modeling of Multimodal Multi-Human Behavior

B. Ivanovic, E. Schmerling, K. Leung, M. Pavone

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2018, Madrid, Spain

ADAPT: Zero-Shot Adaptive Policy Transfer for Stochastic Dynamical Systems

J. Harrison, A. Garg, **B. Ivanovic**, Y. Zhu, S. Savarese, L. Fei-Fei, M. Pavone

International Symposium on Robotics Research (ISRR), 2017, Puerto Varas, Chile

Blog Posts

Back to the Future: Planning-Aware Trajectory Forecasting for Autonomous Driving

B. Ivanovic

Stanford Artificial Intelligence Lab (SAIL) Blog, 2020

How to Deploy Deep Learning Models with AWS Lambda and TensorFlow

B. Ivanovic, Z. Ivanovic

5th most viewed blog post in all of AWS in 2018

Amazon Web Services (AWS) AI Blog, 2017

Experience

Toyota Research Institute

Research Scientist Intern

June 2020 - September 2020

Los Altos, CA - USA

- Worked with Adrien Gaidon on novel trajectory forecasting methods in the Machine Learning Research team.

Amazon.com

Prime Air SDE Intern

June 2017 - September 2017

Seattle, WA - USA

- Worked with Principal Research Scientist Ishay Kamon in the Autonomy team.
- Designed and implemented a novel state-of-the-art deep learning approach for a specific computer vision task within the team, outperforming existing models by 10x. The project was completed successfully and a full-time Research Scientist return offer was extended.

Stanford University

Independent Research Project

January 2017 - June 2017

Stanford, CA - USA

- Worked in the Computer Vision and Geometry Lab (CVGL) and Autonomous Systems Lab (ASL) with Professors Silvio Savarese and Marco Pavone on making reinforcement learning more robust with control theory.
- Tackled the problem of policy transfer in reinforcement learning, applying model-predictive control to provide safety guarantees when transferring a learned policy from one environment to another with different dynamics.

Stanford University

Research Assistant

September 2016 - June 2017

Stanford, CA - USA

- Worked in the Stanford Network Analysis Project (SNAP) Lab with Professor Jure Leskovec on analyzing large-scale physical activity data with modern data science methods.
- Efficiently cleaned, preprocessed, and distilled 3 TB of user physical activity data from over 2 million users of a mobile fitness app. Obtained scientific results with data visualization, statistical analyses, and computational methods (e.g., hierarchical bootstrapping).

Amazon.com

Prime Air SDE Intern

May 2016 - August 2016

Seattle, WA - USA

- Worked with former NASA Astronaut Neil Woodward in the Flight Test team.
- Designed and built fault-tolerant, scalable software and hardware to autonomously collect and process relevant flight test data from numerous locations for internal consumption.

ETH Zurich

Summer Research Intern

May 2015 - August 2015

Zurich - Switzerland

- Worked with Professor Raffaello D'Andrea in the Institute for Dynamic Systems and Control, specifically the Flying Machine Arena.
- Removed superfluous code from an open source motor controller and implemented new features such as motor calibration, emergency safety states, and a better motor startup routine in C. Simulated dynamic motor and propeller system responses in Python.

Amazon.com

SDE Intern

May 2014 - July 2014

Seattle, WA - USA

- Worked in the Demand Forecasting team creating a real-time demand forecasting simulation tool. Used the Hadoop MapReduce framework to process large amounts of simulation data generated by a machine learning module. The project was completed successfully and a return offer was extended.

Awards

NSERC Doctoral Canada Graduate Scholarship (CGS-D)

May 2020

National Sciences and Engineering Research Council (NSERC)

Canada

The CGS-D Program promotes continued excellence in Canadian research by rewarding high-calibre Canadian doctoral students pursuing studies at home or abroad.

Engineering Science Award of Excellence

May 2016

University of Toronto

Toronto, ON - Canada

Received for maintaining a CGPA greater than 3.90.

Computer Science TA Award

May 2016

University of Toronto

Toronto, ON - Canada

Received for being the best Computer Science TA in the Winter 2016 semester.

NSERC Master's Postgraduate Scholarship (CGS-M) (Declined)

April 2016

National Sciences and Engineering Research Council (NSERC)

Canada

The CGS-M Program provides financial support to high-calibre scholars who are engaged in eligible master's programs in Canada.

Dean's Honour List

September 2012 - June 2016

University of Toronto

Toronto, ON - Canada

Placed on the Dean's Honour List for all undergraduate semesters.

University of Toronto Scholarship

September 2012

University of Toronto

Toronto, ON - Canada

Received for being one of the top 300 entrants to the University of Toronto in 2012.

Skills

Programming	Python, Java, C/C++, MATLAB, R, Scala, Verilog, Assembly, Web (HTML5/CSS3/JavaScript)
Learning & Robotics	PyTorch, TensorFlow, MXNet, Theano, MuJoCo, Box2D, MazeBase, ROS
Data Science	NumPy, Pandas, Seaborn, Matplotlib, StatsModels
Libraries/SDKs	Amazon Web Services SDK, Hadoop, Spark, Node.js, Google Web Tools, Android SDK