

# Boris Ivanovic

PHD CANDIDATE IN AERONAUTICS AND ASTRONAUTICS · DEEP LEARNING AND ROBOTICS

Stanford, California, USA

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## Education

### Stanford University

September 2018 - December 2021

Doctor of Philosophy (PhD) - Aeronautics and Astronautics

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

September 2016 - June 2018

Master of Science (MS) - Computer Science

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

September 2012 - June 2016

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

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

Rethinking Trajectory Forecasting Evaluation

**B. Ivanovic**, M. Pavone

*Under review, 2021*

Heterogeneous-Agent Trajectory Forecasting Incorporating Class Uncertainty

**B. Ivanovic**, K-H. Lee, P. Tokmakov, B. Wulfe, R. McAllister, A. Gaidon, M. Pavone

*Under review, 2021*

### Journal Articles

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

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

*IEEE Robotics and Automation Letters (RA-L)* 6.2 (Apr. 2021) pp. 295–302. 2021

### Conference Papers

Leveraging Neural Network Gradients within Trajectory Optimization for Proactive Human-Robot Interactions

S. Schaefer, K. Leung, **B. Ivanovic**, M. Pavone

*IEEE International Conference on Robotics and Automation (ICRA)*, 2021, Xi'an, China

MATS: An Interpretable Trajectory Forecasting Representation for Planning and Control

**B. Ivanovic**, A. Elhafi, G. Rosman, A. Gaidon, M. Pavone

*Conference on Robot Learning (CoRL)*, 2020, Virtual

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, Virtual

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, Virtual

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, Virtual

## Map-Predictive Motion Planning in Unknown Environments

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

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

## 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

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### NVIDIA Research

March 2021 - September 2021

Research Scientist Intern

Santa Clara, CA - USA

- Working in the Autonomous Driving Research team on novel trajectory forecasting methods and their integration within the autonomy stack.

### Toyota Research Institute

June 2020 - September 2020

Research Scientist Intern

Los Altos, CA - USA

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

### Amazon.com

June 2017 - September 2017

Prime Air SDE Intern

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.

### Amazon.com

May 2016 - August 2016

Prime Air SDE Intern

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

May 2015 - August 2015

Summer Research Intern

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

May 2014 - July 2014

SDE Intern

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

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### **NSERC Doctoral Canada Graduate Scholarship (CGS-D)**

May 2020 - December 2021

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

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

## Service

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<b>Reviewing</b>	ICLR (2022), CVPR (2021), ICML (2020, 2021), NeurIPS (2019, 2020, 2021), RSS (2020, 2021), ICRA (2020, 2021, 2022), IROS (2021), CDC (2021), Humanoids (2020), IV (2021), ITSC (2019), TPAMI (2020), RA-L (2020, 2021, 2022), L-CSS (2021)
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