Boris **Ivanovic**

Research Scientist · NVIDIA Autonomous Vehicle Research Group

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Education

Stanford University *September 2018 - December 2021*

Doctor of Philosophy (PhD) - Aeronautics and Astronautics *Stanford, CA - USA*

- Conducted research at the intersection of robotics and deep learning under Prof. Marco Pavone, focusing on autonomous vehicles.
- 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

Whose Track Is It Anyway? Improving Robustness to Tracking Errors with Affinity-Based Prediction

X. Weng, **B. Ivanovic**, M. Pavone

Under review, 2022

ScePT: Scene-consistent, Policy-based Trajectory Predictions for Planning

Y. Chen, **B. Ivanovic**, M. Pavone

Under review, 2022

Injecting Planning-Awareness into Prediction and Detection Evaluation

B. Ivanovic, M. Pavone

Under review, 2022

MTP: Multi-hypothesis Tracking and Prediction for Reduced Error Propagation

X. Weng, **B. Ivanovic**, M. Pavone

Under review, 2022

Sample-Efficient Safety Assurances using Conformal Prediction

R. Luo, S. Zhao, J. Kuck, **B. Ivanovic**, S. Savarese, E. Schmerling, M. Pavone

Under review, 2022

Heterogeneous-Agent Trajectory Forecasting Incorporating Class Uncertainty

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

arXiv, 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

Propagating State Uncertainty Through Trajectory Forecasting

B. Ivanovic, Y. Lin, S. Shrivastava, P. Chakravarty, M. Pavone

IEEE International Conference on Robotics and Automation (ICRA), 2022, Philadelphia, USA

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. Elhafsi, 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

Theses

Trajectory Forecasting in the Modern Robotic Autonomy Stack
B. Ivanovic
Stanford University, 2021

Streamlining the Training of 3D Scene Segmentation Models
B. Ivanovic
University of Toronto, 2016

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

NVIDIA Research *January 2022 - Present*

Research Scientist *Santa Clara, CA - USA*

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

NVIDIA Research *March 2021 - September 2021*

Research Scientist Intern *Santa Clara, CA - USA*

- Worked in the Autonomous Vehicle Research Group 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

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

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

Service

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