

Neil Traft

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You can also view this information on my [LinkedIn profile](#).

Current Position

PhD Student in Complex Systems and Data Science, Vermont Complex Systems Center,
University of Vermont

Areas of Specialization

Machine Learning • Robotics • Data Science
Python • C++ • Matlab • PyTorch • Spark • Cloud Computing

Education

- 2026 (expected) PhD in Complex Systems and Data Science, University of Vermont
- 2017 MSc in Computer Science, University of British Columbia
Thesis: [Improved Action and Path Synthesis Using Gradient Sampling](#)
- 2007 BSc in Computer Science and English Literature / Minor in Mathematics, Tulane University

Previous Experience

- 2021-present **Research Assistant**, University of Vermont, Burlington, VT
Studying in the Neurobotics Lab under [Prof. Nick Cheney](#). Working on projects in meta-learning, transfer learning, and evolutionary computation.
- 2021 **Senior Software Engineer II**, Aurora Innovation, Inc., Pittsburgh, PA
Aurora acquired Uber ATG. I switched roles to focus more on research and technical work. I worked on the Sim ML team, building smart sim actors through imitation learning.
- 2019-2021 **Senior Autonomy Engineer II**, Uber Advanced Technologies Group, Pittsburgh, PA
Leading “Prediction Analytics”, a team of research engineers—the data scientists of Prediction. We research how to evaluate predictions, given that the ground truth can never be known. We research topics in ML robustness and uncertainty representation. We provide an ever-increasing suite of data analysis tools with which to examine and understand the Perception/Prediction system.
- 2017-2019 **Senior Autonomy Engineer**, Uber Advanced Technologies Group, Pittsburgh, PA
Led a cross-team effort to unify evaluation systems across Autonomy (Perception, Prediction, Planning). Established a policy for how all ATG Autonomy developers should conduct their work and judge the effects of their code changes. Worked on uncertainty representation and reasoning within the Prediction system.
- 2016-2017 **Autonomy Engineer II**, Uber Advanced Technologies Group, Pittsburgh, PA
Led the early versions of the “goal prediction” system—a system involving proposal and classification of possible paths for actors to follow. Helped establish a number of machine learning training pipelines.

- 2015-2016 **Software Engineer**, Uber Advanced Technologies Center, Pittsburgh, PA
Autonomy engineer on the Prediction team at Uber ATC—predicting the future state of vehicles, bicyclists, pedestrians, etc.
- 2014-2015 **Research Assistant**, Laboratory for Computational Intelligence, UBC, Vancouver
Performing research toward the completion of my Master’s thesis under [Prof. Ian Mitchell](#) in association with the [CanWheel project](#), a multiple-institution, interdisciplinary “smart wheelchair” initiative. Focusing on motion planning, optimal control, shared control, and stochastic prediction of pedestrians. (See the [Projects](#) section.)
- 2013-2014 **Teaching Assistant**, Dept. of Computer Science, UBC, Vancouver
(2014) CPSC 410 - Advanced Software Engineering
(2014) CPSC 221 - Basic Algorithms and Data Structures
(2013) CPSC 410 - Advanced Software Engineering
Filled in for Prof. Steve Wolfman in two 90 minute lectures on self-balancing binary trees and B-trees. (It’s quite rare for a Masters student to have this opportunity, so I took it!) Also gave a guest lecture on reading and understanding source code “from the trenches,” so to speak.
- 2012-2013 **Owner**, Neil Traft LLC, Boston
Taking contract work for various projects in my free time. I worked on a small Android app for Rockport shoes and a Django app for SportsLab, Inc.
- 2011-2013 **Software Engineer**, Genedata, Inc., Boston
Highly performant bioinformatics software in Java on a client-server architecture. I primarily worked on Analyst, a general statistical tool allowing biologists to perform and visualize many different statistical analyses, normalizations, and transformations. Heavy emphasis on concurrency; responsive UI; efficient caches and data structures; large data sets; dynamic code loading and sandboxing.
- 2010-2011 **Software Engineer**, Pyxis Mobile, Inc., Boston
Mobile application development on the Android platform. I worked on a team that was responsible for implementing Pyxis’ enterprise application framework on Android. Work I did here covered everything from database storage and network communications on the backend, to custom UI components and layout calculations on the frontend.
- 2007-2009 **Software Engineer**, GrayMatter, Inc., New Orleans
3D simulation and visualization in Java/OpenGL. Real-time algorithms for lane-finding and lane-keeping with LIDAR data. Remote control of a robotic vehicle. Some interaction with GIS and scientific libraries. **Team Gray were semi-finalists in the 2007 DARPA Urban Challenge.**
- 2006-2007 **Research Assistant**, Dept. of Computer Science, Tulane University, New Orleans
Helped Prof. Sheila Tejada and her students with various robotics projects, primarily in the area of HRI, using the Sony Aibo robotic platform. Also led a project team which exhibited at a workshop at the AAAI 2006 conference in Boston.

Publications

PAPERS

- 2020 Skanda Shridhar, Yuhang Ma, Tara Stentz, Zhengdi Shen, Galen Clark Haynes, and **Neil Traft**. “[Beelines: Motion Prediction Metrics for Self-Driving Safety and Comfort.](#)” *2021 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2021.
- 2016 **Traft, Neil** and Ian M. Mitchell. “[Improved Action and Path Synthesis Using Gradient Sampling.](#)” *2016 IEEE 55th Conference on Decision and Control (CDC)*. IEEE, 2016.
- 2006 Tejada, Sheila, et al. “[Educational Robots: Three Models for the Research of Learning Theories and Human-Robot Interaction.](#)” *Proceedings of the AAAI 2006 Robotics workshop*, July 2006, Boston.

PATENTS

- 2016 Haynes, Galen Clark, et al. “[Machine Learning for Predicting Locations of Objects Perceived by Autonomous Vehicles](#).” U.S. Patent No. 10,579,063. Issued March 3, 2020.
- 2008 Trepagnier, Paul, et al. “[Control and Systems For Autonomously Driven Vehicles](#).” U.S. Patent 8,126,642. Issued April 26, 2012.

THESES

- 2017 **Traft, Neil**. *Improved Action and Path Synthesis Using Gradient Sampling*. MSc Diss., University of British Columbia, 2017.

Projects

- 2015-2016 **Path Planning Under Uncertainty** [[PDF](#)]
My master’s thesis. Motion planning of holonomic and nonholonomic vehicles while taking into account motion and sensing uncertainty. Methods using both navigation functions and sampling-based planners. Programmed my own version of kinodynamic RRT* for Dubins and Reeds-Shepp cars.
- 2014 **Learning the Hyperparameters of Human Movement** [[PDF](#)]
Predicting the movement of pedestrians in a crowd, when their current positions are assumed known. This project focused on methods of training Gaussian processes to represent human trajectories, and a method of evaluating crowd prediction by estimating the entropy of the prediction error.
- 2014 **Robot Navigation in Dense Human Crowds** [[PDF](#)] [[CODE](#)]
Reproduced a method from an IROS 2010 paper entitled “[Unfreezing the Robot](#)”. A unique approach to mobile robot navigation in which the motion planning is reduced to an inference problem: deciding the best action for the robot is equivalent to predicting the future state of the crowd.
- 2014 **matLearn Gaussian Mixture Model** [[CODE](#)]
Standard implementation of the Expectation-Maximization algorithm for a Gaussian mixture model, with some nice added features like random restarts and visualization.
- 2013 **Object Sensitive Grasping** [[PDF](#)] [[CODE](#)]
Adapting the grasp of a robotic hand to suit differently shaped objects. A neural network would recognize an object using only tactile sensing data, then it would employ a grasp previously found to work well on that object. However, at the time I had very little machine learning experience, and the recognition didn’t work. I now understand quite a few reasons why!
- 2011-2012 **EasyRequest** [[CODE](#)]
An easier way to do HTTP requests on Android. Automatically handles asynchronous tasks and is much less cumbersome than the Apache HTTP library. A well designed, well tested code example.
- 2011 **ApiGen** [[CODE](#)]
A tool which auto-generates a glue layer for a changing API in a statically typed language (Java). It allows you to make changes to an API without breaking backward compatibility, and can be seamlessly inserted into the build process so developers don’t even have to think about it. This began as a personal project and was later integrated into a Genedata product.

Grants, Honors & Awards

- 2013-2017 International Tuition Award, University of British Columbia
- 2008 Named one of Gambit Weekly’s “[40 Under 40](#)” in the New Orleans area
- 2007 Semi-finalist, DARPA Urban Challenge
- 2007 National Society of Collegiate Scholars

2003-2007 Founders Scholarship, Tulane University
2003 National Honors Society

Teaching

2014 **Seminar Leader.** 2nd iteration of the Git seminar.
2014 **Seminar Leader.** Devised and delivered a seminar for grad students on Git and version control.
2014 **Teaching Assistant,** CPSC 410 — Advanced Software Engineering
2014 **Teaching Assistant,** CPSC 221 — Basic Algorithms and Data Structures
2014 **Substitute Lecturer.** Filled in for Prof. Steve Wolfman for one week of CPSC 221. Delivered two 90 minute lectures to a class of 80 students on binary trees and B-trees.
2013 **Teaching Assistant,** CPSC 410 — Advanced Software Engineering
2013 **Guest Lecturer.** Delivered one 60 minute guest lecture to a class of 130 students on reading and understanding source code.

Service & Outreach

2014-2015 **Graduate Student Representative,** UBC CS Communications Committee
2014-2015 **Organizer,** Robuddies Reading Group
2013-2015 **VP Finance & Administration,** Computer Science Graduate Student Association
2013-2015 **Member,** UBC Blog Squad
2015 **Panel Member,** How to Maintain a Good Relationship With Your Supervisor
2014 **Research Demonstration.** Represented the Computer Science department to the incoming class of UBC Vantage College. Delivered robotics demos to drum up interest in CS.
2014 **Volunteer,** GIRLsmarts Workshop

Courses Taken

Graduate Level Courses

2014 CPSC 540 — Machine Learning
2014 MECH 563 — Industrial Robotics
2014 CPSC 532S — Computational Neuroscience
2014 CPSC 525 — Image Understanding II
2013 CPSC 505 — Image Understanding I
2013 CPSC 530P — Sensorimotor Computation
2013 CPSC 542G — Numerical Computation

Undergraduate Level Courses

2007 MATH 331 — Scientific Computing I
2007 CPSC 462 — A.I. Robotics
2006 CPSC 463 — Robot Teams
2006 CPSC 466 — Artificial Intelligence

Coursera Courses

2013 Machine Learning
2012 Algorithms: Design and Analysis, Part 1

References

Prof. Nicholas Cheney
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Prof. Ian Mitchell
Computer Science Department
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