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Research Statement

How do we use software to build more intelligent systems, and how can we use intelligent systems to help us write better software? My research studies the relationship between software and machine learning, to reason about the behavior of real-world programs and use those insights to build more intelligent programming tools for developers.

Education

- **McGill University** – Ph.D. Student in Computer Science (accepted, est. 2019–2023), Supervisor: Jin Guo
- **Université de Montréal** – M.S. in Computer Science (2017–est. 2019), Co-supervisors: Liam Paull, Michalis Famelis
- **Rochester Institute of Technology** – B.S. in Computer Science, Minoring in Chinese Language (2008–2012)
- **Shanghai Jiaotong University** – Certificate of Completion in Chinese Language Studies (2010–2011)

Experience

- **nuTonomy/Aptiv** (Summer 2018) – Autonomous Vehicle Intern. Responsible for software reproducibility and developer operations. Created container-based infrastructure for automated training and evaluation of machine learning models.
- **JetBrains** (2014–2016) – Developer Advocate. Wrote technical documentation, recorded screencasts and webinars on developer tools, taught courses and collected feedback at conferences, companies and universities around the world. Created and curated the Java Annotated Monthly newsletter. Built several widely-used IDE plugins for the IntelliJ Platform.
- **OneSpot** (2012–2013) – Software Engineer. Responsible for designing and launching a business-critical real-time bidder to match ads, websites and visitors using Bayesian inference. Patented techniques in data mining, high-frequency transaction processing and machine learning for online auctions, helping to raise over $7 million in venture capital investment.
- **Garnet Hill** (Summer 2009, Summer 2010) – Data Analysis Intern. Authored a company-wide business knowledge database. Built and tuned an inventory control tool to handle liquidation surplus and wrote SQL Server procedures to model price elasticity of demand and dynamically adjust SKU pricing across product categories during sales events.
- **FIRST Robotics Team #2523** (2007–2008) – Co-founder, Lead Prorammmer. Wrote our team's winning $15k NASA grant application. Collaborated with industry advisors from IBM and Oracle. Designed and wrote our robot's AI and control software for the FIRST Robotics Competition, leading our team to the New England regionals in our first year.

Selected Publications

- **POPL, LAFI (né PPS)** (2019) – Kotlin∇: Differentiable Functional Programming with Algebraic Data Types
- **CSER/SEMLA** (2019) – Kotlin∇: A Shape Safe eDSL for Differentiable Functional Programming
- **NeurIPS Competition Track** (2018, 2019) – The AI Driving Olympics
- **Montreal AI Symposium** (2018) – Duckietown: a Platform for Teaching, Robotics and Machine Learning Research
- **IROS, Automating Robot Experiments** (2018) – Duckietown: Software Infrastructure for Autonomous Robotics
- **ICML** (2019) – Multi-objective training of Generative Adversarial Networks with multiple discriminators
- **arXiv preprint** (2018) – Deep Pepper: Expert Iteration based Chess agent in the Reinforcement Learning Setting
- **US Patent Application US20140244405A1** (2014) – Automatic Generation of Digital Advertisements (OneSpot)

Leadership

- **Conference Speaker** – Teaching about programming tools, machine learning, type systems and speech recognition. JavaOne Shanghai (2013), Vermont Code Camp (2014), Houston TechFest (2014), Silicon Valley Code Camp (2014, 2016), Stanford University Career Fair (2015), GWT.Create (2015), Boston Code Camp (2015), DroidCon Montreal (2015), AnDevCon Boston (2015), JavaOne Brazil (2015, 2016), JavaOne San Fransisco (2015, 2016), DevNexus (2016, 2017), ConFoo (2016, 2017), EclipseCon (2016), Great Indian Developer Summit (2016, 2017), PyCon Ireland (2016), Devoxx Belgium (2016), Devoxx US (2017), Java Day Tokyo (2017), Montréal AI Symposium (2018), ROSCon (2018)
- **Mila Lab Rep** (2018–2019) – Elected as a first year master's student to represent the student body. Advised colleagues and staff during the merger of Montréal's two largest AI labs, hosted Thanksgiving dinner, and ran the 2019 election.

- **Shanghai Jiaotong University** (2010–2011) – Student Ambassador. Coordinated extracurricular activities for foreign language students, and helped promote cultural exchange between Chinese and international students in Shanghai.
- **RIT Badminton** – Student athlete (2008–2010) and President (2011–2012). Recruited talented athletes, organized fundraisers and tournaments, ran weekly practices and lead the expansion of RIT's intercollegiate badminton program.
- **Grace Stuart Orcutt Library** (2007–2008) – Archivist. Collected, cataloged, preserved and archived *The Newell Collection*, an anthology of ancient manuscripts from Vermont State Senator and Latin instructor, Graham Newell.

Teaching

- **Duckietown** (2018) – Teaching Assistant. Wrote code and documentation, taught ROS and containers, provided technical support to students and contributed to software infrastructure and build automation for the first AI Driving Olympics.
- **Rochester Institute of Technology** (2009) – Undergraduate Teaching Assistant for First Year Enrichment classes.

Selected Coursework

- **IFT 6085, Deep Learning Theory** (Université de Montréal, Winter 2018) – Ioannis Mitliagkas, A
- **COMP 767, Reinforcement Learning** (McGill University, Winter 2018) – Doina Precup, A+
- **COMP 551, Applied Machine Learning** (McGill University, Fall 2017) – Jöelle Pineau, A+
- **IFT 6080, Autonomous Vehicles** (Université de Montréal, Fall 2017) – Liam Paull, A

Scholarships and Awards

- **Université de Montréal, International Student Scholarship** (2018–2019), $6,991 per trimester
- **Rochester Institute of Technology, Presidential Scholarship** (2009–2010, 2011–2012) – $10,000 per year
- **Rochester Institute of Technology, Deans List** (2009, 2010, 2011) – Dean's List
- **National Latin Examination** – Magna Cum Laude (2005), Summa Cum Laude (2006)

Recent Service

- **Université de Montréal Summer Immersion Program** (2019) New Orleans, U.S.A. – Volunteer Instructor
- **International Conference on Robotics and Automation** (2019) Montréal, Canada – Volunteer
- **International Conference on Learning Representations** (2019) New Orleans, U.S.A. – Volunteer
- **Neural Information Processing Systems, AI Driving Olympics** (2018) Montréal, Canada – Volunteer
- **Forum Intelligence Artificielle Responsable** (2017) Montréal, Canada – Volunteer
- **Artificial Intelligence for Social Good Summit** (2017) Geneva, Switzerland – Delegate
- **O'Reilly Open Source Convention** (2017) Austin, U.S.A – Volunteer

Selected Open Source Projects

- **Kotlin∇** (2019) – An attempt to port recent advancements in automatic differentiation (AD) to the Kotlin language. It introduces several novel ideas, including shape-safety, algebraic expression rewriting, numerical stability checking with property-based testing, and provides an algebraically-grounded implementation of AD for shape-safe tensor operations.
- **Hatchery** (2018) – Provides development support and programming assistance for building robotics applications.
- **AceJump** (2015) – An editor plugin that supports rapid navigation of large text files with minimal user input.
- **idear** (2016) – A general-purpose voice user interface for handsfree programming using HMM-based speech recognition.

Excellence

People-oriented programmer with a passion for languages. Fluent in Java, Kotlin, Python, C/C++, and Chinese. Well-traveled on clouds, Rails, Docker and *nix. Fast algorithms and rapid prototypes. Clean code with a proven track record in open source collaboration. Results-driven engineer with experience in machine learning, embedded systems and build automation. Strong consistency and referentially transparent (references available on request).

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