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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 (2019–est. 2023), Supervisor: Jin Guo
- **Université de Montréal** – M.S. in Computer Science (2017–2019), Co-supervisors: Liam Paull, Michalis Famelis
- **Rochester Institute of Technology** – B.S. in Computer Science, Minoring in Chinese Language (2008–2012)

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

- **PTML Workshop at NeurIPS** (2019) – Kotlin∇: A shape-safe DSL for differentiable programming
- **Université de Montréal, Master's Thesis** (Under review, 2019) – Programming Tools for Intelligent Systems
- **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
- **ICML** (2019) – Multi-objective training of Generative Adversarial Networks with multiple discriminators
- **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

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), 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, 2019), ROSCon (2018), KotlinConf (2019)
- **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

- **Software Engineering for Building Intelligent Systems** (Fall 2020) – Teaching Assistant.
- **Advanced Projects in Machine Learning** (2020) – Teaching Assistant. Guidance, technical support and grading.
- **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.

Selected Coursework

- **COMP 766, Graph Representation Learning** (McGill University, Spring 2020) – William Hamilton, A
- **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

Academic Awards

- **McGill University, Differential Fee Waiver** (2019–2021) – $12,000 CAD per year
- **Oregon Programming Languages Summer School Fellowship** (2019) – $994 USD
- **Université de Montréal, FESP Scholarship** (2018–2019) – $6,991 CAD per trimester
- **Rochester Institute of Technology, Presidential Scholarship** (2009–2010, 2011–2012) – $10,000 USD per year
- **Rochester Institute of Technology, Deans List** (2009, 2010, 2011) – Dean's List

Recent Service

- **Multidisciplinary Conference on RL and Decision Making** (2019) Montréal, Canada – Student Volunteer
- **International Conference on Robotics and Automation** (2019) Montréal, Canada – Student Volunteer
- **International Conference on Learning Representations** (2019) New Orleans, U.S.A. – Student Volunteer
- **Neural Information Processing Systems, AI Driving Olympics** (2018) Montréal, Canada – Student Volunteer
- **Forum Intelligence Artificielle Responsable** (2017) Montréal, Canada – 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 and C/C++. 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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