Bart Gajderowicz, PhD

Email: bartg@mie.utoronto.ca
Homepage: http://bartg.org
Phone: +1 (416) 558-0385
Address: 502 – 36 Charlotte St., Toronto, Ontario, M5V 3P7
Citizenship: Canadian, Polish

Professional Summary

I am a diligent, dedicated, and self-motivated person with advanced experience in software development, focusing on simulation, reasoning, machine learning, data analytics, and system architectures. I am highly skilled at problem-solving with analytical reasoning. I enjoy teaching through student engagement and experiential learning methodologies. My research focuses on computational sociology, with applications in smart cities and the delivery of services.

Research Fields

Artificial Intelligence, knowledge representation (symbolic), machine learning (sub-symbolic), hybrid-AI (neural-symbolic), computational sociology, social simulation, AI planning, ontology engineering, knowledge graphs, software engineering, human decision-making augmentation, cognitive science, and human-system interactions in complex system-of-systems paradigm.

Technical Skills

Main Languages: GraphDB, Python, LaTeX, Python, Prolog, OWL 2, RDF, Ruby, SPARQL, SQL
Main Technologies: Ontologies (reasoning with OWL 2, RDF), GAMA, ArangoDB, Protégé, Pytorch, Sci-Kit Learn, WordNet, DBpedia, Linux Shell, *SQL, Git, SWI-Prolog, Jupyter Notebooks.

Education

University of Toronto **2013 to 2019**
Doctor of Philosophy in Mechanical and Industrial Engineering

Toronto Metropolitan University (formerly Ryerson University) **2008 to 2011**
Master's of Science in Computer Science

Toronto Metropolitan University (formerly Ryerson University) **2004 to 2008**
Bachelor of Science in Computer Science

Graduate Research Experience

PhD Thesis: Artificial Intelligence Planning Techniques for Emulating Agents with Application in Social Services
Mechanical and Industrial Engineering, University of Toronto **2013 to 2019**
Under the supervision of Professors Mark S. Fox and Michael Grüninger, my goal was to apply data-driven artificial intelligence (AI) and engineering methods to emulate behaviour and predict the progress of social service clients in specific intervention programs. The first objective is to create a reasoning framework that captures the behaviour of individuals who are outside of social norms or do not fit a standard "rational agent" model. This framework combines the areas of AI planning, cognitive science, and social sciences.

The second objective was to create a client agent and a simulation environment that takes a holistic view of evaluating social services. This model pays special attention to life experiences, decision trajectories, and the environment of individual clients, rather than a transactional measure of service provisioning. A new ontology of social service needs captures the needs and motivating factors expressed by clients, mapped to appropriate services and resources. Empirical validation relies on the evaluation of personal and structural constraints faced by clients, including cognitive limitations, lack of community support, housing stability. I have partnered with the Calgary Homeless Foundation, which has provided me with a data set that captures client progress in their Housing First program.

PhD Thesis (pdf): http://hdl.handle.net/1807/97017

The research committee included: Professor Marion Bogo, Professor of Social Work, and previously the Acting Dean, Associate Dean, Practicum Coordinator, and inaugural Sandra Rotman Chair in Social Work at the Faculty of Social Work, University of Toronto; as well as Dr. Vicky Stergiopoulos, Associate Professor in the Faculty of Medicine, Director of the Division of Adult Psychiatry and Health Systems in the Department of Psychiatry at the University of Toronto, and Physician-in-Chief and Clinician Scientist at Centre for Addiction and Mental Health.

Master Thesis: Using Decision Trees for Inductively Driven Semantic Integration and Ontology Matching

Computer Science, Ryerson University, Toronto **2008 to 2011**

Under the supervision of Professors Alireza Sadeghian and Mikhail Soutchanski, my thesis focused on generating decision trees for ontology concepts and applying them to Ontology Matching. It is often the case that different ontologists, experts, and organizations create the vast majority of ontologies for internal use or for use in a narrow context. At the same time, their domains frequently overlap in a wider context. To assist in the reuse of ontologies, this thesis proposed a bottom-up technique for creating concept anchors that are used for ontology matching. The matching process is based on inductively derived decision tree rules. The matching algorithm identifies matching ontology concepts with an associated database used to derive the decision trees. This thesis also introduces several algorithm evolution measures and presents a set of use cases that demonstrate the strengths and weaknesses of the matching process. The technologies used include Protégé, OWL API, HermiT, WEKA and WordNet.

MSc Thesis (pdf): http://bit.ly/BartG-MSc-Thesis

Research Interests

My research focuses on three key areas of Computational Sociology. 1) Creating data-driven decision support systems with a holistic view of human behaviour, organizations, communities, and societies, focusing on smart cities and impact measurement of public, private, and citizen-led activities. 2) Create data integration and a general activity and impact measurement model through semantic technologies and ETL pipelines that collect data from various sources and formats, centered on one data model stored as a knowledge graph. 3) Create human-centric simulation and evaluation models that consider various facets of human behaviour at the macro and micro scales, incorporating computational models of psychology, sociology, and economics. Such systems are highly collaborative and dynamic, where human-system interaction focuses on: agent model calibration with reinforcement learning, extraction of contextual information using natural language processing, the ontological representation of factors impacting human decision-making (e.g. goals), augmenting human decision-making, AI planning and cognitive models to simulate decision making, human-system interactions within a complex system-of-systems paradigm.

Publications

1. Fox, M. S; **Gajderowicz, B**.; and Dishy, L., A Maturity Model for Urban Dataset Meta-data. (under review) http://doi.org/10.48550/arXiv.2402.05211
2. Rosu, D., **Gajderowicz, B.**, Fox M.S. (2023). Representing Goals, Needs and Outcomes in Social Work. In *F. Toyoshima, M. Katsumi, E. Sanfilippo (Eds.), The Ninth Joint Ontology Workshops (JOWO'23)*, CEUR Workshop Proceedings. https://ceur-ws.org/Vol-3637/paper15.pdf
3. Fisher, A., **Gajderowicz, B.**, Latimer, E., Aubry, T., & Mago, V. (2022). BEAUT: An ExplainaBle Deep LEarning Model for Agent-Based PopUlations With Poor DaTa, *Knowledge-Based Systems*, 248. https://doi.org/10.1016/j.knosys.2022.108836
4. **Gajderowicz, B.**, Rosu, D., & Fox, M. S. (2022). Compass Event, Client, and Service Ontology: A Design Pattern for Social Services. In *T. P. Sales & M. M. Hedblom (Eds.), The Eighth Joint Ontology Workshops (JOWO'22)*, CEUR Workshop Proceedings. https://ceur-ws.org/Vol-3249/paper2-OSS.pdf
5. Rosu, D., Fox, M. S., & **Gajderowicz, B.** (2022). Compass Needs Ontology: A Design Pattern for Representing Needs in Social Work. In *T. P. Sales & M. M. Hedblom (Eds.), The Eighth Joint Ontology Workshops (JOWO'22)*, CEUR Workshop Proceedings. https://ceur-ws.org/Vol-3249/paper1-OSS.pdf
6. Fox, M. S., **Gajderowicz, B.**, Rosu, D., Turner, A., Lyu, L., & Lyu, D. (2022). An Ontological Approach to Analysing Social Service Provisioning, In *2022 IEEE International Smart Cities Conference (ISC2)*, 1–7. https://doi.org/10.1109/ISC255366.2022.9922132
7. Fox, M.S., Chowdhury, A., Zhang, J., **Gajderowicz, B.**, Abdulai, T., and Rosu, D. (2020). CAFO: The Common Approach Foundation Ontology, *Technical Report, Centre for Social Services Engineering, University of Toronto.* Available at csse.utoronto.ca
8. Fox, M.S., Chowdhury, A., Zhang, J., **Gajderowicz, B.**, Abdulai, T., Ruff, K., and Rosu, D. (2020). CACO: The Common Approach Core Ontology for Modeling Impact Models*, Technical Report, Centre for Social Services Engineering, University of Toronto.* Available at csse.utoronto.ca.
9. Fox, M.S., **Gajderowicz, B.**, and Ruff, R. (2020). Common Approach Indicator Vocabulary, *Technical Report, Centre for Social Services Engineering, University of Toronto.* Available at csse.utoronto.ca.
10. **Gajderowicz, B**. (2019). Artificial Intelligence Planning Techniques for Emulating Agents with Application in Social Services (Doctoral dissertation). Available at http://hdl.handle.net/1807/97017
11. **Gajderowicz, B.** ,Fox, M.S., & Grüninger, M. (2018). The role of goal ranking and mood-based utility in dynamic replanning strategies. *Journal of Advances in Cognitive Systems,* (8), 211–230. Available at http://cogsys.org/journal/volume6/article-6-14.pdf
12. **Gajderowicz, B.**, Fox, M. S., & Grüninger, M. (2018). Ontology of social service needs: Perspective of a cognitive agent. In *Proceedings of the 2018 Joint Ontology Workshops, Cognition And OntologieS + Explainable AI* (pp. 1–12). Cape Town. Available at http://ceur-ws.org/Vol-2205/paper13_caos2.pdf
13. **Gajderowicz, B.**, Fox, M. S., & Grüninger, M. (2017). General model of human motivation and goal ranking. In *Proceedings of the 2017 AAAI Fall Symposium Series on a Standard Model of the Mind*, Arlington, VA: AAAI Press. Available at https://cdn.aaai.org/ocs/15992/15992-69906-1-PB.pdf
14. **Gajderowicz, B.**, Fox, M. S., & Grüninger, M. (2017). Requirements for emulating homeless client behaviour. In *the Proceedings of the AAAI Workshop on Artificial Intelligence for Operations Research and Social Good* (p. 7). San Francisco, CA: AAAI Press. Available at http://eil.mie.utoronto.ca/wp-content/uploads/2015/06/BartG-socialgood-ws.pdf
15. **Gajderowicz, B.**, Fox, M. S., Grüninger, M. (2014). Requirements for an Ontological Foundation for Modelling Social Service Chains. In *the Proceedings of the 2014 Industrial and Systems Engineering*

Research Conference, Y. Guan, J. Liao (eds.), Montréal, Quebec. Available at https://www.proquest.com/docview/1622308598

16. **Gajderowicz, B.** (2011). Using decision trees for inductively driven semantic integration and ontology matching, (Master's thesis), Ryerson University, 350 Victoria Street, Toronto, Ontario, Canada. Available at https://rshare.library.torontomu.ca/articles/thesis/Using_decision_trees_for_inductively_driven_semantic_integration_and_ontology_matching/14656047
17. **Gajderowicz, B.**, Sadeghian, A. (2009). Ontology Granulation Through Inductive Decision Trees. In *Proceedings of the 4th International Semantic Web Conference Workshop on Uncertainty Reasoning for the Semantic Web*, Washington D.C, USA, pp. 39-50. Available at https://ceur-ws.org/Vol-527/paper4.pdf
18. **Gajderowicz, B.**, Sadeghian, A, Soutchanski, M. (2008). Ontology Enhancement Through Inductive Decision Trees. In *Uncertainty and Reasoning for the Semantic Web II*, da Costa, P.C.G., d'Amato, C., Fanizzi, N., Laskey, K.B., Laskey, K.J., Lukasiewicz, T., Nickles, M., Pool, M. (eds.), ISWC International Workshop, URSW 2008-2010 Revised Selected and Invited Papers. LNCS (LNAI). Springer, Heidelberg. Available at https://link.springer.com/chapter/10.1007/978-3-642-35975-0_14
19. Rahnama, H., Madni, A.M., Sadeghian, A., Mawson, C., **Gajderowicz, B**. (2008). Adaptive context for generic pattern matching in ad hoc social networks. In *Proceedings of the 2008 IEEE 3rd International Symposium on Communications, Control and Signal Processing, ISCCSP 2008*, art. no. 4537195, pp. 73-78 (2008). Available at https://link.springer.com/chapter/10.1007/978-3-642-35975-0_14

Patents

1. **Gajderowicz, B.**; and Vijay, M. Intent elicitation in dynamic and heterogeneous networks with imperfect information. November 10 2022. US Patent App. 17/734,929 (pending), Available at https://patents.google.com/patent/US20220358602A1/en

Posters

2. **Gajderowicz, B.**, Fox, M.S., & Grüninger, M. (2018). Limitations of human-centric decision making: An observer's perspective. In *Poster Proceedings of the 6th Conference on Advances in Cognitive Systems* (pp. 1–12). Stanford, CA: Cognitive Systems Foundation. Available at http://www.cogsys.org/posters/2018/poster-2018-7.pdf
3. **Gajderowicz, B.**, Sadeghian, A., and dos Santos, M. (2009). Expectation Maximization Enhancement with Evolution Strategy for Stochastic Ontology Mapping. In *Proceedings of the 11th Annual Conference on Genetic and Evolutionary Computation*. ACM, New York, NY, pp. 1847-1848. Available at https://dl.acm.org/doi/abs/10.1145/1569901.1570197

Invited Talks and Panels

1. **Seminar**: "Integrative knowledge, ontology, and data for ecosystem and policy that ensure lifelong health, wealth and wellbeing and multi-level resilience," *Ecosystem and Policy: Faculty of Management, Precision Convergence-Retailing,* McGill University. Panelists: Andrea Borghini, **Bart Gajderowicz**, Damien Dooley, John Keogh, February 2024.

2. **Speaker**: **Bart Gajderowicz**: "Towards an Ontology of Traceable Impact Management in the Agriculture Food Chain." *Series: The Convergent Innovation Webinar Series: Inventing "One-World" Solutions for Lifelong Wellness and Sustainable Economic Growth.* Panelists: Jurij Skornik, Troy Ruemping, Rob Warren, Horia Bradau, Naomi Kay Fukagawa. December 6, 2023
3. **Panelist**: Andrea Borghini (speaker): "Bots in the Kitchen: Philosophical Take on the Digital Food Transformation." *Series: The Convergent Innovation Webinar Series: Inventing "One-World" Solutions for Lifelong Wellness and Sustainable Economic Growth*. Panelists: Brian King, Catherine Paquet, **Bart Gajderowicz**, Ebenezer Miezah Kwofie. September 23, 2024.
4. **Speaker**: **Bart Gajderowicz**. "Survey of University of Toronto Ontology of Impact," *Government Ontology workshop, Basic Formal Ontology Summit Meeting.* May 23, 2023
5. Speaker: Matt Parker, **Bart Gajderowicz**, Lester Lym, Daniela Rosu, Alina Turner & Mark S. Fox , "Data Consolidation: How we Solved it with Kompas Ontology and Data," *6th Annual Data That Makes a Difference Conference*, Calgary, Alberta, Canada, May 17th, 2023
6. **Seminar**: **Bart Gajderowicz**. "Neural-symbolic artificial intelligence: state-of-the-art, what's missing, and next steps," *Department of Computer Science Graduate Seminar 2022*, Lakehead University, Thunder Bay, Ontario, Canada, September 23, 2022.
7. **Panelist**: "Research that is outside of the box," *Research and Innovation Week*. Panelists: Salimur Choudhury, Martha Dowsley, **Bart Gajderowicz**, Lindsay Galway, Lana Ray, Pauline Sameshima, Lakehead University, Thunder Bay, Ontario, Canada. February 28, 2020
8. **Speaker**: **Bart Gajderowicz,** Mark S. Fox, and Michael Grüninger. *Artificial Intelligence Planning Techniques for Emulating Agents*: ACM SIGSIM PhD Colloquium, Chicago, Illinois, USA, June 4, 2019 (Awarded an ACM Travel Grant)
9. **Speaker**: **Bart Gajderowicz,** Mark S. Fox, and Michael Grüninger. *Requirements for Data-Driven Social Service Policy Evaluation.* Third Annual Data Sharing Initiative Calgary, Alberta, Canada, May 28th, 2018
10. **Panelist**: *Ethics in Artificial Intelligence.* Panelists: Dwija Patel, Matt Kantor, **Bart Gajderowicz**, and Myles Harrison. Toronto, Ontario, Canada, July 13, 2017
11. **Panelist**: *The Future of Semantic Web and its Applications*, Panelists: Mark van Berkel, **Bart Gajderowicz**, and James Leigh; Toronto, Ontario, Canada, April 4, 2017
12. **Speaker**: **Bart Gajderowicz,** Mark S. Fox, and Michael Grüninger. *Artificial Intelligence Planning Techniques for Emulating Agents, with Application in Social Services*. Machine Intelligence Toronto. Toronto, Ontario, Canada, March 9, 2017.

Working Papers

1. **Gajderowicz, B.** Fisher, A. and Mago, V., "COVID-19 Misinformation dissemination patterns and indicators on Twitter" (in progress)
2. **Gajderowicz, B,** Mark S. Fox and Gao, Y., "Towards an Ontology of Traceable Impact Management in the Food Supply Chain" (in progress)
3. Rosu, D., **Gajderowicz, B.,** Fox, M.S., "COMPASS Ontology: A Common Language for Collaboration and Data Sharing in Client-Centered, Outcome-focused Service Provisioning" (in progress)
4. **Gajderowicz B.** and Barton, A. General Service Pattern (in progress)

Professional Research Experience

Senior Research Associate, University of Toronto

Urban Data Centre / Centre for Social Services Engineering **October 2023 to current**

Under the supervision of Professor Mark Fox, I am the Director of the SeMantIc roLe Extraction project (SMILE), a hybrid AI architecture that focuses on explainable natural language understanding AI models

for extracting Impact Model information from unstructured text. My involvement includes designing and developing SMILE's blackboard architecture, knowledge sources and knowledge graph database. I also supervise two to three students per semester. I also manage the Urban Data Catalogue project (CUDC), where my team develops tools for cataloging datasets about urban centres worldwide. In this role, I also supervise two to three students each semester. As a co-author, I actively contribute to the Common Impact Data Standard (CIDS), an ontological basis for extracting Impact Model information, and serve on the Common Approach Technical Committee, advising on the technical direction of CIDS. I am the lead on the adaPtive grAph Repository pipeLine for dynAmic kNowledge sourCEs (PARLANCE) project, which involves developing data translation and consolidation logic, enabling the Compass platform to merge diverse data sources into a single representation stored in a knowledge graph. As part of my outreach efforts, I have organized workshops for academic and industry audiences and written multiple funding proposals.

Postdoctoral Fellow, University of Toronto

Data Modelling and AI Planning for Learning Social Service Needs/Satisfier Associations.

Centre for Social Services Engineering **August 2021 to September 2023**

Under the supervision of Professor Mark fFox, I am a postdoctoral fellow at the Centre for Social Service Engineering. The goal of this research is to combine applied ontologies and machine learning to automate the construction of individual service plans within the domain of social services based on the theory of needs/satisfiers; a sequence of service interventions whose outcomes address the client's needs. My task was to create an entity and semantic role extraction model to convert unstructured text to a knowledge graph and generate a set of plans based on those services. Here, we created a set of ETL pipelines to transform various data sources about service providers, clients, and funders within the Compass project. Next, we created a hybrid (symbolic and sub-symbolic) model that extracts related knowledge using an ontology-driven search. The result of this research is both an ontology and methodology for dynamic needs/satisfier planning that can be incorporated into the Compass platform and made available throughout Canada. I served as a liaison between our data partner on the Compass project and our research assistants and engineers. I served as a project manager to ensure deadlines were met and resources utilized fully. I also performed outreach duties and organised workshops.

Postdoctoral Fellow, Lakehead University, Wondeur AI

Social simulation of strategic behaviour and contextual factors in the global art market.

Lakehead University / Wondeur AI **August 2019 to July 2021**

Under the supervision of Dr Vijay Mago, I was a postdoctoral fellow at Lakehead University and a senior research scientist at Wondeur AI, our industry partner. This project is an extension of social simulation models developed during my PhD thesis. The models are used to combine machine learning and game-theoretical models with social simulation to capture the behaviour of a market that is strongly dependent on subjective metrics, social norms, and market trends not sufficiently represented in available data. In my role as a senior research scientist at Wondeur AI, I was responsible for developing the simulation research program and the incorporation of social indicators. In cooperation with fellow members of the Wondeur AI senior research team, I am devising a publication strategy and mentoring junior machine learning engineers. In my role as a postdoctoral fellow at Lakehead University, I am assisting in supervising graduate students at DataLab, Dr. Mago’s research lab in the Computer Science department. DataLab focuses on applied research in real-world social and economic problems. This research utilises machine learning, natural language processing, simulation, and machine learning. The methods and tools we develop are used to collect and analyze information from various sources and communicate meaningful results to stakeholders and funder.

Postdoctoral Fellow, MIE and TCS
Tata Consultancy Service (TCS), Behavioural Business and Social Sciences
Mechanical and Industrial Engineering, University of Toronto **April to August, 2019**

The Human Centric Systems Research Group of Tata Consultancy Services (TCS) R&I has been working on methods to create grounded, fine-grained agent models grounded in research in behavioural science. This work overlaps with the models I developed during my PhD, namely the fine-grained agent model of the goal-directed decision-making of economically and socially disadvantaged citizens in an urban environment. The objective of the research project was to explore hybrid models of citizens' decision-making. My responsibilities included investigating planning algorithms to extend the originally myopic and resolute agent decision-making models. The models focused on heuristics planning, case-based reasoning, goal reasoning, just-in-time hierarchical planning, and the wisdom hierarchy.

Research Assistant for Prof. Mark S. Fox, CSSE
Mechanical and Industrial Engineering, University of Toronto **September 2013 to 2019**

As a research assistant under the supervision of Professor Mark S. Fox, I was responsible for various initiatives at the Centre for Social Services Engineering (CSSE). I was a member of the Social Services Simulator project at the CSSE. I was responsible for defining the project's objectives, researching and selecting possible solutions, and performing outreach activities amongst related groups, including engineering, government, and social science. I was responsible for finding organizations to partner with and attending relevant events. These partnerships include data sharing, collaboration on existing and upcoming intervention programs, data analysis and validation, program evaluation, and process analysis. I also advised graduate students and post-doctoral fellows at the CSSE on their projects, sharing my expertise on modelling, analysis, as well as technical direction and outreach initiatives.

Support Worker - (Research project domain knowledge and expertise gathering)
The Scott Mission, Toronto, Ontario **February to July, 2015**

This position was part of my research at the CSSE into the shelter system in the city of Toronto, Canada. As an overnight support worker, I was responsible for attending to the clients 'needs, ensuring their safety, and recording various metrics during my direct interaction with them. I observed and interacted with clients, interviewed front line workers and program directors to understand the unique circumstances and needs of clients.

Senior Research Associate – Ci2 and UPCL
Computer Science Department, Ryerson University, Toronto, Ontario **2007 to 2010**

As a Senior RA at the Computational Intelligence Initiative Lab (Ci2) and founding member of the Ubiquitous and Pervasive Computing Lab (UPCL) at Ryerson University, I reported directly to the lab coordinator. Duties included mentoring junior RAs in developing research projects. I have been responsible for designing and building various systems, ranging from intelligent matching algorithms (resulting in a patent), remote robot controls, context-based content management systems, and distributed media capturing applications. I was also responsible for developing and presenting research projects to industry and academic partners. A detailed list is available upon request.

Mentoring and Supervision Activities

I have mentored PhD, Master's, and undergraduate students in developing their research and software engineering skills. I have advised on publications strategies and venues, and proofread numerous manuscripts, advising one student on a successful PhD grant application. Worked closely with two students

on their academic and software development objectives and mentored over 15 students on work-study research projects.

PhD Students

Gurav Rao, PhD Student, Applied Sciences, Saint Mary's University. Assisted with a successful Mitacs grant application for PhD Research.

Liwei Liao: PhD Student, Educational Leadership and Policy, University of Toronto. As a work-study position, I supervised Liwei on data annotation for an NLP project. Liwei was exposed to the CIDS impact model ontology, which was used to annotate unstructured text for testing and training purposes.

Yunhong Tian: PhD Student, Civil Engineering, University of Toronto. As a work-study position, I supervised on Urban Data Curation, metadata and taxonomy creation, geospatial and social service dataset analysis.

Master's Students

Andrew Fisher: MSc Student, Computer Science, Lakehead University. Assisted in the supervision of. Master's thesis. Defended in December, 2020. Currently a PhD Student in the Computer Science Department, Saint Mary's University. Received Postdoctoral Fellowship at York University.

Girirah Heda: MSc Student in Master's of Information, School of Information, University of Toronto. Supervised on urban data curation, metadata modeling, taxonomy creation, data analysis, and software engineering.

Marina Silic: MSc Student, Medical Biophysics The University of Toronto. As a work-study position, I supervised Marian on hypothesis testing and ETL pipeline on the hybrid NLP project.

Pedram Khoshnevis: assisted in the supervision of Computer Science Master's Thesis, Lakehead University. Defended in April 2021.

Dhivya Chandrasekaran: MSc Student, Computer Science, Lakehead University. Assisted with editing numerous manuscripts. Currently a PhD student in Computer Science, Saint Saint Mary's University.

Undergraduate Students

Yifan Liu: BSc Student, Computer Science, University of Toronto. Supervised Yifan on Natural Language Models and software engineering methodlogy, including unit testing and architecture design.

Silin Lyu: BSc Student, Economics and Statistics, University of Toronto. Supervised on NLP model testing, software engineering methodology and unit testing. As an urban data curator, supervised Silin on metadata and taxonomy creation, and ETL pipeline software engineering.

Rudraksh Monga: BSc. Student, Computer Science; Minor: Mathematics and Statistics, University of Toronto. Supervised Rudraksh on LLM training and transfer learning methods, as well as ML optimization with GridSearch.

Janel Gilani: BSc Student, Computer Science Specialist & Statistics Minor, University of Toronto. Supervised Janel on NLP Validation methods using taxonomy, graph theory, and TF-IDF encoding. Utilized GridSearch for aligning various taxonomies with

Aaron Lio: BASc - Engineering Science, University of Toronto. Supervised on Prompt Engineering for Named Entity Extraction using ChaptGPT for extracting impact model concepts.

James Hariady Widjaja: BSc Student, Computer Science & Economics, University of Toronto. Working with a linguist, I supervised James on NLP models, specifically evaluation and correction of dependency trees.

Leonid Nediak: BSc Student, Mathematics and Computer Science Specialisation, University of Toronto. Supervised Leonid on creating a explainable NLU benchmarking suite, with a focus on Named Entity Extraction, with complex confusion matrix architecture and metrics.

Sunnie Hu: BA Student, Health Studies with Statistical Studies and Visual Sciences, University of Toronto. As a work-study position, I supervised Sunnie on data annotation for an NLP project. Sunnie was

exposed to the CIDS impact model ontology, which was used to annotate unstructured text for testing and training purposes.

Chaerin Song: BScs Student, Statistics and Linguistics, University of Toronto. Supervised Chaerin in performing hypothesis testing and developing a hybrid AI (symbolic and sub-symbolic) model for semantic relation extraction. Chaerin developed a prompt-generating process for Question/Answer LLMs.

Akash Shetty: BSc Student, Honors Math and Physics, McMaster University. Supervised Akash as an AI Research Intern at Wondeur AI on community detection and dimensionality reduction methods.

Highschool Students

Nilanthy Balendra, Susan Feng, and Nika Zolfaghari: While at the Computer Science Department, Toronto Metropolitan University, I mentored three high-school interns as part of the Research Opportunity Programs in Engineering and Science and Women in Engineering initiative at the.

Professionals

Dishyu Lyu: Research Assistant, Urban Data Centre, School of Cities, University of Toronto. Supervise Dishyu during the developing and testing for a data integration ETL pipelines. Performed ontology engineering for semantic integration portion of the pipeline. Supervised developing and testing the Canadian Urban Data Catalogue and the Dataset Metadata Maturity Model.

Sharanya Ramidi: Machine Learning Engineer at Wondeur AI. Managed and mentored Sharanya on NLP tasks, creating text extraction scripts and evaluation criteria. Taught computer programming principles for data analysis.

Suman Kumar: Software Engineer, Tata Consulting Services. As part of my postdoctoral position with TCS, I worked closely with Suman (PI) and two junior machine learning engineers: supervised and taught AI planning methods, case-based reasoning, and agent-based simulation, 2019.

Various Co-op students: As the CTO of Engagio, I interviewed, mentored and supervised a number of co-op students on a social media integration application.

Teaching Experience

MIE1513 (451) Instructor – Mechanical and Industrial Engineering Department

University of Toronto, Toronto, Ontario **1 semester: 2015**

MIE1513 Decision Support Systems: This course is co-taught as the undergraduate course MIE 451. During the Fall 2015 semester, my responsibilities include designing the syllabus, creating and modifying slides for the entire course, managing one teaching assistant, creating exams, designing projects, mentoring students, and grading assigned coursework. The course covers various techniques for information analysis, and knowledge-based problem-solving methods such as heuristic search, automated deduction, constraint satisfaction, and knowledge representation. Prolog is used as the main implementation language. Graduate students have a choice of a final project in Prolog or a combination of a Prolog and a research report.

CXCP685 Instructor – Information Technology Studies

Ryerson University, Toronto, Ontario **3 semesters: 2010 to 2011**

CXCP685 PHP/MySQL Web Design Fundamentals: Responsibilities included creating, administering, and grading lecture notes, assignments, tests, and a final exam. The PHP language is used to introduce programming constructs and web application principles. MySQL is used to introduce database basics. The course teaches students how to develop dynamic and secure web applications with a database back-end.

CPS125 Instructor – Computer Science Department

Ryerson University, Toronto, Ontario **2 semesters: 2009 to 2010**

CPS125 Digital Computation and Programming: Responsible for over 75 engineering students. The C programming language is used to introduce students to computer architecture, as well as programming principles and best practices. Topics include computer architecture, C syntax, programming constructs, file I/O, strings, arrays, and multidimensional matrices.

MIE457 Teaching Assistant - Mechanical and Industrial Engineering Department

University of Toronto, Toronto, Ontario **1 semester: 2017**

MIE457 Knowledge Modelling and Management: My responsibilities included creating and presenting tutorials every week on the topics covered. I was also one of two TAs responsible for administering laboratory lessons, assisting students with the technologies used, and answering questions. This course explores both the modelling of knowledge and its management within and among organizations. Knowledge modelling focuses on knowledge types and their semantic representation. It reviews emerging representations for knowledge on the World Wide Web (e.g. RDF and OWL). Emerging knowledge modelling and automated reasoning software was used in the laboratory.

MIE350 Teaching Assistant – Mechanical and Industrial Engineering Department

University of Toronto, Toronto, Ontario **3 semesters: 2013 to 2016**

MIE350 Design and Analysis of Information Systems: My responsibilities included creating and presenting slides focusing on Object-Oriented Programming and Web Applications, meetings with students regarding their projects, and administering quizzes. This course explores the software lifecycle, encompassing the planning, design, analysis, and implementation of software systems. Students learn techniques and methodologies for requirements engineering, data flow diagrams, process modelling, and UML; these techniques are applied in a course project.

MIE1512 Teaching Assistant - Mechanical and Industrial Engineering Department

University of Toronto, Toronto, Ontario **1 semester: 2016**

MIE1512 Data Analytics: My responsibilities included creating and marking all non-lecture material, including assignments and laboratories. I was responsible for learning multiple data analytics technologies, including Python and Scala Notebooks, IBM Bluemix, and experimental systems, including IBM Data Scientist Workbench. The course required me to evaluate each package, its strengths and weaknesses, and provide students with instructions on using these technologies for their laboratory assignments and projects. This course is a research seminar that focuses on recent developments in the area of Data Analytics and Big Data. This seminar provides an overview of data analytics concepts, approaches, and techniques, including distributed computations on massive datasets and frameworks for enabling large-scale parallel data processing on clusters of commodity servers. Emphasis is given to algorithmic techniques for analyzing Web Data. The project goal is to prepare publishable research contributions in the area of data analytics.

MIE253 Teaching Assistant – Mechanical and Industrial Engineering Department

University of Toronto, Toronto, Ontario **1 semester: 2016**

MIE253 Data modelling: As the head TA, I was responsible for managing seven TAs and organizing laboratory and assignment grading schedules. I was also responsible for giving lectures, as well as creating and marking assignments. This course provides an understanding of the principles and techniques of information modelling and data management, covering both relational theory and SQL database systems (DBMS), as well as entity-relation conceptual modelling. The course also familiarises the student with analytical applications (OLAP) and provides an introduction to XML data management. The laboratory focuses on database application development using SQL DBMS, OLAP queries and data modelling.

MIE451 Teaching Assistant – Mechanical and Industrial Engineering Department
University of Toronto, Toronto, Ontario **1 semester: 2014**
MIE451 Decision Support Systems: Responsibilities included creating and presenting slides focusing on data mining, various decision support systems, Object Oriented Programming using Java, meetings with students regarding their projects, creating and marking exams and projects.

CPS630 Teaching Assistant – Computer Science Department
Ryerson University, Toronto, Ontario **3 semesters: 2007 to 2010**
CPS630 Advanced Web Applications: TA duties included assisting students with course content and conduct tutorials; create and mark assignments/tests; organising guest lecturers; co-organize a student project competition judged by both academic and industry individuals. Topics: Web 2.0 Principles, Ajax technology/frameworks, Google Maps/APIs, Web Services, Apache, Tomcat, JSP, PHP, Ruby on Rails, MySQL, JavaScript, Web media, Mobile APIs.

CPS109 Teaching Assistant – Computer Science Department
Ryerson University, Toronto, Ontario **1 semester: 2008**
CPS109 Computer Science I: TA duties included assisting students with course content and conduct tutorials; mark assignments, mid-terms and final exams; conduct labs. Topics included an introduction to programming techniques, concepts, control structures, and Object-Oriented programming, and graphics using the Java 1.5 programming language.

CPS209 Teaching Assistant – Computer Science Department
Ryerson University, Toronto, Ontario **1 semester: 2007**
CPS209 Computer Science II: TA duties included assisting students with course content and conduct tutorials; mark assignments, mid-terms, and final exams; conduct labs. Topics included inheritance and polymorphism, Swing, Multithreading, enumeration, Object Oriented Design.

Professional Experience

Senior Developer, Influitive Inc., Toronto, Ontario **January to August, 2013**
As a Senior Developer, I was responsible for integration of the Engagio (see below) architecture into the Influitive system workflow. I worked directly with the product management, customer support and the engineering teams to develop and implement an integration strategy. I provided direction on designing solutions and developed modules for high scalability. I was also the first technical lead on a new internal "growth hacker" team, which was tasked with the design and implementation of short and highly iterative projects. A project's success was rated using the A/B Test methodology, and successful projects resulted in formal specification requirements and an implementation schedule. I also lead several initiatives to incorporate machine learning into the Influitive workflow, providing business cases and technical solutions.

Co-Founder and Chief Technology Officer
Engagio Inc. (acquired by Influitive Inc.), Toronto, Ontario **2011 to 2013**
As the CTO and founding member, I was responsible for designing and implementing the technical direction of Engagio and building the technical team. We worked in a highly agile development environment, and adopted the "lean startup" methodology. We built an architecture capable of consuming over 1 million comments per day. I was responsible for taking Engagio from conception to most viable-product-through to a production-ready application. I worked directly with our CEO, marketing department, business analysts, engineers and designers to develop the tools required to analyze system performance and collect statistics. Our engineering goal was a highly scalable and efficient system for growth and agility.

Software Engineer, Semantic Technologies, Eqentia Inc., Toronto, Ontario 2010 to 2012

As a Software Engineer at Eqentia Inc., I was responsible for incorporating semantic technologies and natural language processing into the existing workflow of our system, which processes over 100,000 articles per day. The goal was to improve the quality of text classification and topic extraction on these articles. I was also responsible for building tools to manage interrelated taxonomies on various topics, which ensure their soundness throughout the maintenance process. I incorporated YAGO and DBpedia to enrich the taxonomies with external corpora. I was also responsible for reviewing open-source packages and incorporating them into the Eqentia system. For packages which are a result of academic research, I was also responsible for reviewing any associated publications.

TD Canada Trust, Solutions Developer – Enterprise Technology Solutions 2001 to 2007

Objective was to work with Agile and Project Life Cycle paradigms to develop financial systems. My responsibilities were project management, system analysis, design, development, testing, maintenance, and production support, develop ad-hoc statistical analysis and data mining applications. The technologies used were XML, XPath, XSL, Ruby, Paradox, COBOL, SAS.

Web Application Consultant

NuLayer Inc. February to April, 2010

Reporting to the company founders, the objective was to develop a frontend AJAX heavy application for Ruby on Rails workflow application, which produces printable PDF forms, and debug an existing application. The technologies used were Ruby on Rails, Prototype, CSS, and Prince PDF library.

Celect.org September 2009 to January 2010

Reporting to the Chief Development Officer, the objective was to develop a complete awards application, which allowed administrators to create awards, categories, and the actual online questionnaires to be filled out by judges, and receive submissions from candidates. I was also responsible for consulting on the design and user experience of the site, implementing the designs in CSS, recommending a hosting service, setting up the entire Linux/Apache based web server, and configuring a github.com repository. The system was designed to handle multiple organizations, with multiple awards, and various levels of users. The AJAX equipped questionnaire builder included different types questions such as text, radio buttons, checkbox, file uploads, including specific file types for PDF and photos. The technologies used were Ruby, Ruby on Rails, Postgres, Prototype, CSS, RSpec, Capistrano, Linux, and Apache.

Mikemap.com – Independent Music and Event Management October 2008 to April 2009

Objective was to assist with a startup, and act as their Chief Technology Officer. My duties were to design and implement a localization-based music portal for the promotion, torrent publishing, and business development of independent artists around the world. My main responsibilities included consulting on legal manners, determining technology and architectural direction, coordinating development efforts, overseeing 3 developers and 3 designers. I performed lead development duties and worked with junior programmers on implementing the site architecture and various site features. The technologies used were Ruby, Ruby on Rails, CSS, AJAX, MySQL, Google Maps API, YouTube, Vimeo.

Athletes Video - Social Network April 2008 to November 2008

Reporting directly to the CEO, the objective was to design and develop a social network built around the Media Management System mentioned below, which manages athlete analysis videos, event media, and event websites. My responsibilities were to design and develop a social network for sport enthusiasts, of which a central component is the aforementioned management system. I was also responsible for implementing the CSS based on the designer's mockups. The system included internal messaging, email notifications, user profile management, assigning favorite videos, a photo gallery, and user comments for videos and photos. The site required detailed statistics on page views, as well as tracking the number of

times videos were viewed, and looped. I was also responsible for creating the legal contract, gather requirements, mentor a junior developer, as well as propose and configure production and development web servers. The technologies involved were Ruby, Ruby on Rails, AJAX, Prototype, Flash, CSS, MySQL, Apache, Mongrel, Capistrano, and Subversion.

Athletes Video – Media Management System **February 2007 to October 2007**

Reporting directly to the CEO, the objective was to design and develop a media management system, which manages sporting events, and associated media. My responsibilities were to design and develop a system which manages videos, photos, event sites, and users. The system has an online and batch process for creating content, used by users, field organizers, and administrators. The system worked with multiple organizations, custom designs and branding, and custom domains, and event subdomains. I was also responsible for creating the legal contract, gather requirements, mentor a junior developer, as well as propose, configure and maintain production and development web servers. The technologies involved were Ruby, Ruby on Rails, AJAX, Prototype, CSS, MySQL, Apache, Mongrel, Capistrano, and Subversion.

Appointments

Vice President, AMIGAS, University of Toronto student group at MIE 2015 - 2016
My duties included: liaison with MIE department faculty and staff, advise and coordinate Academic Committee initiatives with Academic VPs; outreach program to IE members and student groups; advisor to the MIE 2016 Graduate Research Symposium Committee.

IE Representative, AMIGAS, University of Toronto student group at MIE 2014 - 2015
My duties included representing and supporting Information Engineering (IE) initiatives.

MIE 2015 Graduate Research Symposium Co-Chair.

President, Computer Science Graduate Student Association (CSGSA) 2009 - 2010

CSC Graduate Student Representative, Computer Science Council 2009 - 2010

Memberships

Association for the Advancement of Artificial Intelligence (AAAI) 2017 - present

International Association for Ontology and its Applications (IAOA) 2009 - present

Association for Computing Machinery Student Membership (ACM) 2009 - present

Institute of Electrical and Electronics Engineers (IEEE) 2009 - present

Awards / Grants / Achievements

Mitacs Accelerate Postdoctoral Fellowship Award (1 year)	$ 25,000/y	CAD	2021 - 2022
Mitacs Accelerate Postdoctoral Fellowship Award (2 years)	$ 25,000/y	CAD	2019 - 2021
Wondeur AI, Postdoctoral Fellowship Award (2 years)	$ 75,000/y	CAD	2019 - 2021
Winner: Best Poster: Post-Doctoral Fellow Poster Competition Natural Sciences and Engineering Category, Lakehead University			2020
MIE Postdoctoral Fellowship Award (4 months)	$ 23,000	CAD	2019
ACM SIGSIM PADS Travel Grant Award	$ 1,000	USD	2017 - 2018
MIE Doctoral Completion A ward	$ 9,500	CAD	2017 - 2018
Research Assistantship, U of Toronto, Industrial Engineering	$ 13,000/y	CAD	2013 - 2018
U of Toronto Fellowship, Mechanical and Industrial Engineering	$ 9,500/y	CAD	2013 - 2017
Travel Grant, AAAI Conference 2017	$ 450	CAD	2017

Ontario Centres of Excellence First Job Initiative	$	37,500	CAD	2010 - 2011
Graduate Stipend, Ryerson University, Computer Science	$	12,000/y	CAD	2008 - 2010
Travel Grant, International Semantic Web Conference 2009	$	1,155	USD	2009
Travel Grant, GECCO 2009	$	750	CAD	2009
Apple Worldwide Developer's Conference Student Scholarship	$	1,633	CAD	2008
Sun Certified Java Programmer (Java 2 Platform 1.4 310-035)				2006
TD Bank Continuing Education Assistance Award	$	1,314	CAD	2004
TD Bank Continuing Education Assistance Award	$	1,797	CAD	2002

Service/Committees

Technical Committee: Common Approach to Impact Measurement	2024
Workshop Chair: Workshop on Ontologies for Services and Society (OSS)	2022 - 2023
Program Committee: International Workshop on Narrative Extraction from Texts	2024
Program Committee: Formal Ontology in Information Systems (FOIS)	2023 - 2024
Program Committee: Semantic Web Journal	2022
Steering Committee: EAI International Conference on Social Data and AI (SDAI)	2019
Steering Committee: MIE Graduate Student Research Symposium	2015 - 2016
Review Committee: Computational and Mathematical Organization Theory	2019 - 2021
Steering Committee: Undergraduate Engineering Research Day, U of Toronto	2015 - 2017, 2020

Hobbies

In my free time, I enjoy traveling, listening to jazz, practicing the trumpet, strength-training, jogging, and cycling.

References

Available upon request.