Silviu Pitis

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Research Summary

My research focuses on two questions. First, how should we think about and design goals and abstractions for artificial agents with human principals? Second, how can we design sample efficient, reasoning agents that can achieve a wide range of different goals? My work applies tools from reinforcement learning, decision theory, causal inference, neural networks and representation learning.

Education

University of Toronto — *Toronto, ON*
PH.D. IN COMPUTER SCIENCE, 4.0/4.0 — *Sep 2018 - May 2022 (est.)*
- Advised by Jimmy Ba. Member of machine learning group and Vector Institute affiliate.

Georgia Institute of Technology — *Atlanta, GA*
M.S. IN COMPUTER SCIENCE, 4.0/4.0 — *Sep 2016 - Dec 2017*
- Coursework focused on artificial intelligence and machine learning.

Harvard Law School — *Cambridge, MA*
J.D., *Magna Cum Laude*, 4.2/4.0 — *Sep 2011 - May 2014*
- Coursework focused on corporate law and law and economics. John M. Olin Fellow in Law and Economics. Team Leader, Harvard Law Entrepreneurship Project. Editor, Harvard Business Law Review. Member, Shareholder Rights Project.

Schulich School of Business, York University — *Toronto, ON*
B.B.A., *With Distinction*, 8.4/9.0 — *Sep 2006 - May 2010*
- Coursework focused on finance, economics and math.

Professional Experience

Kirkland & Ellis LLP — *New York, NY*
ASSOCIATE (CORPORATE LAW) — *Oct 2014 - Mar 2016*
SUMMER ASSOCIATE — *May 2013 - Aug 2013*

Harvard University — *Cambridge, MA*
RESEARCH ASSISTANT (LAW & ECONOMICS) — *Feb 2012 - May 2013*

Pokerstars — *Toronto, ON*
PROFESSIONAL ONLINE POKER PLAYER — *Jan 2008 - Aug 2011*

Publications

All papers and accompanying code available at silviupitis.com/papers

CONFERENCE

- Silviu Pitis, Elliot Creager, Animesh Garg. Counterfactual Data Augmentation using Locally Factored Dynamics. Neural Information Processing Systems (NeurIPS). Virtual, 2020. (Poster).
- Silviu Pitis*, Harris Chan*, Stephen Zhao, Bradly Stadie, Jimmy Ba. Maximum Entropy Gain Exploration for Long Horizon Multi-goal Reinforcement Learning. International Conference on Machine Learning (ICML). Virtual, 2020. (Pre-recorded talk).
- Silviu Pitis*, Harris Chan*, Jimmy Ba. An Inductive Bias for Distances: Neural Nets that Respect the Triangle Inequality. International Conference on Learning Representations (ICLR). Virtual, 2020. (Pre-recorded talk).
- Silviu Pitis, Michael Zhang. Objective Social Choice: Using Auxiliary Information to Improve Voting Outcomes. International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS). Virtual, 2020. (Pre-recorded talk).
- Kristopher De Asis, Alan Chan, Silviu Pitis, Daniel Graves, Richard Sutton. Fixed-Horizon Temporal Difference Methods for Stable Reinforcement Learning. AAAI Conference on Artificial Intelligence (AAAI). New York, NY, 2020. (Poster).
- Silviu Pitis. Rethinking the Discount Factor in Reinforcement Learning: A Decision Theoretic Approach. AAAI Conference on Artificial Intelligence (AAAI). Honolulu, HI, 2019. (Oral, Poster).
- Silviu Pitis. Source Traces for Temporal Difference Learning. AAAI Conference on Artificial Intelligence (AAAI). New Orleans, LA, 2018. (Oral).

Conference (continued)

- Silviu Pitis. Methods for Retrieving Alternative Contract Language Using a Prototype. International Conference on Law and Artificial Intelligence (ICAIL). London, UK, 2017. (Oral, **Best Student Paper**).

Workshop

- Silviu Pitis, Elliot Creager, Animesh Garg. Counterfactual Data Augmentation using Locally Factored Dynamics. Object-Oriented Learning (OOL) at ICML 2020. Virtual, 2020. (Pre-recorded contributed talk, **Outstanding Paper**).
- Silviu Pitis*, Harris Chan*, Stephen Zhao, Bradly Stadie, Jimmy Ba. Maximum Entropy Gain Exploration for Long Horizon Multi-goal Reinforcement Learning. Adaptive and Learning Agents Workshop at AAMAS 2020. Virtual, 2020. (Pre-recorded long talk, **Best Paper**).
- Silviu Pitis*, Harris Chan*, Jimmy Ba. ProtoGE: Prototype Goal Encodings for Multi-goal Reinforcement Learning. The 4th Multidisciplinary Conference on Reinforcement Learning and Decision Making (RLDM 2019). Montreal, Canada, 2019. (Poster).
- Silviu Pitis. Challenging the MDP Status Quo: An Axiomatic Approach to Rationality for Reinforcement Learning Agents. The 1st Workshop on Goal Specifications for Reinforcement Learning, held jointly at ICML/IJCAI/AAMAS 2018. Stockholm, Sweden, 2018. (Poster).
- Silviu Pitis. Reasoning for Reinforcement Learning. Hierarchical RL Workshop, NIPS 2017. Long Beach, CA, 2017. (Poster).

Open Source Projects

- Silviu Pitis, Harris Chan, Stephen Zhao. mrl: modular RL. github.com/spitis/mrl. Github. 2020.
- Silviu Pitis. Swoosh: A leaner, faster backend for Whoosh. github.com/spitis/PyIndex. Github. 2016.

Unpublished / Preprints

- Silviu Pitis. An Alternative Arithmetic for Word Vector Analogies. 2016.
- Silviu Pitis. Punitive Damages in International Trade. Advised by Mark Wu. 2014.
- Silviu Pitis. Designing Optimal Takeover Defenses. Advised by Holger Spamann. 2013.
- Silviu Pitis. Examining Expected Utility Theory from Descriptive & Prescriptive Perspectives. Advised by Archishman Chakraborty. 2010.

Selected Blog Posts

- Silviu Pitis. Binary Stochastic Neurons in Tensorflow. r2rt.com. 2016.
- Silviu Pitis. Written Memories: Understanding, Deriving and Extending the LSTM. r2rt.com. 2016.
- Silviu Pitis. Competitive Squeezes: When Monopoly is Socially Superior to Free Competition. silviupitis.com. 2012.
- Silviu Pitis. Dominant Random Strategies: Why Judges Are Sometimes Better Off Flipping Coins. silviupitis.com. 2011.

Fellowships & Awards

2020 - 2023	**NSERC Postgraduate Scholarship - Doctoral (PGS D),** Natural Sciences and Engineering Research Council of Canada
2019 - 2020	**Ontario Graduate Scholarship (OGS),** Government of Ontario
2018 - 2022	**Faculty of Arts and Science Top (FAST) Doctoral Fellowship,** University of Toronto
2018	**Faculty of Arts and Science Entrance Scholarship,** University of Toronto
2017	**Don Berman Best Student Paper,** International Conference on Law and Artificial Intelligence
2013 - 2014	**John M. Olin Fellowship in Law & Economics,** Olin Center for Law & Economics (1 of 3 in HLS Class of 2014)
2011 - 2014	**Dean's Scholar Prize (8x),** Harvard Law School (awarded to top 1-2 students in large classes)
2006 - 2010	**York University Renewable Entrance Scholarship,** York University
2006	**Invitee,** Canadian Mathematics Olympiad (1 of 60 in Canada)

Teaching & Supervision

Instructor

- Introduction to Machine Learning (CSC311). Fall 2020. (Joint with Roger Grosse, Chris Maddison, Juhan Bae).

Teaching Assistant

- Neural Networks and Deep Learning (CSC413/2516). Spring 2020.
- Machine Learning and Data Mining (CSC411). Spring 2019.
- Introduction to Artificial Intelligence (CSC384). Fall 2018.

Research Supervision

- Andrew Gritsevskiy. Ongoing since Summer 2020 (undergraduate). (Joint with Harris Chan).
- Stephen Zhao. Layer-Wise Contrastive Unsupervised Representation Learning. Review of Undergraduate Computer Science (RUCS). `rucs.ca`, 2019-2020. Undergraduate Summer Research. Summer 2019. (Joint with Jimmy Ba).
- Bohan Zhang. Towards Unifying Deterministic and Stochastic Deep Reinforcement Learning Algorithms. Undergraduate Thesis (ESC499). Spring 2019. (Joint with Jimmy Ba).

Service

Reviewer / Program Committee

- ICLR 2021
- AAAI 2021
- NeurIPS 2020
- ICML 2020 (top 33%)
- IJCAI 2020
- AAAI 2020
- IJCAI 2019
- NeurIPS 2019 (top 50%)
- ICML 2019

Invited Talks

Google Brain, Toronto Journal Club *Toronto, Canada*

Modeling Norms and Metrics with Neural Networks: Deep Norms, Wide Norms and Neural Metrics *Aug 2019*

Other

Affiliations

- Vector Institute for Artificial Intelligence, 2018 to present.
- AAAI, 2017 to present.
- New York Bar, 2015 to present.
- Recurse Center, Spring 2016.
- John M. Olin Center for Law and Economics, 2013 - 2014.

Programming

- Poker hand evaluator and Nash equilibrium solver (Java).
- Real-time multi-user whiteboard application (Javascript).
- Contract aggregator and multi-way diff tool (C#, F#).
- Proprietary stock valuation model (Python, Tensorflow).
- Search engine (Python, 2x faster than best Python alternative).
- Deep reinforcement learning framework (Python, Pytorch).

Private Tutoring / Coaching

- Poker. 2008 - 2011.
- Management statistics (undergraduate level). 2008.
- Math and physics (gifted high school level). 2006 - 2008.

Entrepreneurial & Related

- NextAI (startup accelerator), Scientist-in-Residence 2019, 2020.
- DealWIP (legal tech startup), Advisor 2019.
- iAgree LLC (alt. dispute resolution startup), Consultant 2012.
- SCOPE. Cofounder & Director, 2006 - 2009. Not-for-profit that recruited over 60 student volunteers and ran goal-setting workshops for over 2000 Toronto high school students.