Sahand Rezaei-Shoshtari

PhD Student in Computer Science

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Education

Present – Sep. 2020 | **PhD, School of Computer Science, McGill University, Montreal, Canada**
Supervisors : Doina Precup, David Meger
CGPA : 4.00/4.00

Dec. 2019 – Sep. 2017 | **Master of Engineering - Thesis, McGill University, Montreal, Canada**
Supervisors : Inna Sharf, David Meger
CGPA : 4.00/4.00
Thesis : Learning Manipulator Dynamics for Control and Interaction Inference

Sep. 2016 – Sep. 2012 | **Bachelor of Mechanical Engineering, University of Tehran, Tehran, Iran**
Supervisor : Masoud Shariat Panahi
CGPA : 3.98/4.00
Thesis : Online Path Planning for a Mobile Robot in Dynamic Environments using Reinforcement Learning

Work Experience

Present – Apr. 2022 | **Research Intern, Samsung AI Centre, Montreal, Canada**
- Deep reinforcement learning for robotics

Sep. 2020 – Mar. 2020 | **Research Intern, Samsung AI Centre, Montreal, Canada**
- Multimodal generative modeling for learning intuitive physics using the senses of touch and vision
- Development of a visuotactile simulator for robotic manipulation in PyBullet
- Deep reinforcement learning for load balancing of 5G networks

Mar. 2020 – Jan. 2020 | **AI Programmer, Ubisoft La Forge, Montreal, Canada**
- Deep reinforcement learning for automated video game testing
- Development of a video game environment in Unity3D for navigation in complex 3D environments

Aug. 2019 – Mar. 2019 | **Research Intern, Samsung AI Centre, Montreal, Canada**
- Object detection neural networks for human hand-wave motion detection
- Development of the vision stack on-board of a mobile robot using Google Edge TPU

Apr. 2019 – Sep. 2017 | **Teaching Assistant, McGill University, Montreal, Canada**
- **Courses :** System Dynamics and Control, Numerical Methods, Machine Element Design

Publications

2022 **Rezaei-Shoshtari, S.**, Zhao, R., Panangaden, P., Meger, D. and Precup, D., 2022. "Continuous MDP Homomorphisms and Homomorphic Policy Gradient". *Under Review*.

2021 **Rezaei-Shoshtari, S.**, Hogan, F.R., Jenkin, M., Meger, D. and Dudek, G., 2021, May. "Learning Intuitive Physics with Multimodal Generative Models". In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 35, No. 7, pp. 6110-6118).

2021 Hogan, F.R., Jenkin, M., **Rezaei-Shoshtari, S.**, Girdhar, Y., Meger, D. and Dudek, G., 2021. "Seeing Through your Skin : Recognizing Objects with a Novel Visuotactile Sensor". In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision* (pp. 1218-1227).

2020 **Rezaei-Shoshtari, S.**, Meger, D. and Sharf, I., 2020. "Learning the Latent Space of Robot Dynamics for Cutting Interaction Inference". In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (pp. 5627-5632). IEEE.

2020 Molamohammadi, M., **Rezaei-Shoshtari, S.** and Quitoriano, N., 2020. "Jacobian of generative models for sensitivity analysis of photovoltaic device processes". In *Machine Learning for Engineering Workshop at NeurIPS (Vol. 2020)*.

2019 **Rezaei-Shoshtari, S.**, Meger, D. and Sharf, I., 2019, November. "Cascaded gaussian processes for data-efficient robot dynamics learning". In *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (pp. 6871-6877). IEEE.

Honors and Awards

2022	ICML 2022 Outstanding Reviewer (Top 10%). ICML.
2022 – Present	Canada Graduate Scholarship-Doctoral (CGS-D) Award. Amount of $105,000. NSERC.
2022 – Present	Fonds de Recherche du Quebec - Nature et Technologies (FRQ-NT) Award. Amount of $70,000. FRQ.
2020 – 2021	DeepMind Grad Award. Amount of $25,000. DeepMind and McGill University.
Nov. 2019	IROS Student and Developing Countries (SDC) Travel Award. Amount of $800. IEEE/RSJ IROS 2019.
2017 – 2018	Grad Excellence Award. Amount of $5,000. McGill University.
Jul. 2012	National University Entrance Exam. Ranked 19^{th}. Iran.

Skills

Programming	**Python**, **C++**, **C#**, **MATLAB**, Simulink
Machine Learning Frameworks	**PyTorch**, **TensorFlow**, **GPyTorch**, Jax, GPFlow
Platforms	**ROS**, **Docker**
Robotic Software	**Mujoco**, **Bullet**, **Gazebo**, **MoveIt!**, **RViz**, **OpenCV**
Other Software	**Unity 3D**, **SolidWorks**, LaTeX

Select Projects

Multimodal Generative Modeling and Visuotactile Simulation — 2020

github.com/SAIC-MONTREAL/multimodal-dynamics Webpage

- Multimodal generative modeling for learning intuitive physics using the senses of touch and vision.
- Development of a visuotactile simulator for robotic manipulation in PyBullet.

Gym Forest Fire — 2020

github.com/sahandrez/gym_forestfire

- Fully-vectorized forest fire simulation based on cellular automaton for tackling wildfires with reinforcement learning.
- With OpenAI Gym interface and an implementation of TD3 with CNN actor and critic.

Control and Motion Planning Utilities for Kinova Jaco 2 Robot — 2018-2019

github.com/sahandrez/jaco_control

- Developed a ROS package for Kinova Jaco 2 robot with unified interface for the real and simulated robot.
- Implemented impedance control, feedforward torque control, and velocity control utilities.
- Implemented motion planning utilities for joint space and Cartesian space planning.

RLBase : Implementations of RL Algorithms — 2019

github.com/sahandrez/rlbase Blog Post

- Minimalistic Deep RL implementations as an educational resource.
- Fork of OpenAI Spinning Up with additional algorithms.

Learning Quadrotor Controls Using Data-Efficient Model-based Reinforcement Learning — 2017

github.com/sahandrez/quad_pilco Simulation Videos

- Implemented PILCO (Probabilistic Inference for Learning Control) on a quadrotor to learn the control policies under the loss of an actuator.
- Successfully learned to hover with only three actuators.

Courses

IFT 6135	**Representation Learning**, Université de Montréal - **4.30/4.30**
IFT 6760	**Reinforcement Learning and Optimal Control**, Université de Montréal - **4.30/4.30**
COMP 766	**Probabilistic Graphical Models**, McGill University - **4.00/4.00**
COMP 765	**Intelligent Robotics**, McGill University - **4.00/4.00**

Certifications

Mar. 2021	**ANITI Reinforcement Learning Virtual School (RLVS) 2021**, Virtual
Oct. 2020	**Simons Institute Mathematics of Online Decision Making Workshop**, Virtual
Aug. 2019	**CIFAR Deep Learning and Reinforcement Learning (DLRL) Summer School**, Edmonton, Canada