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Ossama Ahmed

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Education

ETH Zürich	Sep. 2018 - Sept. 2020

MSc., Robotics, Systems and Control   *Zürich, Switzerland*

Courses: Autonomous Mobility on Demand, Probabilistic Graphical Models for Image Analysis, Advanced Topics in Machine Learning, Advanced Machine Learning, Deep Learning, Vision for Robotics, Linear Systems Theory, Model Predictive Control, Causality, Machine Perception, Bayesian Statistics, System Identification and Autonomous Mobile Robots.

Tutor: Prof. Andreas Krause

McGill University	Sep. 2013 - Dec. 2016

BEng., Software engineering.   *Montreal, QC*

Courses: Honours Algorithms and Data Structures, Compiler Design, Artificial Intelligence and Digital System Design.

Awards: - Meyer Undergraduate Award   - Gruber SURE Award

Work Experience

MILA, Montreal Institute for Learning Algorithms	Oct. 2020 - Present

Visiting student Researcher   *Montreal, QC*

- Research on generalization in reinforcement learning under the supervision of **Anirudh Goyal** and **Prof. Yoshua Bengio**.

Empirical Inference, Max Planck Institute for Intelligent Systems	Feb. 2020 - Sept. 2020

Visiting student Researcher   *Tubingen, Germany*

- Conducted research on the intersection of causality and reinforcement learning for a physical multi-finger robot under the supervision of **Stefan Bauer** and **Prof. Bernhard Schölkopf**.

Learning and Adaptive Systems Lab, ETH Zurich	Oct. 2019 - Feb. 2020

Master's student Researcher   *Zurich, Switzerland*

- Investigated the effect of using a Bayesian Neural Network to model the dynamics of a system in order to capture the state uncertainties, in a model-based RL context under the supervision of **Jonas Rothfuss** and **Prof. Andreas Krause**.

Robotic Systems Lab, ETH Zurich	Feb. 2019 - July. 2019

Master's student Researcher   *Zurich, Switzerland*

- Investigated the effect of behavioral cloning on policy gradient methods in designing legged locomotion policies for the quadrupedal robot ANYmal under the supervision of **Vassilios Tsounis** and **Prof. Marco Hutter**.

DeepLite.ai	June. 2018 - Sep. 2018

Associate Research Engineer - Consultant   *Montreal, QC*

- Worked on an AI-Driven optimizer that makes Neural Networks faster, smaller and energy-efficient from cloud to edge-computing. Particularly explored using reinforcement learning to compress DNNs to satisfy computational constraints.

Qualcomm	June. 2017 - June. 2018

Machine Learning Software Engineer   *Toronto, ON*

- Worked on the Snapdragon Neural Processing Engine SDK which is designed to help developers run Neural Network models trained in **Caffe**, **Caffe2** or **Tensorflow** on Snapdragon mobile platforms, whether that is the **CPU**, **GPU** or **DSP**.
- Developed techniques for deep network compression for efficient inference across Snapdragon mobile platforms.

Reliable Silicon Systems Lab, McGill University	May. 2016 - May. 2017

Research Assistant   *Montreal, QC*

- Leveraged machine learning by training a neural network to predict the performance of future candidate neural networks under the supervision of **Prof. Brett Meyer**.

Publications

- **Ossama S. Ahmed**, Frederik Träuble, Anirudh Goyal, Alexander Neitz, Manuel Wütrich, Yoshua Bengio, Bernhard Shölkopf and Stefan Bauer, "CausalWorld: A Robotic Manipulation Benchmark for Causal Structure and Transfer Learning", under review at ICLR.
- S. C. Smithson, **Ossama S. Ahmed**, G. Yang, W. J. Gross, and B. H. Meyer, "Neural Networks Designing Neural Networks", Hardware and Algorithms for Learning On-a-chip (HALO) 2016, Workshop on, Nov 2016. (Poster)

Technical Skills

- **Languages:** Python, Java, C++, C, Java Script, OCaml, Matlab and VHDL.
- **Frameworks:** Tensorflow, Pytorch and ROS.

Notable Projects –

Real Robot Challenge (Python, C++) Fall 2020
Currently co-organizing **real robot challenge** to advance the state-of-the-art in robotic manipulation.

BlackBox MPC (Python, Tensorflow) Fall 2020
Developed a framework of different derivative-free optimizers which can be used in conjunction with an MPC (model predictive controller) and an analytical/ learned dynamics model to control an agent in a gym environment.

Online Adaptation using Graph Networks in Model-Based RL (Python, Tensorflow) Fall 2019
Considered online adaptation in a model-based RL context where a dynamics model is trained in conjunction with using MPC to control a system in an environment that changes continously.

Deep 3D Human Pose Estimation (Python, Tensorflow) Spring 2019
Proposed a pipeline for pose estimation, namely the HighResolution Network combined with a low-weight baseline model for extracting the 3D skeleton of human subjects; splitting the challenge to image-related and geometric-related tasks.

Local Exploration Based on TSDF Map using RL (Python, PyTorch) Spring 2019
Most current exploration algorithms are based on heuristics and sampling/evaluating many potential viewpoints. The goal of this work is to learn an ideal motion to maximize the known space based on a local map representation.

Monocular Visual Odometry Pipeline (Matlab) Fall 2018
Successfully implemented a monocular visual odometry pipeline with the most essential features: initialization of 3D landmarks, key point tracking between two frames, pose estimation using established 2D ↔ 3D correspondences, and triangulation of new landmarks.

Planning Under Uncertainty (Python, ROS) Fall 2018
Successfully implemented a path planner and a velocity profiler for a duckiebot as part of **duckietown,** a robotics outreach and educational platform, while taking into account various sources of uncertainty.

Telepresence System (C++, Python) Fall 2016
Successfully developed a Telepresence System that is equipped with high definition cameras remotely connected to an Oculus Rift. The purpose of the Telepresence System is to allow the users to see as if they were physically in place of the system itself. The project focused on three main areas: distortion removal, frames stitching and high definition video streaming.

GoLite Compiler (OCaml, Java Byte Code) Winter 2016
Designed a compiler for GoLite, a subset of the Go programming language. Built the entire compiler pipeline (parser, syntax tree, type checker, code generator and optimizer), producing Java Byte Code as the target language.

HUS AI agent (Java, Python) Winter 2016
Developed an RL agent to compete against more than 200 engineering students to play the HUS game, which is from the family of "Mancala Games". **The agent ranked from the top 10%.**

Enigma Machine (VHDL, ModelSIM) Winter 2016
Designed, built and tested a model of a digital Enigma Machine, a cipher machine used in WWII, on an FPGA board.

Catch the Flag Robot (Java, Lejos API) Fall 2015
Led my team in developing an autonomous robot, in a team of 5 students, to compete against more than **120 engineering students** to play catch the flag game, where we **ranked 3/25**.