KAREEM ELSAWAH

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OBJECTIVE

Machine learning engineer with experience with robotics, NLP, and data science. My most recent interests have been generative modeling, causal inference, and robotics. Interested in applied research opportunities in these fields.

EDUCATION

MSc in Applied Computing, University of Toronto, Department of Computer Science   Expected Dec 2024
Courses (ongoing): ML for healthcare, Computer Vision for Robotics

Bachelors (Hons) of Computer Engineering, Ain Shams University   Sep 2018 - July 2023
Specialization: Data Science   GPA: 3.89
Thesis: Autonomous Drones for Environment Mapping

EXPERIENCE

Autonomous Racing, Team Leader   Nov 2019 - July 2023
ASU Racing Team   *Cairo, Egypt*

- Led Formula AI and Shell AI teams for the 2021 season where we won several international awards. Wrote a research gate article on the system developed in 2021
- Designed and Implemented a novel deep learning architecture capable of detecting the types and 3D positions of cones at speeds exceeding 40 fps (a modified version of LaserNet).
- Developed and tested a graph-based SLAM algorithm for the Formula AI problem
- Created low-level control on a real-life car and tested the system using it
- Held a summer AI & Robotics workshop with over 200 applicants filtered to over 50 participants

Machine Learning Intern   July 2022 - October 2022
Microsoft, Advanced Technology Lab   *Cairo, Egypt*

- Implemented various transformer-based baselines for low-resource machine translation.
- Improved the baseline for low-resource machine translation by 4% (BLEU) using rescoring during training rather than inference (language model prior).
- Started work on transfer learning between languages in the embedding space using contrastive learning approaches.

Perception Engineering Intern   Jan 2021 - Sep 2021
ARL, Autotronics Research Lab   *Cairo, Egypt*

- Develop 3D object detection and tracking as a part of the perception system for a self-driving car
- Fused LiDAR and RGB Cameras to detect objects in 3D using PVCNN
- Tracked objects in 2D and 3D using SORT, DeepSORT, and similar 3D variants.
- Created a visualizer in Unreal Engine to view all of the cars' perceptions (surrounding cars, lanes, traffic lights, path planning, pedestrians, etc.)

Junior Machine Learning Engineer   Aug 2021 - Oct 2021
Omdena

- Contributed to data wrangling, data analysis, and modeling on a real-world time series problem
- Tested early baselines using SARIMAX. Built a Bayesian AR model using PyMC3 with a learned prior that enabled few-shot learning and allowed the model to quickly adapt to specific users' habits

PROJECTS

GANVAS: PyTorch implementation of various generative models including: Autoregressive models, Normalizing Flows, Variational Autoencoders, and Denoising Diffusion models.

Zeta: Implementation of REINFORCE, A2C, and PPO from scratch using only NumPy including an implementation of a deep learning framework with CNNs. Trained on several OpenAI gym environments: continuous and discrete action spaces as well as some with images as inputs instead of states. We also created a 3D physics engine from scratch to create custom environments such as a walking spider and a drone to train the models.

Why: a causal inference library for structural causal modeling and identification. "Why" implements a variety of algorithms including the PC algorithm for causal discovery; GNN and CGNN for edge orientation; COM, GCOM, and TARNet estimators; Backdoor adjustment; Bounds and Sensitivity analysis

BROS: Bandwidth Reduction for Online Streaming. A computer vision and deep learning tool to reduce the required bandwidth for streaming lectures by removing the lecturer (while showing where he/she is pointing) and discretizing the shown board.

AWARDS

Formula AI, 5th place UK, 2023

Dell - Hacktrick.23, 2nd place Egypt, 2023

International Conference on Smart Cities Competition, 2nd place Egypt, 2023

Shell Eco-Marathon, Pitch the future, 1st place Global, 2022

Shell Eco-Marathon, Autonomous Programming, 5th place Global, 2022

Machathon 1.0, 2nd place Egypt, 2020

AI Crowd, AI Blitz 3, 4th place Global, 2020

SKILLS

Machine/Deep Learning: PyTorch, Tensorflow, NumPy, Pandas, Scikit-learn
Languages: Python, C++
Others: ROS, Flask, Node.js
Topics: Computer Vision, Reinforcement Learning, Generative Models, NLP, Causal Inference
Game Development: Unreal Engine 4/5, Blender

EXTRA-CURRICULAR ACTIVITIES

Technical Team Leader, STP   Oct 2020 - March 2023

- Organized the Machathon 4.0 autonomous driving competition using both simulations and real-life cars.
- Led three teams to deliver workshops on Machine Learning, Web & Cloud, and Python & Arduino with a focus on projects and implementing algorithms from scratch.
- Organized Machathon 3.0 with a focus on computer vision: reading car license plates.
- Delivered advanced sessions on Machine Learning with a focus on Natural Language Processing to prepare participants for the Machathon 2.0
- Organized the Machathon 2.0 competition with a focus on Arabic NLP