Hshmat Sahak

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Computer skills

Languages Python, Java, C, C++, MATLAB, R, SQL, Verilog/VHDL, Assembly
Libraries Pandas, TensorFlow, JAX, PyTorch, Keras, OpenCV, scikit-learn, Tesseract

Experience

Jan 2023 – Present **Research Scientist Intern**, Vector Institute for AI, Toronto, ON.
- Used Diffusion models as a form of data augmentation to generate synthetic examples for discriminative tasks like classification, outperforming GAN-based methods on downstream classification task
- Demonstrated that diffusion models trained on one dataset can be fine-tuned in the embedding space only to produce images matching another dataset distribution (e.g., ImageNet → CIFAR). **Submitted to ICML 2023**

May 2022 – Dec 2022 **Student Researcher**, Google Brain, Toronto, ON.
- Train a robust Denoising Diffusion Probabilistic Super-Resolution Model that accepts low-res images of arbitrary dimensions & real-life degradations (e.g., noise, blur, jpeg compression) and outputs corresponding high-res images
- Outperform state-of-the-art in blind single-image super-resolution by combining higher-order degradation scheme with noise conditioning augmentation, a technique that adds noise to input at test time and conditions diffusion model on the noise level. **Submitted first-author paper to ICML 2023**

May 2021 – Aug 2021 **Deep Learning Power Architect Intern**, Nvidia, Santa Clara, CA.
- Implemented algorithm to improve battery mode dynamic compute power predictions by considering GPU idle time
- Suggested improvements for GPU power distribution on Nvidia workstations, resulting in 5-16% power gains over static GPU settings
- Used Jupyter Notebook to visualize GPU power consumption and performance (frames/second) on compute tasks
- Implemented a flow to control the training, inference and deployment of our DL pipeline using YAML files

Jan 2021 – Apr 2021 **Research Intern**, UofT Data-Driven Decision-Making Lab, Toronto, ON.
- Compared COVID statistics in various regions with corresponding COVID-related tweet counts and mask/vaccine hesitancy scores. Used Folium library, word clouds and topic modelling to identify spatial & temporal tweet distribution.
- Fine-tuned BERT model using PyTorch to detect mask sentiments, improving mask attitude classification by 41% compared to vanilla VADER sentiment analysis and outperforming existing hashtag & regex-based classifiers

May 2020 – Aug 2020 **Research Intern**, UofT Dynamic Systems Lab, Toronto, ON.
- Designed and implemented a scalable, real time trajectory generation algorithm using MATLAB to synchronize the flight of 50 drones with live music from a MIDI keyboard
- Wrote python script interfacing keyboard with Crazyflie ROS by gathering keyboard input sequences as ROS bags
- Surveyed 50+ safe-learning papers and categorized them by key ML concepts to help write safe-learning survey paper

Education

Sept 2019 – Present **Engineering Science**, *University of Toronto*, Canada, *GPA – 4.0 (95% average)*.
Major in Machine Intelligence, Minor in Robotics & Mechatronics

Projects

Chess AI.
- Developed chess engine using Python chess module
- Implemented AI to use multiple advanced algorithms, including Killer Move Heuristic, History Heuristic, Principle Variation Search, Transposition Table, Zobrist Hashing, Quiescent Search, and Iterative Deepening

TaskBot.
- Built and programmed a robotic pet that can pick up and sort objects, respond to stimuli, draw, and play the piano
- Worked with Arduino microcontroller; using Bluetooth to control arm and sensors for obstacle detection & path planning

Sneke AI.
- Developed AI agent in C to play snake game with near-optimal performance on boards of arbitrary size.

Awards

Aug 2021 **The Second Garnet W. McKee-Lachlan Gilchrist Scholarship:** Rank 2 in second year of program
Aug 2021 **University of Toronto Scholar:** 100 most outstanding students in 2020-2021
Mar 2020 **Undergraduate Math Contest:** 4th place in Math Contest open to all years and disciplines
July 2019 **Toronto District School Board (TDSB) Top Scholar:** Graduated from high school with 100% average
May 2019 **Canadian Math Olympiad:** Invitation to write the CMO