Michael J. Munje – Curriculum Vitae (updated Jan. 2024)

Personal Information

Name : Michael Joseph Munje
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Research Statement

I am interested in human-centric autonomous agents and robots that can solve complex sequential decision-making tasks. As such, my work draws in elements from **machine learning** (ML), **reinforcement learning** (RL), **computer vision**, and **robotics**. Some areas of focus include imitation learning, leveraging prior knowledge, and improving collaboration between humans and robots. My long-term research goal is to enable human-centric robot autonomy in everyday human life.

Education

The University of Texas at Austin — *Expected May 2027*
Ph.D. in Computer Science
Selected Coursework : Robot Learning, Learning for Controls and Dynamics, Autonomous Robots

Georgia Institute of Technology — *Dec. 2022*
M.S. in Computer Science, *Machine Learning Specialization*
Selected Coursework : Deep Reinforcement Learning, Classic Reinforcement Learning, Imitation Learning, Machine Learning, Deep Learning, Artificial Intelligence, Robot Intelligence : Planning, Computer Vision, Web Search & Mining, Natural Language Processing.

California State University Northridge — *May 2019*
B.S. in Computer Science, *Minor in Mathematics*
Selected Coursework : Machine Learning, Regression Analysis, Statistics, Linear Algebra, Probability, Calculus I-III, Numerical Analysis, Graduate Algorithms, Data Mining, Discrete Math.

Industry Experience

Research Intern — *May 2023 - August 2023*
IBM Research
Improved a quantization framework to increase inference speed and decrease memory requirements for large-language models. Implemented evaluation suite for autoregressive language models. Conducted analysis through extensive experiments on diverse decoder language model quantization schemes.

Data Science Intern — *June 2022 - August 2022*
Riverside Research
Development of reinforcement learning library used for various human-machine teaming tasks. Contributed to planning algorithms for the Sawyer robotic arm to build block towers.

Data Science Intern — *Aug. 2021 - Nov. 2021*
Riverside Research
Developed end-to-end object detection and pose estimation pipeline, reproduced results from reinforcement learning paper related to theory of mind.

Software Engineer Intern — *June 2021 - Aug. 2021*
Microsoft
Trained machine learning models and optimized parameters used in ad rank function in counterfactual platform ; analyzed the results by flighting A/B tests globally.

Software Engineer Intern *June 2020 - Aug. 2020*
Microsoft
Implemented black-box optimization algorithms used to find optimal hyperparameters for combinatorial structures used within a counterfactual platform used to simulate global ad auctions. My work had a direct impact of reducing computation time by 30% while increasing performance by 10% for a computationally expensive algorithm that is widely used globally.

Data Science Intern *Oct. 2019 - June 2020*
NASA Jet Propulsion Laboratory
Deployed fresh craters detection pipeline across 99% of Mars with candidate extraction algorithm. Utilized weak supervision and trained classifiers to filter orbital imagery.

Software Engineer Intern *June 2019 - Aug 2019*
Northrop Grumman
Developed machine learning and data science tools and added core functionalities to software systems.

Research Experience

Research Assistant *Jan. 2024 - Current*
University of Texas Austin
Research Advisor : Professor Amy Zhang
Description : This ongoing research involves applications of goal-based reinforcement learning for robotic control.

Research Assistant *Sept. 2023 - Current*
University of Texas Austin
Research Advisor : Professor Peter Stone
Description : This ongoing research involves autonomous navigation.

Research Assistant *Aug. 2022 - April 2023*
Georgia Institute of Technology
Research Advisor : Professor Matthew Gombolay
Project title : Interactive Policy Modification for Human-AI Coordination
Description : Develop experiment platform for interactively modifying the policy for interpretable reinforcement learning agents with the goal being improved Human-AI coordination. Reproduce prior work in self-play and population-based agents using the PPO algorithm. Submitted for publication.

Research Assistant *June 2020 - Dec. 2020*
California State University Northridge
Research Advisor : Professor Kyle Dewey
Project title : Towards a Systems Programming Language Designed for Hierarchical State Machines
Description : Contributed to experimental programming language similar to C/C++ called Proteus, designed for NASA Jet Propulsion Laboratory flight engineers that uses hierarchical state machines for streamlining software verification. This work directly led to a conference publication.

Research Assistant *Feb. 2020 - May 2020*
California State University Northridge
Research Advisor : Professor Adriano Zambom
Project title : Motion planning for an unmanned vehicle in the presence of accelerating obstacles
Description : Devised statistical-based methods for estimating the trajectories of autonomous vehicles in a simulation. I contributed to the codebase as well as the proofs for the maximum-likelihood estimators. This work helped contribute to a journal publication.

Research Assistant *Aug 2018 - May 2019*
California State University Northridge
Research Advisor : Dr. Kah Chun Lau
Project title : Predicting the Molecular Properties of Ionic Liquids using Machine Learning
Description : Contributed to the initial codebase for a machine learning pipeline that predicting various molecular properties of ionic liquids such as viscosity and melting point. This work directly led to a journal publication, to which I am credited for the codebase.

REU Participant
June 2018 - Aug. 2018

Tufts University
Research Advisors : Professor Csaba D. Toth, Dr. Diane L. Souvaine
Project title : Reconfiguration of connected graph partitions
Description : Devised algorithms for gerrymandering detection. One of my novel contributions included proving that the shortest such sequence of k-district maps is an NP-hard problem. This work directly led to a journal publication.

Research Assistant
Dec. 2017 - June. 2018

California State University Northridge
Research Advisor : Dr. Nhut Ho
Project title : Investigating the Effects of UAV Autonomy in Search & Rescue Environments
Description : Developed the codebase for a human-machine teaming experiment investigating the role of drone autonomy and its relation to human trust.

Teaching Experience

Teaching Assistant
Jan. 2024 - May. 2024

University of Texas at Austin
Reinforcement Learning

Teaching Assistant
Aug. 2023 - Dec. 2023

University of Texas at Austin
Elements of Software Design

Lecturer
April 2022 - June 2022

California State University Northridge
Computer vision course for the Data Science Program.

Teaching Assistant
Summer 2019 - June 2021

California State University Northridge
Data Science Program, NSF Award # 1842386

Teaching Assistant
Aug. 2018 - Dec. 2019

California State University Northridge
AIMS^2 program : Calculus I-III, Physics I-II, Intro to Algorithms, Intro to Data Structures, Advanced Data Structures, Automata Theory, Algorithm Design & Analysis

Teaching Assistant
June 2018 - Nov. 2018

California State University Northridge
Intro to Algorithms, Algorithm Design & Analysis

Publications

Journal Papers

Using machine learning to reduce observational biases when detecting new impacts on Mars Wagstaff, K.L., Daubar, I.J., Doran, G., **Munje, M.J.**, Bickel, V.T., Gao, A., Pate, J. and Wexler, D., 2022. *Icarus*, 386, p.115146.

Reconfiguration of connected graph partitions Akitaya, H.A., Jones, M.D., Korman, M., Korten, O., Meierfrankenfeld, C., **Munje, M.J.**, Souvaine, D.L., Thramann, M. and Toth, C.D., 2019. *Journal of Graph Theory.*

Conference Papers

Towards a systems programming language designed for hierarchical state machines. McClelland, B., Tellier, D., Millman, M., Go, K.B., Balayan, A., **Munje, M.J.**, Dewey, K., Ho, N., Havelund, K. and Ingham, M., 2021, July. *In 2021 IEEE 8th International Conference on Space Mission Challenges for Information Technology (SMC-IT)* (pp. 23-30). IEEE.

Providing predictions of adversary movements in a gridworld environment to a human-machine team improves teaming performance. Coady, J.A., Dysart, P., Schumann, A., Koehler, S.A., **Munje, M.J.**, Casebeer, W.D. and Huberdeau, D.M., 2023, June. *In Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications V* (Vol. 12538, pp. 159-172). SPIE.

Workshop Papers

TEAM3 Challenge: Tasks for Multi-Human and Multi-Robot Collaboration with Voice and Gestures. **Munje, M.J.**, Teran, L.K., Thymes, B. and Salisbury, J.P., 2023, March. *In Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction* (pp. 91-96).

Abstracts

Large-scale automated detection of fresh impacts on Mars using machine learning with CTX observations. **Munje, M.J.**, Daubar, I.J., Doran, G., Wagstaff, K.L. and Mandrake, L., 2020, August. In 11th Planetary Crater Consortium Meeting (Vol. 11, No. 2251, p. 2065).

Fundamental Study of Ionic Liquids Melting Point Structure-Property Using Machine-Learning Method. Acar, Z., **Munje, M.**, Nguyen, P. and Lau, K.C., 2021. In **APS March Meeting Abstracts** (Vol. 2021, pp. H71-181).

Awards

GEM Ph.D. Fellowship *2023*
GEM M.S. Fellowship *2021*
California Pre-Doctoral Program *2020*
Sally Casanova Scholarship *2020*
Bolan Family Endowed Scholarship *2020*
John and Jo Guarrera Endowed Scholarship *2020*
Barry E. Nelson Memorial Endowed Scholarship *2019*
Associated Students Scholarship *2018*
Pearl Simmons Scholarship Endowment *2018*
Southern California Edison Scholarship *2018*

Skills

Programming Languages : Python, C/C++, C, R, SQL#
Reinforcement Learning Libraries : stable-baselines3, ACME, Garage, RLlib
Scientific Computing Libraries : Scikit-Learn, Pandas, NumPy
Deep Learning Libraries : PyTorch, TensorFlow, Captum, Tensorboard
Computer Vision Libraries : OpenCV, torchvision, scikit-image, Pillow
Visualization Libraries : Matplotlib, seaborn
Other Tools : Bash, MuJoCo, ROS, Open MPI, Docker
Office softwares : LaTeX, Microsoft Office
Operating systems : Linux, Windows
Languages : English (native), Spanish (elementary)

Professional Activities

International Conference on Human-Robot Interaction (HRI) *2022*
Reviewer

International Conference on Machine Learning (ICML) *2020*
Volunteer

International Conference on Learning Representations (ICLR) *2020*
Volunteer

Conference on Neural Information Processing Systems (NeurIPS) *2020*
Volunteer

Media Coverage

NASA Is Training an AI to Detect Fresh Craters on Mars, In *Wired Magazine*

AI Is Helping Scientists Discover Fresh Craters on Mars, In *NASA Feature Article*