Mahdi Naddaf

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No VISA Sponsorship Needed

Work Experience

- **Ford Motor Company** — Palo Alto, California, USA
  Research Scientist at Greenfield Labs — *2021 – 2023*

As the lead scientist at Ford's Autonomous Systems Lab, I developed an advanced research platform for cutting-edge methods in autonomous systems. It includes multimodal perception, navigation, RL, Sim2Real, Real2Sim capabilities, and safe neural decision-making. This platform facilitated the research and development of autonomous capabilities for manufacturing robots with a focus on vision in the loop.

Skills

- Python, C++, ROS, NVIDIA Omniverse Platform (Isaac Sim, Isaac Gym, Code), MATLAB (Including GUI, Simulink, and libraries), Tensorflow, PyTorch, Vision sensors (Intel RealSense, Azure Kinect, Zivid, Motion Capture Cameras, LiDAR), NVIDIA Jetson, Azure, OpenCV, GCP, AWS, HPC, Linux

Research and Projects

- **Ford Motor Company - Palo Alto, CA** 2021 - 2023
  - Led and contributed to the implementation of machine learning and deep learning methodologies for advanced manufacturing applications, focusing on pick and place and assembly processes
  - Utilizing Sim-to-Real and Real-to-Sim approach to optimizing cost, increasing quality, reducing waste during the manufacturing process, and in situ quality checks for manufacturing parts
  - Designed and implemented robust data pipelines to facilitate data modeling and generate custom large-scale datasets for 3D object manipulation in robotics and object detection for collision avoidance in autonomous vehicle applications
  - 3D object generation for domain randomization and auto-labeled dataset in Physics enabled environment (NVIDIA Replicator)
  - Deep Learning for object pose estimation using RGB-D cameras based on synthetically generated data. Multiple neural network architectures, including CNN, RNN, GNN, Detectron, etc.
  - Utilizing machine learning and statistical signal processing on force torque sensor for grasping various objects without damaging them
  - Deployed 6DoF object pose estimation with point cloud data for robot manipulation applications
  - Deployed robot manipulator teleoperation using Virtual Reality. Used for data generation for behavioral cloning and imitation learning on YuMi Cobot
  - Expert on industrial robot platforms (ABB IRB4600), Cobots (YuMi)
  - Expert on industrial robot platforms simulation is ROS and Isaac Sim
  - Experienced on various end-effectors including suction cups and finger-based
  - PI for alliance projects with universities including M.I.T, UC Berkeley, UC Davis
- **Detecting Chronic Obstructive Pulmonary Disease in CT-Scan Images - Ann Arbor, MI** 2021 - 2021
  - Funded by National Institutes of Health (NIH)
  - Utilizing Deep Learning based methods for predicting COPD in chest scan images
- **Weld Defect Detection in Dicom X-ray Images** 2019 - 2021
  - Funded by Stanley Black and Decker Oil and Gas to save millions in weld quality evaluation
  - Developed Deep Learning based defect detector with Bayesian optimization using TensorFlow and Keras
  - Created database from scratch and pre-processing images using OpenCV, scikit learn, OCR, etc.
  - Implemented the back end to run on AWS S3 bucket and EC2
  - Achieved an accuracy of 90% for defect detection and 85% for multi-class defect detection
- **Real-Time Road Crack Detection and Mapping** 2017 - 2018
  - Funded by Lamar University CICE, to save billions in maintenance of national pavements
  - Developed and optimized Deep Learning based classification for crack classification
  - Implemented a heuristic mapping algorithm for mapping classified cracks
  - Implemented on both vehicle and drone platforms
  - Achieved an accuracy of 92% for classification of 13 classes of cracks

Education

- **University of Michigan** — Ann Arbor, Michigan, USA
  Postdoctoral Research Fellow — *2021 – 2021*
- **Lamar University** — Beaumont, Texas, USA
  Doctorate of Engineering in Electrical Engineering — *2016 – 2020*
- **University of Southampton** — Southampton, United Kingdom
  Master of Science in Artificial Intelligence — *2011 – 2013*

Publications

- Sadra Naddaf-Sh, **M-Mahdi Naddaf-Sh**, Maxim Dalton, Soodabeh Ramezani, Amir R. Kashani, and Hassan Zargarzadeh, 2023. Application of Machine Learning in Automotive Stud Weld Defect Classification. IEEE Sensors Journal, 2023, doi: 10.1109/JSEN.2023.3309620.
- Debo Shi, Alireza Rahimpour, Amin Ghafourian, **M-Mahdi Naddaf-Sh**, Devesh Upadhyay, Ty A Lasky, and Iman Soltani, 2023. Deep Bayesian-Assisted Keypoint Detection for Pose Estimation in Assembly Automation. Sensors 2023, 23, 6107.
- Sadra Naddaf-Sh, **M-Mahdi Naddaf-Sh**, Maxim Dalton, Soodabeh Ramezani, Amir R. Kashani, and Hassan Zargarzadeh, 2023. Explainable Models for Multivariate Time-series Defect Classification of Arc Stud Welding. International Journal of Prognostics and Health Management 2023, 14, 3.
- Sadra Naddaf-Sh, **M-Mahdi Naddaf-Sh**, Hassan Zargarzadeh, Maxim Dalton, Soodabeh Ramezani, Gabriel Elpers, Vinay S Baburao, Amir R Kashani, 2022. Real-Time Explainable Multiclass Object Detection for Quality Assessment in 2-Dimensional Radiography Images. Complexity Volume 2022, Article ID 4637939, 17 pages, 2022
- **M-Mahdi Naddaf-Sh,** Harley Myler, and Hassan Zargarzadeh, "Design and Implementation of an Assistive Real-Time Red Lionfish Detection System for AUV/ROVs," Complexity, vol. 2018, Article ID 5298294, 10 pages, 2018
- **M-Mahdi Naddaf-Sh,** SeyedSaeid Hosseini, Jing Zhang, Nicholas A. Brake, and Hassan Zargarzadeh, "Real-Time Road Crack Mapping Using an Optimized Convolutional Neural Network," Complexity, vol. 2019, Article ID 2470735, 17 pages, 2019
- Sadra Naddaf-Sh, **M-Mahdi Naddaf-Sh**, Amir R. Kashani, and Hassan Zargarzadeh, "An Efficient and Scalable Deep Learning Approach for Road Damage Detection," IEEE BigData 2020 conference, 7 pages, 2021
- **M-Mahdi Naddaf-Sh,** Sadra Naddaf-Sh, Hassan Zargaradeh,Mohammad R. Zahiri, and Amir R. Kashani, Next-Generation of Weld Quality Assessment Using Deep Learning and Digital Radiographic Images. Published in the AAAI Conference, 2020, Stanford University