Archit Hardikar

LinkedIn | GitHub | Website | architnhardikar@gmail.com | +18628420949

Experience

MagLev Aero Inc. , *Robotics and ML Engineer* *June 2023 - Present*

- Implemented Reinforcement Learning (SAC) aided controller for robust jerk-free electromagnetic stabilization systems. Trained using domain randomization, parallelization, reward engineering.
- Conducted Research on use of DNN Surrogate for Genetic Topological Optimization of Electrodynamics levitating systems (91% test accuracy, 70% time reduction, 20k$ annual savings).
- Developed novel tool - CNN Variational Auto Encoder for Generative AI aircraft designs. This tool enabled faster convergence of Genetic Algorithms using lower dimension Latent Embedding.
- Created a novel Non-Linear System Dynamics estimator, response predictor using Physics Informed Neural Networks.
- Built Retrieval Augmented Generation, Function Calling using Llama3.1 for domain specific queries and AI frontend.
- Developed stable Individual Blade Pitch Control (PID, rate-limiter, anti-windup) for a multi blade rotor.
- Implemented Model Predictive Control (MPC), for active magnetic bearings stabilizer.

UPenn xLab: Safe Autonomous Systems Lab , *Graduate RA* *May 2022 - Dec 2022*

- Achieved **fastest** car award in 10th International F1Tenth Autonomous Grand Prix at IEEE ICRA by implementing spline-based RRT* for fast dynamic vehicle overtake maneuvers using 30Hz LIDAR updates. (GitHub)
- Explored use of Inverse Perspective Mapping for autonomous driving. Deployed detectron on NVIDIA Jetson for real-time car detection. (GitHub)
- Implemented Point Pillar detection with 3D LIDAR Point Clouds on Autonomous Go-Kart, optimized raceline.

MagLev Aero Inc. , *Robotics Intern (Controls)* *June 2022 - Aug 2022*

- Developed digital signal processing, filtering software for high speed sensor input.

Eaton , *ML Engineer* *Dec 2020 - Aug 2021*

- Developed AI assisted requirements capture tool. CNN based classifier, cosine similarity contextual Engineering Drawing segmentation. (50% time reduction, 260k$ annual savings).

Mercedes Benz , *Project Trainee* *June 2019 - Dec 2019*

- Derived Forward and Inverse Kinematics for KUKA robots for paint shop. Optimized glass fitting robot trajectory by 20%. (50k$ annual savings).

Education

University of Pennsylvania *Master of Science - Robotics and Applied Mechanics, GPA: 3.7/4.0*
University of Pune *Bachelor of Technology, GPA: 4.0/4.0*

Projects

Path Planning and Controls | Skills: MPC, LQR, Value Iteration, PyDrake, ROS Gazebo, OSQP solver

- **MPC Manipulator Arm:** Implemented Finite horizon Hierarchical Linear MPC on collision free trajectory enabling real-time, constrained position, velocity, and acceleration control. Derived forward , inverse kinematics of 7-dof manipulator arm for dynamic object grasping using AprilTags. (Artificial Potential Fields, RRT). (GitHub)

Computer Vision and Machine Perception | Skills: PyTorch, Tensorboard, OpenCV, CUDA

- **YOLO:** Scripted YOLOv1 from scratch in Pytorch to predict bounding boxes. MAP achieved: 0.43. (GitHub)
- **SOLO:** Implemented FPN based model (Segmenting objects by location) to predict segmentation masks. (GitHub)
- **MaskRCNN:** Implemented a FPN based two-staged model to predict instance segmentation masks. (GitHub)
- **NeRF:** Implemented Neural Radiance Fields using Volumetric Rendering. Achieved PSNR of 25. (GitHub)

Localization and State Estimation: | Skills: Particle Filter, ESKF, KF, Visual-Inertial Odometry

- **Visual Inertial Odometry:** Implemented geometric non-linear PID controller on quadrotor to follow min-snap A* path. Fused the IMU and stereo pair information to estimate 3D pose of a flying robot using Error State Kalman Filter(ESKF). (GitHub)
- **Sensor Fusion:** Implemented Kalman Filter, Complementary Filter (C/C++) on MPU6050 sensor by fusing 3-axis gyroscope and 3-axis accelerometer for accurate pose estimates on custom-made quadrotor. (GitHub)

Publications

P. O'Regan, T. Lembke, I. Randall, J. Juranovits, S. Gedestad, **Archit Hardikar**, B. M. Concia, and P. C. Gomez. *Thrust Testing and Experimental Validation of a Magnetically Levitated Rotor for Electric Flight Applications*. URL: https://arc.aiaa.org/doi/abs/10.2514/6.2024-4314, doi:10.2514/6.2024-4314

Skills

Programming Languages: C, C++, Python, MATLAB, HTML, Arduino

Frameworks: ROS, ROS2, Git, Pytorch, Tensorflow, Linux, OpenCv, Docker, HPC, slurm

Achievements

Best Graduating Student, Institute Topper and Gold Medalist in Bachelor of Technology (2020)