Resume

Sharath Matada

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Education

- **University of California, San Diego** — La Jolla, United States of America
  Master of Science - Mechanical and Aerospace Engineering(Robotics) — *September, 2022 - Aug, 2024*
  Relevant Coursework:
  ECE276A: Sensing and Estimation in Robotics, ECE276B: Planning and Learning in Robotics, ECE271A: Statistical Learning, MAE204: Robotics, MAE207: Soft Robotics

- **National Institute of Technology, Karnataka(NITK)** — Surathkal, India
  Bachelor of Technology - Mechanical Engineering — *August 2014 - May, 2018*
  Relevant Courses: *Automatic Control Engineering, Robotic Systems*
  Additional Courses: *Deep Learning using PyTorch(IBM), Model Predictive Control*

Publications

- **Generalizable Motion Planning via Operator Learning**
  International Conference on Learning Representations(ICLR), 2025
  Sharath Matada*, Luke Bhan*, Yuanyuan Shi, Nikolay Atansov
  Preprint
- **Reconstructing Robot Motion from Video**
  Submitted to ***Science Robotics****, Under Review*
  Jingpei Lu, **Sharath Matada**, Yiyu Chen, Florian Ritcher, Quan Nguyen, Michael Yip
  Preprint

Skills Summary

- **Robotics:** Optimal Control, Path Planning(A*,RRT, RRT*), Model Predictive Control for Quadrupeds, Kalman Filter, Particle Filter, Visual-Inertial Extended Kalman Filter
- **Machine Learning:** Statistical Learning, Supervised and Self-Supervised Learning, Physics Informed Learning, Reinforcement Learning, Neural Operators for solving PDEs
- **Programming Languages:** Python,C, C++
- **Simulation:** CoppeliaSim, MuJoCo, PyBullet
- **Machine Learning Tools:** Pytorch, Tensorflow, JAX, Kubernetes
- **Others:** Linux, Arduino, Raspberry Pi, MATLAB, Labview, GIT, MS Office

Experience

- **Senior Engineer, Horizon Surgical Systems, Inc.**
  Oct 2024 - Current
  - Working on design and control of next generation manipulators and operator input devices for **robotic ophthalmic surgery**

- **Graduate Research Assistant, Existensial Robotics Lab**
  Jul 2023 - Oct 2024, Advisor: Prof. Nikolay Atanasov, Associate Professor
  - Developed a novel learning-based motion planning framework using **neural operators**, enabling robust generalization to previously unseen environments by mapping **environment representations** to **value functions** on the fly.
  - Developed neural operator architectures that generate **ϵ-consistent** heuristic functions to boost the efficiency of search-based motion planning algorithms like A* to achieve close to optimal paths on large real-world maps
  - Co-led authorship on a research paper detailing this approach, currently under submission for publication at ICLR

- **Senior Robotics Engineer, Systemantics(Collaborative Robotic Arm Maker)**
  Jun 2018 - Aug 2022, Advisor: Dr. Jagannath Raju, CTO
  - **Motion Control**
    - Designed feedback controller and modeled friction, inertial and gravity effects for a robotic manipulator
    - Reduced visible vibrations using flexible joint control with full-state feedback
  - **Safety for Human-Robot Interaction**
    - Designed a disturbance observer to detect collisions with external environment to improve safety for human-robot collaboration
    - Implemented an admittance controller to achieve kinesthetic teaching (intuitive method of teaching the robot by physically applying forces to the robot to move to a particular point in space)
  - **Robot Kinematics and Dynamics**
    - Optimized kinematic architectures of hybrid mechanisms(combination of serial and parallel linkages)for maximum dexterity and minimum intertial load on each joint
    - Characterized the effect of joint elasticity coupled with parallel mechanisms on robot performance in task space
  - **Software Design**
    - Designed a finite state machine and implemented a state estimator for robot joint
    - Implemented trapezoidal commutation for a BLDC motor in a robot joint

Course Projects

- **ECE276A: Sensing and Estimation in Robotics** — University of California, San Diego
  - Conducted data synchronization between IMU and stereo camera image features for accurate and efficient measurements
  - Implemented EKF prediction for real-time positioning and orientation updates using SE(3) kinematics and IMU measurements
  - Developed EKF update step to correct landmark locations using Jacobian of observation model with visual observations
  - Simultaneously corrected car pose and landmark locations using observation model Jacobian w.r.t. car pose, feature locations
  - Analyzed sensitivity to motion and observation model noise and generated an environment map achieving 95% accuracy
- **ECE276B: Planning and Learning in Robotics** — University of California, San Diego
  - Implemented a collision-checking mechanism for a robot's safe navigation in 3D maze-like environments towards the goal
  - Implemented and assessed weighted-A* and RRT, RRT* algorithms for the robot's goal-reaching performance
  - RRT achieved 30 % faster and more memory-efficient performance, while A* showed superior path quality with shorter path
  - Provided insights into expanded nodes, sampling method heuristic selection (Euclidean, Manhattan distance), aiding algorithm selection based on complexity, efficiency trade-offs, and graph creation efficiency in the sampling-based approach

Internship Experience

- **ABB Robotics** — Bengaluru,India
  Intern — *May 2017 - July 2017*
  - Developed a robotic system where an anthropomorphic robotic arm was attached to a 6-DOF IRB1600 ID ABB Industrial Robot to explore grasping.
  - Was involved in the mechanical design, programming and basic electronic design of the system.
- **NMCAD Lab, Aerospace Department, Indian Institute of Science** — Bengaluru,India
  IASc-INSA-NASI Joint Academies' Research Fellow (Summer Research Fellowship) — *May 2016 - July 2016*
  - Worked on Design of Flapping-wing type Micro Aerial Vehicles using self-actuated composites
  - The design was based on the flapping pattern of the rufous hummingbird (Selasphorus Rufus) with the mechanism to allow 2 degrees of freedom for figure 8 like configuration

Teaching Experience

- **MAE3: Introduction to Mechanical Design** — University of California, San Diego
  Graduate Teaching Assistant — *0ct 2022 - Dec 2022*
  - Designed bearing devices to demonstrate basic concepts of under-constraint, exact constraint and over-constraint bearing designs to students
  - Conducted physics review for MAE3 students
  - Conducted weekly office hours at the Design Studio

Activities

- **Volunteer at Youth for Seva**
  A not-for-profit NGO in India supporting schools and other organisations in social sector
- **Amateur Runner and Cyclist**
  A weekend activity to explore new places and test personal limits
- **Former Secretary of Association for Computer Machinery, Student Chapter, NITK**
  Managed club activities such as the project expo

References

- **Dr.Jagannath Raju** — CTO, Systemantics India Pvt. Ltd
  jagannath@systemantics.com.
- **Prof. Nikolay Atanasov** — Associate Professor, UCSD
  natanasov@ucsd.edu