

# 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 Atanasov  
[arXiv](#)
- 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
  - \* Designing next-generation manipulators and operator input devices for **robotic ophthalmic surgery**
  - \* Developing a pipeline for data collection, calibration, and system characterization of robotic manipulators
  - \* Deployed calibrated kinematics on manipulator subsystems, improving overall accuracy
- 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  **$\epsilon$ -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 accepted for publication at ICLR 2025
- 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 inertial 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

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- **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

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- **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

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- **MAE3: Introduction to Mechanical Design** University of California, San Diego  
*Graduate Teaching Assistant* Oct 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

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- **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

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