

# Sharath Matada

Email: [sharath.matada@gmail.com](mailto:sharath.matada@gmail.com)  
Portfolio: [www.sharathmatada.com](http://www.sharathmatada.com)  
Github: <https://github.com/sharath-matada>

## EDUCATION

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- **University of California, San Diego** La Jolla, United States of America  
• *Master of Science - Mechanical and Aerospace Engineering* September, 2022 - March, 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

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- **Reconstruction of Robot Motion from Video**  
*Science Robotics*, In Preparation to be Submitted by Jan 2024  
Jingpei Lu, **Sharath Matada**, Yiyu Chen, Florian Rietcher, Quan Nguyen, Michael Yip  
[Website](#)

## RESEARCH EXPERIENCE

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- **Graduate Research Assistant, Existential Robotics Lab, UCSD**  
Jul 2023 - Current, Advisor: Prof. Nikolay Atanasov, Assistant Professor
  - Working on learning based planner for dynamic environments capable of real-time planning in high dimensional spaces that takes in the **Signed Distance Field** of the environment to generate Value function based on the **Bellman Equation** using **Deep Neural Networks**
  - Implemented a **Neural SDF** that can be generalized to dynamic environments using **Deep Neural Networks**
  - Implemented a **Q\*-function** represented as a **Convolutional Neural Network(CNN)** trained using supervised learning methods
- **Graduate Research Assistant, Advanced Robotics and Controls Lab, UCSD**  
Oct 2022 -Jun 2023, Advisor: Prof. Michael Yip, Associate Professor
  - Worked on reconstructing complex robot motion(dancing) from video on quadruped by **Model Predictive Control(MPC)** using off the shelf optimal control solvers
  - Successfully implemented the controller on Pybullet for Go1 robot at a frequency of 400 Hz in C++ capable of running real-time
  - Tested various **State Estimators(Extended Kalman Filters)** on the Go1 Hardware Platform
- **Senior Robotics Engineer, Systemantics(Collaborative Robotic Arm Maker)**  
Jun 2018 - Jul 2022, Advisor: Dr. Jagannath Raju, CTO
  - **Motion Control**
    - \* Designed feedback controller(PID) and modeled friction, inertial and gravity effects
    - \* Worked on flexible joint control using full-state feedback
  - **Safety for Human-Robot Interaction**
    - \* Worked on disturbance observer design to detect collisions with humans or external environment to improve safety for human-robot collaboration
    - \* Worked on implementation of admittance controller to achieve kinesthetic teaching (alternative method of teaching the robot by physically applying forces to the robot to move to a particular point in space) for intuitive teaching
  - **Software Design**
    - \* Worked on design of finite state machine and implementation of state estimator
    - \* Worked on trapezoidal commutation of BLDC motor
  - **Mechanical Design**
    - \* Worked on integrated joint design(hollow bore) consisting of strain wave gearing, BLDC motor, output and input encoders and compact electromagnetic brakes
    - \* Designed compact spring-loaded electromagnetic brakes with the EM coil optimised for minimum power dissipation
    - \* Designed lightweight links and grippers for serial robots and precision components for the complex mechanisms

## SKILLS SUMMARY

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- **Languages:** Python,C, C++
- **Simulation:** CoppeliaSim, MuJoCo, PyBullet
- **Machine Learning:** Pytorch, Tensorflow, JAX, Keras
- **Robotics Software Development:** ROS2
- **Others:** Linux, Arduino, Raspberry Pi, MATLAB, Labview, GIT, MS Office

## 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
    - \* Graded clock report assignments

## 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. PhD, MIT*
- **Prof. Michael Yip** Associate Professor, UCSD  
*yip@ucsd.edu*
- **Prof. Nikolay Atanasov** Assistant Professor, UCSD  
*natanasov@ucsd.edu*