Sidharth Tadeparti

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Education

2023–2025 **MS**, *Stanford University*, Stanford, CA, GPA: 4.1/4
Mechanical Engineering

2019–2023 **B.Tech (Honours)**, *Indian Institute of Technology Madras*, India, GPA: *9.76/10*
Mechanical Engineering, Top 1% overall and Department Rank - 1/149

Coursework

- Collaborative Robotics, Robot Perception, Reinforcement Learning
- Machine Learning, Deep Learning, Motion Planning
- Probability, Optimization, Data Science, Data Structures and Algorithms
- Scientific Computing, Robotics, Control Theory.

Research Experience

2022–2023 **Bachelor's Thesis**, *IIT Madras*, Model Predictive Control for Platooning
Automotive Controls Lab
- Guided by Dr. CS Shankar Ram, Professor, IIT Madras and Dr. Devika KB, University of Exeter
- Developed an energy efficient model predictive control system for automated heavy vehicle platoons.
- Utilized a detailed vehicle model while leveraging CasADi to implement centralized and distributed frameworks.
- Demonstrated stable operations using on real-world drive cycles and hardware-in-loop tests.
- **Preliminary results presented** at the *European Control Conference 2023* (ECC '23)

2020–2021 **Research Internship**, *IIT Madras*, Deep Learning for Heat Conduction
AI Design and Membrane Technology Lab
- Guided by Dr. Vishal VRN, Assistant Professor, Mechanical Engineering, IIT Madras.
- Built and trained convolutional neural networks (CNNs) using synthetically generated temperature distributions.
- Evaluated the efficacy of encoder-decoder networks and variational-auto-encoders against ANN based approaches.
- **Results published** in *Case Studies in Thermal Engineering* (CSITE).

Publications

Sidharth Tadeparti, Vishal V.R. Nandigana, Convolutional neural networks for heat conduction, Case Studies in Thermal Engineering, Volume 38,2022,102089,ISSN 2214-157X.

S. Tadeparti, K. B. Devika and S. C. Subramanian, "Computationally Efficient Non-linear Model Predictive Control for Truck Platoons," 2023 European Control Conference (ECC), Bucharest, Romania, 2023, pp. 1-6, doi: 10.23919/ECC57647.2023.10178412.

Sidharth Tadeparti, K. B. Devika, and Shankar C. Subramanian "Non-linear Model Predictive Control for Truck Platoons", 2023, (Sub-judice, under review at the European Journal of Control)

Projects

2023 **Autonomous Air Traffic Control**, *Stanford University*

Decision Making Under Uncertainty

- Constructed MDPs and POMDPs to autonomously control the movement of cooperating aircraft toward a runway.
- Achieved safe approach control under both partial and complete observability constraints.
- Outperformed random policies by >100% using offline (QMDP) and online (Monte-Carlo TS) techniques.

2023 **Autonomous Exploration and Mapping for Turtlebots**, *Stanford University*

Principles of Robot Autonomy I

- Progressively developed control (flatness-based), planning (A*), frontier exploration, and high-level perception for the turtlebot.
- Simulation developed in Gazebo and Rviz using ROS2 and autonomy stack deployed on turtlebot hardware.

2023 **Motion Planning**, *IIT Madras*, Motion Planning of 7 DoF Surgical Robot

Motion Planning, Dr. B Sebastian, Dr. N Patel

- Planned and simulated the motion of a KUKA iiwa robot subject to a remote centre of motion.
- Implemented ROS packages with kinematics and collision check subroutines and interfaced the custom planners with gazebo.
- The RRT* and IRRT* planners exhibited successful guidance through orifices of size 10mm in less than 10s.

2022 **Modern Control Theory**, *IIT Madras*, Estimation and Model Predictive Control

- Designed a model predictive controller to control the water levels in a double actuator quadruple-tank setup *K. H. Johansson, "The quadruple-tank process: a multivariable laboratory process with an adjustable zero"*.
- Implemented kalman filters and particle filters for state estimation in addition to constrained-state-space MPC.

2022 **Computational Creativity**, *CNDE, IIT Madras*

- Guided by Dr. Krishnan Balasubramanian, Institute and Chair Professor, Mechanical Engineering, IIT Madras.
- Explored generating computational creativity using deep learning in applications across engineering and art.
- Fine-tuned pre-trained transformer models (GPT-2) to generate distinctive poetry with high coh-metrix scores.

2021 **Electric Vehicle Power Train Simulation**, *Bosch EV Simulation Challenge*

Silver Medal at the Inter IIT Technical Meet

- Evaluated a performance baseline for the electric passenger car segment and modeled the power-train in Simulink.
- Designed parameters for a PMSM motor and verified power-train performance against performance baseline.

2021 **Battery Life Prediction**, *Caterpillar-Industry Defined Problem*

Runner up in the IDP challenge.

- Utilized empirical models based on aging experiment data to predict the remaining life of auxiliary engine batteries.
- Proposed a machine learning-based solution with empirical model based feature engineering to improve accuracy.

2020 **Computational Fluid Dynamics**, *Personal Project*

Guide: Mr. Ramadoss Magesh, Siemens Digital Industries.

- Explored the fundamentals of computational fluid dynamics by implementing finite differencing method codes.
- Capstone project on the Numerical Solution to a de-Laval nozzle, validated results against the analytical solution.

Professional Experience

2023 **VC Intern**, *Venture Highway LLP*, Bangalore, India

A part of their selective student venture partner program.

- Explored the fundamentals of the space - Sourcing, Evaluations of startups and Portfolio Management.
- Investigated the role of interest rates on the premium housing market for a real-estate tech portfolio company.

2022 **Technical Intern**, *ITC Limited*, Bangalore, India

KITES Summer Intern, offered a full time role.

- Quantified and optimized the production capacity of the central kitchen at ITC's Cloud Kitchen Business.
- Developed a data-driven production planning tool and delineated an automation based capacity expansion plan.
- Improved utilization for 60% of SKUs and projected a 84% increase in productivity through an expansion plan.

2021 **Engineering Intern**, *Caterpillar Inc*, Chennai, India

Diesel Engine R&D

- Interned with Engineering Design Centre on the design optimization, modeling and simulation of engine crankshafts.
- Developed GUI based design tools to optimize the location of oil-holes in crankshafts with errors of less than 1%.

Skills

Languages	C++, Python, Julia, MATLAB
Tools	ROS, ROS2, PyTorch, Tensorflow, CasADi, Simulink
Design Tools	Fusion360, Siemens NX, Siemens Tehcnomatix, Ansys, Figma

Select Achievements

Banco Foundation Prize : Awarded to the graduating student with the best academic record in the B.Tech Mechanical Program at **IIT Madras**.

Sivasailam Merit Prize : Awarded to the student with the best individual project in the B.Tech Mechanical Engineering Program at **IIT Madras**.

Vaidy Krishnan Memorial Prize : Awarded to the graduating student with the best overall performance in curricular and extra-curricular activities in the B.Tech Mechanical Engineering Program at **IIT Madras**.

Cockerel Engineering Fellowship : Awarded a one-time grant in recognition of academic excellence. The scholarship is awarded to a select number of graduate school applicants at **UT Austin**.

Honda YES Scholar '21 : **1 among 14** students across India to be recognized for technical excellence and leadership potential. The award includes a **$7000** research grant to be utilized at a Japanese Institution.

Silver Medal winner at the **Bosch** EV Simulation Challenge as a part of the Inter IIT Tech Meet 9.0 - 2021. Offered an **Interview for a full time position** at Bosch at their Electrification Team.

Secured Second position at the **Caterpillar**, Industry Defined Problem Challenge (IDP) - 2021. Offered an **Internship** at Caterpillar's Diesel Engine Design Team.

Extra-Curricular Activities

2019-2023 **Squash**, *IIT Madras*

Member of Madras Hawks, IIT M's Squash Team , Fourth Place at the 55th Inter-IIT Sport Meet, IIT Roorkee, 1st Place at Intercollegiate Tournament. Silver Medal at the *Schroeter*. Captained the Cauvery Hostel Team as a Freshman

2020-2022 **Product Design Club**, *IIT Madras*, Centre for Innovation

- Brought together facets of Technology, Design, and Business to develop a Product Design Culture at IIT M.
- Initiated high impact projects across domains in-addition to conducting design thinking workshops.
  Sample Projects:
  - A low-cost Heads Up Display to help food delivery agents navigate safely and avoid road accidents.
  - A user friendly course management system to help ease academic activity and enhance student collaboration.
  - An automated liquid nitrogen dosing system delivery system to enable low-cost modified atmosphere packaging.

2020-2021 **Student Mentorship**, *IIT Madras*

Recognized as a Star Mentor for my enriching contribution in guiding 6 Mechanical Engineering Freshmen through their Freshman Year as a part of IITM's mental wellness mentorship initiative - *SAATHI*.