Sidharth Tadeparti

+1 650-546-9538| Stanford, CA | sidt@stanford.edu | sidharthtadeparti.github.io

EDUCATION

Stanford University **Stanford, CA**
MS in Mechanical Engineering (Robotics, Control and AI), **GPA**: 4.04/4.0 2025
Courses: Visual Computing Systems (Deep Learning + Graphics + 3D Computer Vision + Parallel Computing), Optimal and Learning based Control, Experimental Robotics (Manipulator Control), Theoretical Statistics.

Indian Institute of Technology Madras **Chennai, India**
B. Tech (Honors) in Mechanical Engineering, **GPA**: 9.76/10 (**Department Rank: 1, Top 1%** Overall). 2023
Courses: Motion Planning, Modern Control, Machine Learning, Intro. Robotics, Data Structures and Algorithms.

RESEARCH EXPERIENCE

Lobell Lab, CS/School of Sustainability, **Stanford University**
Research Assistantship with Dr. David Lobell , June 2024 – Present
- Geospatial-temporal Species prediction and mapping using vision-language foundation models such as CLIP
- Efforts include dataset curation through automated filtering and computing efficient contrastive finetuning.
- Results currently in press at ICCV and AAAI

Autonomous Systems Lab, **Stanford University**
Research Rotation with Dr. Marco Pavone*,* Jan 2024 – Present
- Working at the intersection of Optimal Control and Machine Learning to build robust safety critical systems.
- Development of Fallback Safe MPC that mitigates failure due to Out of Distribution(OOD) perception inputs.
- Integrated Model Predictive Controllers with the XPlane® simulator to evaluate system performance.

Automotive Control Lab, **IIT Madras** *[Thesis]*
Bachelor's Thesis, Aug 2022 – May 2023
- Developed non-linear predictive controllers for energy efficient and stable heavy vehicle platooning.
- Utilized a detailed vehicle dynamics model and CasADi to develop centralized and distributed frameworks.
- Validated performance with co-simulation using a Hardware-in-Loop interface with IPG TruckMaker ™
- Preliminary results presented at the ECC, Awarded the best undergraduate thesis prize for Mechanical Engr.

Membrane Technology Lab, **IIT Madras**
Research Internship, Aug – Dec 2020
- Trained convolutional neural networks (CNNs) using synthetically generated temperature distributions.
- Evaluated the efficacy of encoder-decoder networks and variational-auto-encoders against ANNs.
- Achieved SSIM* scores of up to 0.74 while using image-based methods (*Image Similarity Metric)
- **Results published** in Case Studies in Thermal Engineering (CSITE).

PUBLICATIONS

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 revision)

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

PROFESSIONAL EXPERIENCE

Dexterity, Inc, Redwood City, CA
Robotics Engineering Intern (Cameras and Vision Team), June-Sept 2024
- Image processing for characterization and functional testing of Cameras using Motion Capture Systems.
- Developed pseudo-algorithms for geometric compute vision algorithms used in autonomy stack.
- **Automated testing procedure**, modularized testing software and wrote python APIs for cameras.

Venture Highway (General Catalyst)
VC Intern, May-July 2023
- Sourced, Evaluated and performed Due Diligence on early-stage SaaS startups in the Indian Ecosystem.
- Investigated the role of interest rates on the premium housing market for a real-estate tech portfolio company.

ITC Limited, **Bangalore, India**
Technical Intern, Foods Business Division, May-July 2022 [**Offered a full-time technical role**]
- Quantified and optimized the production capacity of the central kitchen at ITC's Cloud Kitchen Business.
- Developed a planning tool using **historical data** with a chef-level-interface that guided daily production.
- Improved utilization for 60% of SKUs. Projected an 84% productivity increase through automation.

Caterpillar Inc, **Chennai, India**
Engineering Intern, Engine Design Centre, May-July 2021
- **Developed GUI based design tools** to optimize the geometry and location of crankshaft oil-holes.
- The tool's error was less than 1% and was integrated into the Engine Design Centre's in-house software.

PROJECTS

De-raining Natural Scenes with Diffusion Models (Apr-Jun 2024) *[Report]* Computer Vision (***CS231N***)
- Built multi-stage models to remove rain in natural scenes for autonomous vehicle applications.
- Utilized a combination of segmentation for region proposal and identification and diffusion models.

GPU Accelerated Image Classification (Apr-Jun 2024) Parallel Computing (***CME 213***)
- Progressively Developed CUDA Kernels to perform fundamental operation of multi-layer perceptron.
- Utilized MPI and the ICME cluster to accelerate model training and inferences across multiple GPUs.

Collaborative Resource Gathering (Jan-Mar 2024)*[Website]* Collaborative Robotics (***CS 339R***)
- Developed the autonomy stack for collaborative resource gathering tasks between Locobots (Trossen Robotics)
- Utilized strategies for legible motion planning for locomotion and manipulation to mimic patterns by co-bot.

Autonomous Air Traffic Control (Oct-Dec 2023) *[GitHub]* Decision Making Under Uncertainty (***CS238***)
- Constructed a POMDP to autonomously control the movement of co-operating aircrafts towards a runway.
- **Outperformed random policies by >100%** using offline (QMDP) and online (Monte-Carlo TS) techniques.

Autonomous Exploration and Mapping (Oct-Dec 2023) Principles of Robot Autonomy (***CS 237A***)
- Progressively implemented control (flatness-based), planning (A*) and high-level perception for the TurtleBot.
- Simulation developed in Gazebo and Rviz using ROS2, and autonomy stack deployed on TurtleBot hardware.

Motion Planning of a 7-DoF Surgical Robot (Feb-May 2023) *[GitHub]* Motion Planning (IIT Madras)
- Planned and simulated the motion of a KUKA iiwa7 robot subject to a remote center of motion constraint.
- Implemented **ROS packages** with 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.

Estimation and Model Predictive Control Modern Control Theory (IIT Madras)
- Designed a model predictive controller to control the water levels in a double actuator quadruple- tank setup
- Implemented Kalman filters and particle filters for state estimation in addition to constrained-state-space MPC

Battery Life Prediction *Caterpillar IDP, Apr 2021,* ***Runner Up****, Team Project*
- Utilized empirical models based on aging experiment data to predict the remaining life of auxiliary batteries.
- Proposed an ML solution with empirical model-based feature engineering to improve accuracy to **2% MSE.**

SOFTWARE SKILLS

Languages: Python, C++, Julia, MATLAB ***Tools***: CUDA, PyTorch, ROS, JAX, CasADi, TensorFlow, Linux, Git.

SELECT ACHIEVEMENTS

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

Banco Foundation Prize : For the best academic record in the Mechanical Program at IIT Madras.

Sivasailam Merit Prize : For the best undergraduate thesis in the Mechanical Engineering Program at IIT Madras.

Vaidy Krishnan Memorial Prize : For the best overall performance in curricular and extra-curricular activities in the Mechanical Engineering Program at IIT Madras.

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.

EXTRA-CURRICULAR ACTIVITY

Co-Led the Product Design Club
Centre for Innovation, IIT Madras, May 2021-April 2022
- Brought together facets of Technology, Design, and Business to develop a Product Design Culture, rooted in Design Thinking. **Sample Projects:**
  · A low-cost Heads Up Display to help food delivery agents navigate safely and avoid road accidents. [*Info*]
  · A user-friendly course management system to help ease academic activity and enhance student collaboration.
  · An automated Liq. Nitrogen dosing system to enable low-cost modified atmosphere packaging.