Aditya Dutt

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Education

Stanford University — Expected Graduation Jun 2025
Master of Science — *Depth: Robotics and AI*

University of Illinois at Urbana-Champaign — Aug 2019 - May 2023
Bachelor of Science (Highest Honors) — *Minors: Physics, Computer Science*

Relevant Coursework

Robotics: Advanced Robotic Manipulation, Collaborative Robotics, Principles of Robot Autonomy
ML: Reinforcement Learning, Computer Vision (A+), Computer Graphics, ML from Human Preferences, Systems for ML
Control & Optimization: Convex Optimization, Optimal and Learning-based Control

Specializations: AI for Robotics (Udacity), DeepLearning.AI Neural Networks Specialization (Coursera)

Research & Work Experience

Ambi Robotics — Jun 2024 - Sep 2024
Robotics/ML Software Engineer Intern, Supervisor: Ben Kolligs — *Berkeley, CA*

- Built, trained, and deployed a **Transformer OCR model** , reducing the **No-Read-Rate by 10%** for package scanning
- Designed a **Single-View 6D Pose Reconstruction algorithm**, for accurate estimation and Package dimensionalization
- Deployed the algorithm **within 3 weeks** of conception and resulted in **0 package missorts** due to Reconstruction errors
- Researched Region of Interest **Instance Segmentation Models** for accurate object tracking during motion planning
- Mastered software skills like **Unit-Testing**, **Docker** containerization, **Git Flow**, and **Cloud-script** based data collection

Principles of Robot Autonomy I and II - Website — Sep 2024 - Present
Graduate Teaching Assistant, Supervisors: Prof. Marco Pavone, Prof. Jeannette Bohg, Prof. Dorsa Sadigh — *Stanford, CA*

- Conducted lab sessions on **SLAM, Object Detection, ICP, and A* Planning** using ROS2 and Turtlebots
- Delivered a **lecture** on building **Neural Networks** in **PyTorch** for **Object Detection** to 100+ students
- Designed problems integrating **YOLO-based** object measurement models with **EKF**, and **MPPI control** for navigation
- Migrated RL and IL policy implementations (**DQN, Behavior Cloning**) from TensorFlow to **PyTorch**

Multi-Robot Collaboration Research (Nvidia, MuJoCo) - GitHub — Mar 2024 - Dec 2024
Student Researcher, Supervisors: Mandi Zhao, Prof. Shuran Song, Prof. Jeannette Bohg — *Stanford, CA*

- Integrated `dm_control` in MuJoCo with Nvidia's `cuRobo` **Motion Planner** for multi-robot planning and control
- Built **Sequential** and **Combined Planners** to combat **dynamic obstacles** and generate task-based **trajectories**
- Configured the **NVISII renderer** for high-quality **Ray-tracing** based camera observations for **Robot Perception**
- Explored **multi-agent RL** and **Vision-Language-Action (VLA) policies** for high-level, vision-based planning strategies

Assistive Robotics and Manipulation Lab (ARM Lab) - Poster — Sep 2023 - Dec 2024
Student Researcher, Supervisor: Prof. Monroe Kennedy — *Stanford, CA*
Outstanding Poster Presentation

- Designing a **Vision Model with Event Cameras** for **volume estimation of fluids** in containers
- Designed and constructed a **synchronized RGB + Event camera rig** to capture equivalent images from unified views
- Extending the capabilities of **SAM2 video segmentation** using **knowledge-distillation** and event-based data

Papers *(Pre-print)*

1. **Human Preference Next-Best-View Synthesis for 3D Gaussian Splatting - Paper** — Sep 2024 - Present
   ***Outstanding Project Award**, Supervisors: Prof. Sanmi Koyejo, Prof. Monroe Kennedy*
   - Created a **human preference dataset** for candidate views of scenes generated using **Gaussian Splats**
   - Developed a **visual preference model** combining Bradley-Terry theory and a ResNet to **distill human preferences**
   - Achieved **SOTA performance** in real-time **scene reconstruction** with superior view selection

2. **Knowledge Distillation of Foundation Model for Multi-view 3D Reconstruction - Paper** — Apr 2024 - Present
   - Explored **knowledge distillation** techniques to enhance 3D reconstruction of the **Dust3r** foundation model
   - Evaluated performance of **student models** like vanilla CNNs and **Vision Transformers**
   - Obtained equivalent reconstruction quality with a **40% reduction in model size** using **Vision Transformers**

Projects

1. **Modelling Intelligent Game Agents using Deep RL and Imitation Learning** Jan 2025 - Present
   - Trained AI agents for **3D obstacle games** to evaluate difficulty by **mimicking human gameplay patterns**
   - Enhanced policy learning using function approximation in the **Actor network** of **Proximal Policy Optimization (PPO)**
   - Compared **PPO** agents against **Goal-Conditioned Behavior Cloning** trained on expert human trajectories
   - Conducted scalable 3D simulations using the high-performance **Madrona** engine across varied obstacle scenarios

2. **Imitation and Reinforcement Learning for Robot Autonomy** Sep 2023 - Present
   - Built a custom neural network policy for driving agents in **CARLO sim** using **Behavior Cloning** and **CoIL**
   - Trained a Markovian Drone to navigate storms using **Fitted Deep Q-Learning** and **TD Errors**
   - Implemented autonomous car planners with **A*/RRT*** and **Trajectory-Optimization** techniques in simulation

3. **Transformer ML Model Efficiency (Python) - Paper** Sep 2024 - Dec 2024
   - Exploring **model efficiency techniques** to optimize LLMs for **CPU inference**
   - Sparsifying large models like **Gemma2B** and **LLama3.2-1B** using **weight-pruning** and **quantization** methods
   - Experimenting with **sparsity rates** of the Transformer layers to achieve high performance on **text generation tasks**

4. **Model Predictive Control for Multi-robot Collaboration (Python) - GitHub** Apr 2024 - Jun 2024
   - Explored the performance of **two model-based predictive control techniques** in solving a multi-robot collaboration task
   - Compared Deepmind's **MuJoCo MPC** package with Nvidia's **cuRobo MPC** framework
   - Analyzed the frameworks using performance metrics like **horizon** steps, **exploration** time, and **end-effector poses**

Leadership & Skills

- **Leadership**
  1. **MS Program Mentorship & Research Seminar Coordinator**, ME Graduate Students Committee, Stanford (Present)
  2. Teaching Assistant, ME 334, Advanced Dynamics, Stanford (Spring 2024)
  3. Computational Mechanics Review Session Lead, MechSE Department, UIUC (Fall 2022)
- **Technical Skills -** Python, Pytorch, C++, ROS, Linux, Docker, Git, C#, Unity, Unreal, SolidWorks, KiCAD