Siddharth Ancha

Education

Present   **Postdoc**, CSAIL, *Massachusetts Institute of Technology*, Cambridge
Advisor: Nicholas Roy

2022   **Ph.D.**, Machine Learning Department, *Carnegie Mellon University*, Pittsburgh
Advisors: David Held and Srinivasa Narasimhan
Thesis: *Active robot perception using programmable light curtains.*
Committee: David Held, Srinivasa Narasimhan, Katerina Fragkiadaki, Wolfram Burgard
QPA – 4.12/4.0

2017   **M.Sc.**, Department of Computer Science, *University of Toronto*, Toronto
Supervisors: Daniel Roy and Roger Grosse
Thesis: *Measuring the reliability of MCMC inference with bidirectional Monte Carlo.*
GPA – 4.0/4.0

2015   **B.Tech.**, *Indian Institute of Technology (IIT)*, Guwahati
GPA – 9.83/10
Department Rank 2 (2/80) *and* **Institute Rank 2 (2/620)**
Major in Computer Science and Engineering
Minor in Mathematics

Preprints/Publications

2024   **EVORA: Deep Evidential Traversability Learning for Risk-Aware Off-Road Autonomy**
Xiaoyi Cai, <u>Siddharth Ancha</u>, Lakshay Sharma, Philip R. Osteen, Bernadette Bucher, Stephen Phillips, Jiuguang Wang, Michael Everett, Nicholas Roy, Jonathan P. How
ArXiv Preprint, 2024
[**Paper**] [**Website**] [**Talk**] [**Code**]

2024   **Deep Evidential Uncertainty Estimation for Semantic Segmentation under OOD Obstacles**
(Nominated for Best Paper in Robot Vision)
<u>Siddharth Ancha</u>, Philip R. Osteen, Nicholas Roy
International Conference on Robotics and Automation (ICRA), 2024
[**Paper**] [**Website**] [**Talk**]

2023   **Active Velocity Estimation using Light Curtains via Self-Supervised Multi-Armed Bandits**
(Invited to Autonomous Robots Special Issue)
<u>Siddharth Ancha</u>, Gaurav Pathak, Ji Zhang, Srinivasa Narasimhan, David Held
Robotics: Science and Systems (RSS), 2023
[**Paper**] [**Website**] [**Talk**] [**Code**]

2021   **Semi-supervised 3D Object Detection via Temporal Graph Neural Networks**
Jianren Wang, Haiming Gang, <u>Siddharth Ancha</u>, Yi-Ting Chen, David Held
International Conference on 3D Vision (3DV), 2021
[**Paper**] [**Website**] [**Talk**] [**Code**]

2021   **Active Safety Envelopes using Light Curtains with Probabilistic Guarantees**
<u>Siddharth Ancha</u>, Gaurav Pathak, David Held, Srinivasa Narasimhan
Robotics: Science and Systems (RSS), 2021
[**Paper**] [**Website**] [**Talk**] [**Code**] [**Blog**]

2021 **Exploiting & Refining Depth Distributions with Triangulation Light Curtains**
Yaadhav Raaj, <u>Siddharth Ancha</u>, Robert Tamburo, David Held, Srinivasa Narasimhan
Conference on Computer Vision and Pattern Recognition (CVPR), 2021
[**Paper**] [**Website**] [**Talk**] [**Code**]

2020 **Active Perception using Light Curtains for Autonomous Driving** [Spotlight]
<u>Siddharth Ancha</u>, Yaadhav Raaj, Peiyun Hu, Srinivasa Narasimhan, David Held
European Conference on Computer Vision (ECCV), 2020
[**Paper**] [**Website**] [**Talk**] [**Code**]

2020 **Uncertainty-Aware Self-supervised 3D Data Association**
Jianren Wang, <u>Siddharth Ancha</u>, Yi-Ting Chen, David Held
International Conference on Intelligent Robots and Systems (IROS), 2020
[**Paper**] [**Website**] [**Talk**] [**Code**]

2019 **Combining Deep Learning & Verification for Precise Object Instance Detection**
<u>Siddharth Ancha</u>, Junyu Nan, David Held
Conference on Robot Learning (CoRL), 2019
[**Paper**] [**Website**] [**Talk**] [**Code**]

2018 **Autofocus Layer for Semantic Segmentation**
Yao Qin, K. Kamnitsas, <u>Siddharth Ancha</u>, Jay Nanavati, Garrison Cottrell, Antonio Criminisi, Aditya Nori
Medical Image Computing & Computer Assisted Intervention (MICCAI), 2018
[**Paper**] [**Code**]

2016 **Measuring the reliability of MCMC inference with bidirectional Monte Carlo**
Roger Grosse, <u>Siddharth Ancha</u>, Daniel Roy
Neural Information Processing Systems (NIPS), 2016
[**Paper**] [**Code**]

2016 **Lifted Auto-Context Forests for Brain Tumour Segmentation**
Loic Le Folgoc, Aditya V. Nori, <u>Siddharth Ancha</u>, Antonio Criminisi
MICCAI Brain Lesion Workshop, 2016
[**Paper**]

Awards

2023 **Rising Star in Cyber-Physical Systems**
Awarded to 34 out of 118 applicants.
awarded by the CPS Rising Stars Workshop,
organized by the University of Virginia and the National Science Foundation CPS program

2022 **IROS 2022 Outstanding Reviewer Award**
Awarded to only 5 out of 4,291 reviewers! [Announcement]
awarded by the IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS)

2014 **S.N. Bose Scholarship**
Among 50 students from all over India nominated to pursue academic internships in top research universities
in the United States.
awarded by Indo-US Science and Technology Forum and Dept. of Science and Technology, Govt. of India

2013 **ACM ICPC Regional Contest**, *IIT Kanpur*
Stood 12th at the ACM Inter-Collegiate Programming Contest, IIT Kanpur Regionals.

2012 **Institute Merit Scholarship for Academic Excellence**
Ranked first in the department (among 80 students) and the institute (among 620 students).
awarded by the Indian Institute of Technology, Guwahati

2009-10 **KVPY Fellow**
Awarded the prestigious *Kishore Vaigyanik Protsahan Yojna* Fellowship and Scholarship.
Attended National Science Camp at IISER Mohali and IISc Bangalore.
awarded by the Department of Science and Technology, Govt. of India

2009,10 **Regional Mathematical Olympiad**, *Homi Bhabha Center for Science Education*
Qualified the Regional Mathematical Olympiad (RMO) for two conescutive years.

2009	**Inter-School Math Talent Exam**, *Ramanujam Society of Born Mathematicians, Modern School, Vasant Vihar*
	Stood 6th in the Inter-School Mathematics Talent Examination.
2008	**JSTSE Award**, *Directorate of Education*, Govt. of NCT of Delhi
	Received the Junior Science Talent Search Examination Award.
2007-11	**NTSE Scholar**
	Awarded the prestigious *National Talent Search Examination* Scholarship.
	awarded by the National Council of Educational Research and Training, Govt. of India
2004–10	**National Math and Science Olympiads**

- Stood 19th in the Junior Mathematics Olympiad (2009)(Delhi).
  Indian Mathematical Olympiads Foundation
- Secured All India Rank 4 in the Unified Cyber Olympiad (2008).
- Secured All India Rank 55 in the 4th National Cyber Olympiad (2004).
- Secured All India Rank 91 in the 8th National Science Olympiad (2006).
  Science Olympiad Foundation
- Secured All India Rank 136 in the UC National Science Talent Search Exam (2010).

Internships

May - August 2019	**Facebook AI Research**, *New York*, USA
	Mentors: Rama Vedantam and Edward Grefenstette

- Worked on deep variational models for *sequential sentence understanding*. Given a sentence, the task was to generate a diverse but consistent set of image sequences described by the sentence.
- Trained deep conditional variational autoencoders (CVAEs) and deep Kalman filters for temporal image generation and inference over text.
- Used PyTorch as the deep learning framework.

June - August 2017	**Microsoft Research Cambridge**, *Cambridge*, UK
	Mentors: Aditya Nori and Antonio Criminisi

- Worked on deep neural networks for medical image segmentation.
- Experimented with various deep learning architectures for semantic segmentation of organs in medical images (CT scans of the abdominal and pelvic region) – dilated convolutions, U-Net/SegNet, DenseNet and ResNets.
- Used PyTorch as the deep learning framework.
- Worked on techniques for image de-noising and preprocessing to remove artefacts from medical images.

July - September 2016	**Microsoft Research Cambridge**, *Cambridge*, UK
	Mentors: Aditya Nori and Antonio Criminisi

- Worked on hierarchical decision-forest based medical image segmentation systems for segmenting Glioblastoma structures in multimodal MRI brain images. Defined a rigorous framework for using hold-out validation data for efficient node splitting, leading to improved generalization.
- This work was joint winner of the MICCAI Brain Tumour Segmentation (BraTS) 2016 challenge.
- Worked on the problem of incorporating medical expert feedback into ensemble machine learning based segmentation systems. Proposed a Bayesian framework to incorporate feedback in a principled manner to produce a more refined and accurate re-segmentation in real-time.
- This technique is being deployed to solve real-world problems at Microsoft.

June - August 2015	**Microsoft Research India**, *Bangalore*, India
	Mentors: Aditya Nori and Sriram Rajamani

- Worked on understanding and analysing *Adversarial Examples* in Neural Networks.
- Trained deep neural networks on GPU, generated adversarial examples, studied their properties, studied various ways in which AEs can be generated and demonstrated the extent to which neural networks are prone to adversarial examples.
- Studied methods to make neural networks robust to adversarial examples, showed flaws in current techniques for adversarial training, suggested an improved technique and demonstrated improved performance.

May - July 2014	**University of Illinois at Urbana-Champaign**, *USA*
	Mentor: Dan Roth, *Professor*, Dept. of Computer Science

- Worked in the area of *Machine Learning* for *Natural Language Processing*.
- Created text representations and *Dataless Classification* methods to solve the *Textual Entailment* problem, and built a TE based NLP system for the KBP Slot Filler Validation Task organised by *NIST*.
- The system processes a corpus of text using the Illinois NLP pipeline, and extracts entities participating in specified relations with given entities (persons, organizations) in the text using the dataless classification methods.

May - July 2013	**Google India Summer Internship**, *Google Bangalore*, India
	Mentor: Nishant Redkar

- Built a recommendation system for Google Baraza, a social question-answering website in English, Russian, Arabic and Thai.
- Developed heuristics using various user-generated signals and user history to score and rank questions for each user which will be recommended to him/her.
- Worked on distributed computing using Google MapReduce and on various Google technologies such as Bigtables, Protocol Buffers etc.

Conference Reviewing

2024	Robotics: Science and Systems (RSS), *2024*
2024	Int. Conference on Robotics & Automation (ICRA), *2024*
2022	Intelligent Robots & Systems (IROS), *2022*
	Outstanding Reviewer Award (5 out of 4,291 reviewers)
2021	NeurIPS Workshop on Ecological Theory of RL, *2021*
2021	Conference on Robot Learning (CoRL), *2021*
2020	Robotics: Science and Systems (RSS), *2020*
2020	Conference on Robot Learning (CoRL), *2020*
2019	NeurIPS Black in AI Workshop, *2019*
2019	Robotics: Science and Systems (RSS), *2019*
2019	Conference on Robot Learning (CoRL), *2019*

Students Mentored

2023-Present	Sunshine Jiang, *(MIT Undergraduate)*
2022-Present	Laura Brandt, *(MIT PhD → Blue Origin)*
2020-22	Gaurav Pathak, *(CMU MSR → Adobe ML Engineer)*
2021	Rahul Chakwate, *(CMU Intern from IIT Madras → UW-Madison MS)*
2018-21	Jianren Wang, *(CMU MSR → CMU PhD)*
2020	Shubham Sahoo, *(CMU Intern from IIT Kharagpur → Analog Devices)*
2018-20	Junyu (Jenny) Nan, *(CMU MSR → CMU PhD)*
2018-20	Jianing (Aurora) Qian, *(CMU MSR → UPenn PhD)*
2018	Yifan Qiao, *(CMU Intern from Tsinghua Univ.)*

Teaching Assistantship

CMU	10-703: Deep Reinforcement Learning & Control
CMU	10-315: Introduction to Maching Learning
UofT	CSC120: Computer Science for the Sciences
UofT	CSC236: Introduction to the Theory of Computation
IITG	CS203: Formal Languages & Automata Theory

Relevant Courses

Computer Science

CS101	Object-Oriented Programming	16-824	Visual Learning and Recognition
CS202	Discrete Mathematics	CSC2541	Computational Neuroscience
CS201	Data Structures	10-703	Deep Reinforcement Learning & Control
CS204	Algorithms	16-833	Simultaneous Localization & Mapping
CS502	Computational Geometry	CS556	Performance Modelling of Computer Systems
CS203	Formal Languages & Automata Theory	HS224	Game Theory and Economics
CS301	Theory of Computation	CS242	Software Engineering
CS505	Structural Complexity	CS341	Operating Systems
CS510	Information & Randomness	CS344	Databases
CSC2515	Introduction to Machine Learning	CS346	Compilers
10-715	Advanced Introduction to Machine Learning	CS348	Networks
10-716	Advanced ML Theory & Methods	CS461	Computer Graphics
STA2104	Stat. Methods for Data Mining and ML	15-868	*Special Topics*: Physics-based Rendering
CS568	Data Mining	CS522	Embedded Systems
CSC2506	Probabilistic Graphical Models	CS222	Digital Design & Computer Architecture
10-708	Probabilistic Graphical Models	CS244	Systems Programming
CSC2523	Deep Learning for Vision		

Mathematics

MA101	Linear Algebra	MA691	Statistical Simulation & Data Analysis
MA312M	Modern Algebra	36-705	Intermediate Statistics
MA101	Calculus & Real Analysis	10-718	Data Analysis
MA211M	Advanced Real Analysis and Measure Theory	MA311M	Scientific Computing
MA411M	Differential Geometry	MA321	Optimization
MA225	Probability Theory and Random Processes	MA102	Multivariable Calculus and Differential Equations
MA212M	Mathematical Statistics	MA201	Complex Analysis and Partial Differential Equations

Technical Skills

Languages	C, C++, C#, Python, Java, JavaScript, MATLAB, GNU Octave, Julia, Haskell
Libraries	PyTorch, TensorFlow, ROS, PCL, OpenCV
Other	HTML, MySQL
Tools	Git, Vim, Unix Shell Script, Eclipse Android Development
OS	Windows 10/8/7/XP, Linux (Ubuntu), Mac OS X
Documentation	MS-Office, Pages, LaTeX