

# Pranay Mathur

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## EDUCATION

M.S. Robotics (AI and Perception)	Georgia Institute of Technology	GPA: 3.92/4	Aug 2022 – May 2024
B.E. Electronics and Instrumentation	Birla Institute of Technology and Science, Pilani	GPA: 8.87/10 (Dept. Rank 3)	Aug 2017 – July 2021

## EXPERIENCE

**MathWorks — Engineering Development Group Intern | Natick, MA** May 2023 – Aug 2023

- Developed the test harnesses search feature in the Simulink Test Toolbox using graph search algorithms and deployed it to production
- Optimized the C++ and MATLAB back-end of the Simulink Test Toolbox achieving a 70% speed-up over original execution time

**Google Summer of Code — Open-source Developer | Remote** June 2022 – Aug 2022

- Utilized 3D multi-view geometry and object detection for mapping landmarks and path-finding for a 1:10 scale autonomous racing car
- Implemented model compression using quantized EfficientDet to improve inference speed on an embedded PC with an Edge TPU

**Addverb Technologies — Perception Engineer, Mobile Robotics | India** Aug 2021 – July 2022

- Prototyped appearance-based navigation using spatio-temporal LSTM for semantic-scene understanding and efficient image retrieval
- Used bag-of-words of learnt key-point descriptors for Visual-Place Recognition (VPR) to augment SLAM and de-localization recovery
- Shipped monitoring and control infrastructure for a fleet of autonomous mobile robots on the cloud for low-latency visualization

**Autonomous Robots Lab, UNR— Undergraduate Researcher | Reno, NV** July 2020 - Jan 2021

- Developed a generalizable Resource-Aware algorithm for deployment of Visual Inertial Odometry (VIO) algorithms on computationally constrained aerial vehicles achieving a reduction in average CPU usage of up to 50% under the guidance of Prof. Kostas Alexis
- Released two official ROS and ROS2 perception packages - a ROS wrapper for Open3D and example use-cases with pointclouds
- Contributions selected for presentation as a Lightning Talk at ROSCon 2020 and are part of official ROS-Perception repositories

**KPIT Technologies — Research Intern | India** May 2020 – July 2020

- Developed CNN based multi-modal sensor fusion architecture for object detection using 3D LiDAR, RGB camera and RADAR
- Implemented model with improved inference for self-driving cars in adverse weather conditions, low-illumination and partial occlusions

## PUBLICATIONS (Selected)

### Neural Visibility Field for Uncertainty-Driven Active Mapping

Shangjie Xue, Jesse Dill, **Pranay Mathur**, Frank Dellaert, P. Tsotras, Danfei Xu – IEEE/CVF Computer Vision and Pattern Recognition (CVPR), 2024

### Proactive Human-Robot Interaction using Visuo-Lingual Transformers and Object Interaction Graphs (Best Paper Award)

**Pranay Mathur** – Geriatrics Workshop - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023

### Resource-aware Online Parameter Adaptation for Computationally-constrained Visual-Inertial Navigation Systems

**Pranay Mathur**, Nikhil Khedekar, Kostas Alexis - IEEE-RAS International Conference on Advanced Robotics (ICAR), 2021

### A Generalized Kalman Filter Augmented Deep-Learning based Approach for Autonomous Landing in MAVs (Best Paper Award)

**Pranay Mathur**, Yash Jangir, Neena Goveas - IEEE International Symposium of ACA on Intelligent Robotics and Industrial Automation (IRIA), 2021

### Multi-Sensor Fusion-Based Object Detection Implemented on ROS

**Pranay Mathur**, Ravish Kumar, Rahul Jain - Springer International Conference on Machine Learning and Autonomous Systems (ICMLAS), 2021

### BCI Controlled Quadcopter using SVM and Recursive LSE Implemented on ROS

Kshitij Chhabra, **Pranay Mathur**, Veeky Baths - IEEE International Conference on Systems, Man and Cybernetics (SMC), 2020

## SKILLS

C, C++, Python, Java, Bash, CUDA, PyTorch, TensorFlow, CMake, OpenCV, OpenMP, ROS 1/2, MATLAB, Linux, GitHub

## PROJECTS

**Embodiment Agnostic Long-Horizon Manipulation with Differentiable Kinematics using Human-Play Data** Aug 2023 – May 2024

Faculty Advisor: Dr. Danfei Xu, Assistant Professor at Georgia Tech and Research Scientist at NVIDIA AI

- Worked on advancing SOTA in generalizable egocentric robot manipulation policies using hierarchical BC policies learnt from human-play data
- Implemented vision encoder for a trajectory prediction model using the DINOv2 foundation model with LoRA. Achieved embodiment agnostic visual representations by aligning latent-space visual embeddings using an auxiliary KL divergence loss and manipulator masking
- Implemented a modified version of action-chunking with transformers (ACT) using Differentiable-Kinematics and integrated it with low-level controllers for a modified version of the ALOHA robot platform.

**Long-Horizon planning of Next-best-view of NeRFs and Gaussian Splats**

Aug 2023 – Nov 2023

Faculty Advisor: Dr. Danfei Xu, Assistant Professor at Georgia Tech and Research Scientist at NVIDIA AI

- Established SOTA in visibility-based uncertainty quantification in Neural Radiance Fields (NeRFs) applied to active mapping approaches
- Implemented pose optimization pipeline and active mapping baselines to evaluate and compare our proposed approach with current SOTA

**Human-Motion Prediction: With great power comes great res-pose-ability**

Jan 2023 – May 2023

Faculty Advisor: Dr. Zsolt Kira, Assistant Professor at the School of Interactive Computing

- Implemented transformers and Convolutional Seq-to-Seq models for human-motion prediction on computationally-constrained systems
- Achieved comparable performance to several baselines implemented in the [fairmotion](#) library at reduced computational costs

## AWARDS AND VOLUNTEERING

**Best Paper Awards** – IEEE IRIA '21, IEEE/RSJ IROS'23 – Geriatrics Workshop

**Mantra Innovator of the Year** – CEL/BITSAA International '20

**Prof. Suresh Ramaswamy Memorial Award for Best Project**- BITSAA International '19

**Teaching Assistant** – Deep-Learning, Computer Vision, Principles of User Interface Software, Signals and Systems, Microelectronic Circuits