# UTHIRALAKSHMI SIVARAMAN

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## Education

**Worcester Polytechnic Institute (WPI)** — Worcester, USA
*Master's in Robotics Engineering | GPA: 3.8/4* — Aug 2022 – Expected May 2024

**SASTRA Deemed University** — Thanjavur, INDIA
*Bachelor's in Electrical and Electronics Engineering | GPA: 7.79/10* — Jun 2015 – Jun 2019

## Technical Skills

**Programming:** Python, C++(11/14/17), Linux, Bash, Git
**Deep-learning:** PyTorch, TensorFlow, Keras, CUDA
**Robotics:** Gazebo, ROS, ROS2, Vrep, OpenAI Gym, OpenCV, PCL
**Hardware:** UR5e, KUKA KR6R700-2, Franka Emika Panda, Intel RealSense D435i

## Experience

**Graduate Robotics Researcher** — Worcester, USA
*Manipulation & Environmental Robotics Lab, WPI* — May 2023 – Dec 2023

- Advanced camera viewpoint automation on the **Franka Emika Panda** robot through dataset aggregation and epsilon-optimal **imitation learning** policy evaluation, bridging the **Sim2Real** gap.
- Focused on rapid 3D object recognition and performance enhancement in real-world scenarios by testing RGB-D Point Cloud descriptors from **Intel Real-Sense** data.
- Boosted system efficiency and reliability by **30%** through critical **ROS** bug fixes, **PCL** viewer enhancements with **C++**, inverse kinematics solver integration, and code-base refactoring with improved logging and class structures.

**Project Associate - Robotics Software Engineer** — Chennai, India
*Healthcare Technology Innovation Center, IIT Madras Research Park* — Nov 2020 - Apr 2022

- Engineered a python based vector collision system for **UR5e** surgical robots, integrating with advanced path planning and 3D visualization for spine surgery applications.
- Led precision testing for minimally invasive spine surgery with UR5e and phantom models, streamlining automated procedures for enhanced user engagement and feedback.
- Explored record and replay functions for **UR5e** using **RTDE**, enhancing force feedback through detailed analysis of force-torque sensor data.
- Assessed **KUKA KR6R700-2** for spine surgery, establishing **KRC5** communication using **KUKA robot language (KRL)** and leading **ASTM**-standard accuracy evaluations.

**Robotics Software Intern** — Lincoln, United Kingdom
*Lincoln Center for Autonomous Systems, University of Lincoln* — Jan 2019 - Jun 2019

- Explored robotic manipulation using a **7 DOF Franka Emika Panda** arm, focusing on push and grasp maneuvers, and integrated a **Kinect sensor** in **GAZEBO/VREP** simulations.
- Developed a **Encoder-Decoder LSTM network** for predicting sequences in robotic tasks, achieving enhanced 45% per-pixel accuracy in object dynamics through color encoding and IOU bounding box values.

## Featured Projects

**Perception Stack for Autonomous driving Vehicle** — Apr 2023
*Python, PyTorch, Blender*

- Created a complete **Perception stack** for **Self driving car** to achieve **30%** better object & lane segmentation and localization.
- Combined pre-trained models on **MaskRCNN, YolovP2, Yolov5x** to **detect** and **segment** lanes, objects, pedestrians, traffic signals cars across front-view monocular camera captured by Tesla S Model.
- Orchestrated the successful implementation of the **Intel MiDaS transformer** model to obtain monocular depth information, optimizing coordinate conversion and delivering captivating 3D visualizations in **Blender**.

**Structure from Motion and 3D View Synthesis** — Mar 2023
*Python, NumPy, OpenCV, Scipy, Matplotlib, PyTorch, CNN* — GitHub

- Leveraged epipolar geometry, non-linear triangulation, and bundle adjustment techniques to rapidly reconstruct a building's 3D structure (**Mapping**) and extract camera poses (**Localization**) from 2D images.
- Optimized 3D scene realism and development by leveraging **Neural Radiance Fields (NeRF)** to enhance 100 Lego blocks' 2D images data-set; achieved a **40%** increase in visual fidelity.

**Classical and Deep Learning based Image Stitching** — Feb 2023
*Python, NumPy, Scipy, OpenCV, Matplotlib, PyTorch, CNN* — GitHub

- Improved both advanced classical and deep learning techniques, incorporating both supervised and unsupervised methods, to estimate **Homography**between diverse scene images. Utilized corner detection, RANSAC feature matching, and ANMS score, resulting in **30%** improvement in image stitching quality in panoramic fashion.

**Deep and Un-Deep Sensor Fusion** — April 2023
*Python, NumPy, OpenCV, Docker, Pangolin, TensorFlow*

- Implemented "Robust Stereo VIO for Fast Autonomous Flight" for 3D camera positioning utilizing **Stereo images** and **IMU** data on the **EuRoC** dataset using MSCKF algorithm.
- Compared deep learning algorithms, including **1D Conv** and **Bidirectional LSTM**, against traditional methods for **visual-inertial odometry** performance.

**Auto Calibration of 2D Camera** — Feb 2023
*Python, NumPy, OpenCV, Scipy, Matplotlib* — GitHub

- Calibrated a camera using Zhang's method, modeling radial-tangential distortion, and applied Levenberg-Marquardt optimization to reduce the re-projection error by **0.02**