Harshitha Belagavi Rajaprakash

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EDUCATION

Master of Science in Computer Science (GPA : 3.92/4)

University of Southern California, Los Angeles [Aug 2023 - May 2025 (expected)]

Courses: Analysis of Algorithms ; Applied Natural Language Processing ; Robotics ; Machine Learning ; Deep Learning for Robot Manipulation ; Robotic Perception

Bachelor of Engineering (Computer Science and Engineering) - 90.01% (GPA : 4.0/4) (1st Rank, Gold Medallist)

University Visvesvaraya College of Engineering, Bangalore University, Bengaluru [Aug 2017 - July 2021]

Relevant courses: Data Structures, Design and Analysis of Algorithms, Database Management, Machine Learning

SKILLS

Languages: Python (Libraries : PyTorch, pandas, numpy, scipy, scikit-learn, OpenCV), Java, javascript, Node.js, React.js

Software: Unity, Mujoco, IsaacGym, ROS, SQL

AREAS OF INTEREST

Robotics, Robot Perception, Robot Learning, Computer Vision, Assistive Robotics, Human Computer Interaction, XR Technologies, Machine Learning.

WORK EXPERIENCE

Research Assistant, SLURM Lab, University of Southern California, LA   Jan 2024 - Present
– Working at Sensing, Learning, and Understanding for Robotic Manipulation (SLURM) Lab at University of Southern California (USC) under Dr. Daniel Seita.
– Working on robotic manipulation in contact-rich scenarios and leveraging trajectory optimization for planning.
– Building a simulation designing a reward using PPO for scooping particular particles in a clustered environment.
– Building a solution to enable robotic assistance for dressing patients with muscular dystrophy and other neuro-immune conditions, as well as working on assistance for sponge bathing a patient to ensure maximum coverage.

Research Assistant, Indian Institute of Science, Bangalore, India   Nov 2022 - Aug 2023
– Worked at Indian Institute of Science, CPDM, Intelligent, Inclusive Interaction Design (I3D) Lab under the guidance of Dr. Pradipta Biswas on HCI solutions powered by AI/ML and computer vision techniques.
– Built Mixed Reality and Virtual Reality applications for tele operated remote welding Digital twin by mapping the coordinates defined for welding movement to the robot coordinates. Conducted a comparative study of the two.
– Built a mixed reality based Assistive Assembly Process Instruction tool in collaboration with Collin's Aerospace, where Computer Vision is used to detect and track the intricate components. Instructions and warnings are provided to the user based on the tracked positions through multiple modalities; virtual cues and auditory feedback.
– Curated and annotated a custom dataset for the components in hand with real and generated synthetic images to improve the detection. The dataset with real and synthetic data improved the average confidence score by 4%.

Developer Associate, SAP Labs India   July 2021 - Oct 2022
– Built reuse services in Data Privacy and Protection that enables businesses to be compliant with GDPR regulations. Part of Devops activities in the team, ensuring deployment ready code-base, orchestrating the release of the services, sanitation of the code base and new data centre deployments for release of services.

Developer Associate Intern, SAP Labs India   Feb 2021 - July 2021
– Worked on various reuse services(including Personal data Manager and Data Privacy Integration) built to archive and handle data of end users, analysed various consumption scenarios along with supporting customer incidents.

PROJECTS

Caregiving and Assistive Robotics, SLURM Lab, USC
Developing a solution to enhance robotic aide for people with neurological disorders like muscular dystrophy to help with Dressing and Bathing

Plant manipulation, SLURM Lab, USC
Retrieval of a target by a robotic arm leveraging trajectory optimisation to plan the waypoints. Compared the achieved results with Inverse Kinematics and achieved improvement of 2+% success rate of the end effector reaching the target using our optimiser, in a collission sensitive approach.

Dexterous Bi Manual Manipulation for Scooping, SLURM Lab, USC
Built a simulation for facilitating scooping of a sphere from a cluster of particles, and designed corresponding reward function to train with PPO

Eye gaze enabled robotic interaction - for SSME affected individuals, IISc Bangalore
Built an interface for children with Severe Speech and Motor Impairment, where the dwell time and location of the eye gaze is considered to bring about actions in the robot.

IROD - Object detection, IISc Bangalore
Designed a novel model for object detection for Indian Road Dataset. Benchmarked the model against state of the art models(MRCNN, DRN, FCN, etc) on IROD and Cityscapes Datasets.

Instructive Assembly Process Application, IISc Bangalore
Development of an application to initially identify different components of an Assembly Process using Computer Vision and then display instructions to the user on how Assembly must be carried out through Mixed Reality at IISc, Bangalore

XR interface in Remote Welding Scenarios, IISc Bangalore
Development and Comparison of remote welding through Mixed reality interface and Virtual reality application. Development of the Application for Hololens and used Regression Model to map the coordinates from Mixed Reality space to Robot workspace.

Exploration and Analysis of Activation Functions, USC
Analyse the performance of various state-of-the-art activation functions under five different datasets and two Deep Learning architectures, Extreme Learning Machine (ELM) and Multi-Layer Perceptron (MLP). Proposed three novel activation functions. Results show that the proposed activation functions perform fairly well as compared to the state-of-the-art counterparts

PUBLICATIONS(2 ONGOING)

I-ROD: An Ensemble CNNs for Object Detection in Unconstrained Road Scenarios
Abhishek Mukhopadhyay, **Harshitha BR**, Prashant T Gaikwad, Imon Mukherjee, Pradipta Biswas, Signal, Image and Video Processing Journal, Springer (In Review)

Investigating Swimming Effect of Holograms in Mixed Reality
Subin Raj, **Harshitha B R**, Amaresh Chakrabarti, Pradipta Biswas, International Conference on Pattern Recognition(ICPR 2024) (Accepted), July 2024

Harnessing Learn Rate Schedule for Adaptive Deep Learning in LoRaWAN-IoT Localization
R. Swathika; S. M. Dilip Kumar; N. N. Srinidhi; **B. R. Harshitha**, IEEE Access, May 2024
Link

Development and comparison studies of XR interfaces for path definition in remote welding scenarios
Ananthram Rao M C; Subin Raj; Aumkar Kishore Shah; **Harshitha B R**; Naveen R Talawar; Vinay Krishna Sharma; Sanjana M; Himanshu Vishwakarma; Pradipta Biswas, Multimedia Tools and Applications, November 2023
Link

Multiple Multicast Architecture for XMPP based Applications
Harshitha B R, Niyati B Mehta, Shivangi Rai, Deepti , S M Dilip Kumar, S Sheela, 3rd International Conference for Emerging Technology (INCET), IEEE, 2022
Link

IoT-enhanced Extensible Messaging Presence Protocol:A Multiple Multicast Architecture for Diverse Applicatio
S Sheela, **B R Harshitha** and S M Dilip Kumar, IC-ICIC-2023; International Conference on "IOT, Communication, Intelligence and Computing", 2023
Link

ACHIEVEMENTS

1. Secured 1st Rank and 3 Gold Medals, Batch of 2021, UVCE, Bangalore University.
2. Awarded "Best Student Award", Batch of 2021, UVCE, Bangalore University.
3. First place in SAP-CSR Hackathon by developing app to get measurements for prosthetics using CNN, OpenCV, Mediapipe