Omey M. Manyar

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Research Interests

Robot Learning; Robotic Manipulation; Motion Planning; Physics-based Simulation; Reinforcement Learning; Inverse Reinforcement Learning; Computer Vision

Education

University of Southern California — May 2021 – Present
Ph.D. in Mechanical Engineering — Los Angeles, CA

University of Southern California — Aug. 2019 – May 2021
Master of Science in Mechanical Engineering — Los Angeles, CA

National Institute of Technology Karnataka — Jul. 2012 – May 2016
Bachelor of Technology in Mechanical Engineering — Surathkal, India

Experience

Graduate Research Fellow — May 2021 – Present
Advisor: Dr. S. K. Gupta. Realization of Robotics Systems Lab, USC — Los Angeles, CA
- Devised a learning methodology to model expert behavior from sparse demonstrations for sequential planning problems for an autonomous agent
- Designed a framework to generate physics-informed synthetic images for training a ResNet-50-based segmentation model in Pytorch to detect wrinkles and folds in a sheet. Link: code and dataset
- Analyzed the use of differentiable simulators for robotic manipulation of compliant objects (sheets)

Graduate Research Assistant — Jan. 2020 – May 2021
Advisor: Dr. S. K. Gupta. Center for Advanced Manufacturing, USC — Los Angeles, CA
- Project lead for development of a multi-robot system for automation of composite sheet layup in collaboration with ARM Institute, Lockheed Martin and Boeing Inc
- Devised a multi-constraint sheet grasping planner for robots using a high fidelity physics based simulator
- Integrated multiple software modules developed in C++, Java and Python with ROS to accomplish a system that reduced cycle time by 30%

Automation Technologist — Jan. 2018 – Jul. 2019
Rolls-Royce Plc. — Singapore
- Seconded from Nanyang Technological University for leading the technological development in advanced robotics at the manufacturing facility of Rolls Royce
- Spearheaded the deployment of an AI-based smart predictive tool for surface finishing processes
- Developed a collaborative robotic solution that improved Cpk value of filleting operations to 1.98

Graduate Engineer — Aug. 2016 – Jul. 2017
General Motors India Pvt. Ltd. — Bengaluru, India
- Streamlined robotic welding process in the body shop unit of the manufacturing facility of GM India
- Created an investment forecasting tool with savings of 25% for Global Vehicle Development Program at Level 0
- Formulated a dealership improvement strategy, focusing towards customer satisfaction in the west zone of GM India

Summer Undergraduate Researcher — May 2015 – Aug. 2015
Advisor: Dr. Howie Choset. Biorobotics Lab, Carnegie Mellon University — Pittsburg, PA
- Designed a compliant gripper based on pseudo-rigid body modelling technique for snake robots

Honors and Awards

- Best Conference Paper Award. *Won the conference wide best paper award at the 42nd ASME's IDETC-CIE Conference 2022*

- Viterbi Graduate School Fellowship. *Recipient of the Viterbi Graduate School Fellowship awarded to selected Ph.D. students by the Viterbi School of Engineering, USC*

- Academic Excellence Award. *Given to the best outgoing Master of Science student by the Aerospace and Mechanical Engineering Department at the Viterbi School of Engineering, USC*

- National Science Foundation Travel Award. *Awarded at ASME MSEC Conference in 2022 and 2021, ASME IDETC-CIE 2022 and 2021*

List of Publications

- **Omey M. Manyar**, Junyan Cheng, Reuben Levine, Vihan Krishnan, Jernej Barbic and Satyandra K. Gupta. (November 22, 2022). Physics Informed Synthetic Image Generation for Deep Learning based Detection of Wrinkles and Folds. ASME. Journal of Computing and Information Sciences and Engineering. doi: https://doi.org/10.1115/1.4056295

- **Omey M. Manyar**, Junyan Cheng, Reuben Levine, Vihan Krishnan, Jernej Barbic and Satyandra K. Gupta. Synthetic Image Assisted Deep Learning Framework for Detecting Defects During Composite Sheet Layup. *ASME IDETC-CIE Conference, St. Louis, MO, USA, August 2022.* **Best Paper Award**

- **Omey M. Manyar**, Alec Kanyuck, Bharat Deshkulkarni and Satyandra K. Gupta. Visual Servo-Based Trajectory Planning for Fast and Accurate Sheet Pick and Place Operations. *ASME MSEC, Purdue University, IN, USA, June 2022*

- Yi-Wei Chen, Rex Jomy Joseph, Alec Kanyuck, Shahwaz Khan, Rishi Malhan, **Omey M. Manyar**, Zachary McNulty, Bohan Wang, Jernej Barbic, and S. K. Gupta. A Digital Twin for Automated Layup of Prepreg Composite Sheets. *ASME Journal of Manufacturing Science and Engineering, September 2021.* *https://doi.org/10.1115/1.4052132*

- **Omey M. Manyar**, Jaineel Desai, Nimish Deogaonkar, Rex Jomy Joesph, Rishi Malhan, Zachary McNulty, Bohan Wang, Jernej Barbic, and S. K. Gupta. A Simulation-Based Grasp Planner for Enabling Robotic Grasping during Composite Sheet Layup. *IEEE's International Conference on Robotics and Automation, Xi'an, China, May 2021.* *https://doi.org/10.1109/ICRA48506.2021.9560939*

- Vigneashwara Pandiyana, Tegoeh Tjahjowidodo, Wahyu Caesarendra, **Omey M. Manyar** and David Then. In-process virtual verification of weld seam removal in robotic abrasive belt grinding process using deep learning. *Robotics and Computer Integrated Manufacturing Journal, Volume 57, June 2019.* *https://doi.org/10.1016/j.rcim.2019.01.006*

- Srinivasan Lakshminarayanan, **Omey M. Manyar**, Domenico Campolo. Toolpath Generation for Robot Filleting. Advanced Surface Enhancement. INCASE 2019, Singapore. https://doi.org/10.1007/978-981-15-0054-1_28

Projects

Multi-Robot Cell for Automation of Composite Layup | Project Link   Nov. 2020 – Sep. 2021
- Developed a multi-robot cell accomplishing sheet grasping/manipulation, sheet transport, sheet heating and sheet draping task
- Developed vision-based defect detection system for contingency planning for robotic manipulation of sheet
- Work was done in collaboration with ARM Institute and Lockheed Martin

Human-Robot Teaming for Sheet Manipulation Task | Video Link   Jan. 2020 – Oct. 2020
- Developed a hybrid cell demonstrating the use of robots as assistants in sheet manipulation tasks on an industrial application
- Integrated multiple software modules developed in C++, Java and Python with ROS to accomplish a system that reduced cycle time by 30%

COVID-19 Disinfection Robot- ADAMMS-UV | Forbes Link, Viterbi News Link   Apr. 2020 – May 2020
- Extended a mobile manipulator platform to perform deep UV disinfection of indoor environments autonomously
- Examined varied methods that can be deployed for sterilizing surfaces exposed to the coronavirus

Technical Skills

Programming: Python, C/C++, Java, MATLAB
Libraries and Frameworks: PyTorch, Tensorflow, OpenAI Gym, ROS MoveIt, OpenCV, Open3D
Middleware: Robot Operating System
Simulators: VegaFEM, WeBots, Gazebo, Unity, MuJoCo
Robots: KUKA LBR iiwa, ABB, UR5, Yaskawa
Developer Tools: Git, Docker, CUDA

Leadership and Involvement

Viterbi CURVE Fellowship Mentor: Mentored Undergraduate CURVE Fellowship Recipients
Reviewer and Session Chair: RAL (2023), ICRA (2023, 2022), IDETC-CIE (2022)