

Omey M. Manyar

omey-manyar.com | manyar@usc.edu | linkedin.com/in/omey-manyar | Google Scholar

Research Interests

Robotic Manipulation; Perception; Imitation Learning; Physics-Informed Learning; Motion Planning; Reinforcement Learning; Physics-based Simulation

Education

University of Southern California <i>Ph.D. in Mechanical Engineering (Robotics)</i>	May 2021 – May 2025 (Expected) Los Angeles, CA
University of Southern California <i>Master of Science in Mechanical Engineering</i>	Aug. 2019 – May 2021 Los Angeles, CA
National Institute of Technology Karnataka <i>Bachelor of Technology in Mechanical Engineering</i>	Jul. 2012 – May 2016 Surathkal, India

Experience

Toyota Research Institute <i>Robotics Research Intern</i>	Los Altos, CA May 2024 – Aug. 2024
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- Worked on Visual Place Recognition task with RGB-D images for an indoor grocery picking mobile robot (Link)
- Trained a multi-task model that fuses RGB and Depth images to predict goal pose for a given query RGB-D image

Amazon Robotics <i>Applied Science Intern</i>	Seattle, WA May 2023 – Aug. 2023
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- Implemented a 3D pose estimation feature of heterogeneous objects placed in cluttered bins as a part of stow manipulation team (Link)
- Trained a Vision Transformer-based model for effective feature matching and subsequently employing the Perspective-n-Point with RANSAC algorithm for accurate pose estimation

Realization of Robotics Systems Lab, USC <i>Graduate Research Fellow</i>	Los Angeles, CA May 2021 – Present
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- Developed a self-supervised physics-informed learning methodology for Bi-manual bin-packing of deformable packages. The model was trained in MuJoCo and deployed in the real-world for efficient packing
- Devised an inverse reinforcement learning-based methodology to model expert behavior from sparse demonstrations for sequential planning problems for an autonomous agent
- Developed a LSTM (GRU)-based multi-modal model that fused vision and wrench data for object state estimation for anomaly detection. Validated the framework on a real-world screwdriving task
- 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 sheets with a test mAP of 0.98. Link: code and dataset

Rolls-Royce Plc. <i>Robotics Technologist</i>	Singapore Jan. 2018 – Jul. 2019
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- Spearheaded the deployment of an AI-based smart predictive tool for robotic surface finishing processes
- Developed a collaborative robotic solution that improved Cpk value of filleting operations to 1.98

General Motors India Pvt. Ltd. <i>Graduate Engineer</i>	Bengaluru, India Aug. 2016 – Jul. 2017
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- 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

Honors and Awards

- Runner up at the AeroDef Student Research Poster Challenge. *Secured 2nd place for presenting a poster on Physics-Informed AI for Multi-Robot Cells*
- 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*

List of Selected Publications

- **Omeiy M. Manyar**, Hantao Ye, Meghana Sagare, Siddharth Mayya, Fan Wang and S. K. Gupta. Simulation-Assisted Learning for Efficient Bin-Packing of Deformable Packages in a Bimanual Robotic Cell. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Abu Dhabi, UAE, Oct 2024.
- **Omeiy M. Manyar**, Santosh V. Narayan, Rohin Lengade, and S. K. Gupta. Physics-Informed Learning to Enable Robotic Screw-Driving Under Hole Pose Uncertainties. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, USA, Oct 2023.
- **Omeiy M. Manyar**, Zachary McNulty, Stefanos Nikolaidis, and S. K. Gupta. Inverse Reinforcement Learning Framework for Transferring Task Sequencing Policies from Humans to Robots in Manufacturing Applications. *IEEE's International Conference on Robotics and Automation*, London, UK, May 2023.
- **Omeiy 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>
- **Omeiy 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**
- **Omeiy 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, **Omeiy 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>
- **Omeiy 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>

Projects

- Suction-based Bi-manual Manipulation of Deformable Packages** | Video Link Aug. 2023 – Present
- Built a system with a minimalist suction-based gripper for handling of complaint packages
 - Trained a GNN-based physics-informed model to learn package dynamics to identify failure modes in manipulation by observing packages under motion capture system
- Mobile Manipulation-based System for Fastening** | Video Link Jan. 2023 – May. 2023
- Extended a mobile manipulator platform to perform insertion and screw-driving operations under high perception uncertainties
- Human-Robot Teaming for Sheet Manipulation Task** | Video Link Jan. 2020 – Sep. 2021
- 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%

Technical Skills

Programming: Python, C/C++, Java, MATLAB
Libraries and Frameworks: PyTorch, ROS/ROS2, MoveIt, OpenCV, Open3D
Simulators: MuJoCo, Nvidia Isaac Sim, WeBots, Gazebo, Unity
Robots: KUKA LBR iiwa, ABB, UR5, Yaskawa
Developer Tools: Git, Docker, Bazel, CUDA

Leadership and Involvement

Viterbi CURVE Fellowship Mentor: Mentored Undergraduate CURVE Fellowship Recipients
Reviewer and Session Chair: CoRL (2024), RAL (2022-2024), ICRA (2021-2024), IDETC-CIE (2022)