KARTIK RAMACHANDRUNI

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SUMMARY

Robotics researcher with 1.5 years of industrial experience working in TCS Research & Innovation Labs. A strong foundation and hands-on expertise in robotic perception and control with a few research papers detailing my work. Currently working on solving a vision-based imitation learning problem using self-supervised methods. Keenly interested to work on enabling robot agents to learn and execute complex behaviors autonomously. Currently seeking to pursue a Ph.D. degree to explore new areas of research and come up with novel solutions.

EDUCATION

B.Tech, Mechanical Engineering (ME), *Indian Institute of Technology (IIT) Jodhpur 2014-18*
CGPA: 9.59/10.0
· Received Governor's Medal for Best Academic Performance in Mechanical Engineering Batch of 2018

Senior Secondary, *Sri Chaitanya Junior College*   *2012-14*
Percentage: 98.3%

RESEARCH EXPERIENCE

Robotics Researcher   *2018-Present*
TCS Research & Innovation Labs, Bangalore

Undergraduate Researcher   *2014-18*
Indian Institute of Technology (IIT) Jodhpur

PROJECTS

Self-supervised Imitation learning framework from video demonstrations *2018-Present*
TCS Research & Innovation Labs   *Dr. Swagat Kumar*

· Designed a deep learning framework that generates feature representations from video frames and uses them to imitate the demonstration with reinforcement learning (RL) agent
· CNN based feature extractor uses multi-level spatial attention module to learn task-specific feature representations invariant to background and appearance
· Deep RL agent called DDPG used to imitate the task using feature representations as state space
· Experimental setup in Gazebo simulator to test the efficacy of entire framework [IEEE RO-MAN 2019]

Vision-based control of UR5 robot to track occluded objects   *2017-18*
IIT Jodhpur   *Dr. Suril Shah*

· Developed an eye-in-hand visual servoing system with monocular camera to follow occluded targets
· Used Adaptive Kalman Filter (AKF) coupled with novel mean-adaptive acceleration motion model to handle uncertainty in visual data during target occlusion
· Implemented AKF on industrial UR5 6-DOF manipulator with PID control in image space to perform 2D object following of a circular object [AIR 2019]

Design & Development of All-Terrain Vehicle (ATV), SAE BAJA India   *2015-17*
Team Racers IITJ (IIT Jodhpur)   *Dr. Kaushal Desai*

· 2-year participation in *Racers IITJ*, a 25-member ATV team for the national level student competition *SAE BAJA India*
· Power-Train member (2015-16)- Designed and built an efficient and light-weight transmission assembly for the ATV using Belt-type CVT coupled with a 2-speed Gearbox

- Manufacturing lead (2016-17)- Supervised the entire manufacturing process and implemented novel solutions such as a new tube fixture system for rollcage manufacturing, a lathe-mounted notching mechanism for precise angle cutting of steel tubes and a jute-reinforced composite seat designed with ergonomic considerations
- Secured ranks of **63** (2015-16) and **92** (2016-17) out of 185 teams in the finale event at Pithampur, Indore

Design of Retrieval Mechanism for Underwater Objects   *2015-17*
Collaboration with IIT Jodhpur and Larsen & Toubro (L&T)   *Dr. Suril Shah*

- University-industry collaboration project with L&T Aerospace and Defense department to develop a retrieval mechanism for underwater objects from a host submerged platform
- Used Genetic Algorithm (GA) to solve multi-objective workspace optimization problem of 6-DOF manipulator as part of mechanism design
- Performed forward dynamics simulation of retrieval operation in MATLAB using Recursive Newton-Euler algorithm (RNEA) to simulate hydrodynamic conditions

PUBLICATIONS

- **K. Ramachandruni**, M. Vankadari, A. Majumder, S. Dutta and S. Kumar, "SMAK-Net: Self-Supervised Multi-level Spatial Attention Network for Knowledge Representation towards Imitation Learning," in *2019 IEEE RO-MAN*, IEEE, 2019
- **K. Ramachandruni**, S. Jaiswal and S. V. Shah, "Vision-based control of UR5 robot to track a moving object under occlusion using Adaptive Kalman Filter," in *Proceedings of Conference on Advances in Robotics*, ACM, 2019

ACADEMIC ACHIEVEMENTS

Board of Governors Prize, 2018   *IIT Jodhpur*
Best academic performance in graduating class of 2018 of B.Tech. ME program

Academic Distinction Award, 2018   *IIT Jodhpur*
Best academic performance in Semester VII among IVth year B.Tech. ME students

Academic Distinction Award, 2017   *IIT Jodhpur*
Best academic performance in Semesters V, VI among IIIrd year B.Tech. ME students

Academic Distinction Award, 2016   *IIT Jodhpur*
Best academic performance in Semesters III, IV among IInd year B.Tech. ME students

Academic Distinction Award, 2015   *IIT Jodhpur*
Best academic performance in Semesters I, II among I^{st} year B.Tech. ME students

POSITIONS OF RESPONSIBILITY

Placement Lead, ME branch   *2017-18*
Student Career Development and Placements cell, IIT Jodhpur
- Responsible for ensuring smooth Placement & Internship procedures of ME students by being a liaison between Industry and Student population

Student Mentor, Racers IITJ   *2017-18*
SAE BAJA India 2018 team of IIT Jodhpur
- Co-mentored the student ATV team for the national level SAE BAJA competition of 2018

Manufacturing Lead, Racers IITJ   *2016-17*
SAE BAJA India 2017 team of IIT Jodhpur
- Directed the entire fabrication process of an ATV vehicle for the SAE BAJA 2017 competition by planning and regulating the timeline of each process and addressing numerous shortcomings in existing manufacturing techniques with innovative solutions
- Aided the design process of various sub-teams by providing essential inputs about the scope of manufacturing techniques and suggesting appropriate design changes

RELATED COURSEWORK/SKILLS

· Undergraduate courses: Robotics (Audit), Artificial Intelligence (AI), Engineering Optimization, Operations Research (OR) Optimization
· Coding skills: Python (including OpenCV, Numpy, Tensorflow), ROS, Gazebo robotics simulator, MATLAB, C/C++, Pybullet physics engine, OpenAI Gym