Utkarsh Aashu Mishra

Personal Information

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Education

2017 - Present — Bachelors of Technology in Mechanical Engineering
Indian Institute of Technology(IIT), Roorkee, India
CGPA: 9.031/10.0 | Transcripts

Interests

Robotics, Autonomous Vehicles, Optimal Control, Reinforcement Learning

Bachelor Thesis

Ongoing / Sep 2020 — Learning Control Policies for Imitating Human Gaits
Collaboration: EPFL Biorobotics Laboratory

Primary Supervisor: Prof. Dr. Pushparaj M. Pathak, MIED, IITR

Co - Supervisor: Prof. Dr. Auke J. Ijspeert, Biorobotics Laboratory, EPFL

Simulating Healthy Movements using Predictive Simulation and developing Robust Control Policies using Deep Reinforcement Learning to effectively control a full body skeletal model and achieve the desired gait. Intro Video

Internships

Ongoing / Jul 2019 — Structural Stability based Motion Planning for Cable Driven Parallel Robots
Guide: Dr. Stephane Caro, Team Lead: ROMAS,LS2N, France

Motion Planning of Suspended cable Robots in Clutterd Enviornments

Implemented RRT* with GJK collision detection

Jul 2020 / Apr 2020 — Behavioral Planning for Autonomous Vehicles using Reinforcement Learning
Reinforcement Learning Intern at Swaayatt Robots, India

Worked on constructing observation, states and action space for Behavioral Planning DRL framework coupled with a probabilistc local planner and PD controller

Conducted experiments with DQN, DDPG, TRPO and PPO algorithms on Carla Self-Driving Simulator with ROS Bridge. More Information

May 2019 / Jul 2019 — Quasi Photon-Monte Carlo: An Importance Sampling Approach
SPARK Research Fellowship 2019 at IIT Roorkee, India

Accepted: ASME Summer Heat Transfer Conference (SHTC 2020)

Worked on Quasi Photon Monte Carlo Method along with Importance Sampling technique and its application to radiative heat transfer.

Research Experience

Ongoing
Jan 2020

Trajectory Planning and Tracking for Toe-Foot Bipedal Robot Model
Computer Science and Engineering Department, IIT Roorkee, India

Accepted: ROBOTICS AND ARTIFICIAL INTELLIGENCE (ROAI) 2020

Working on a 9-DOF Toe-Foot Robot Model, devloped Unsupervised Inverse Kinematics and Dynamic Equations for modelling.

Novel Trajectory planning strategies are explored and Optimal Tracking controller is developed

Nov 2019
Aug 2019

Path Planning and Optimization of Cable-Driven Parallel Robots
Mechanical and Industrial Department, IIT Roorkee, India

Accepted:28th Mediterranean Conference on Control and Automation (MED'2020)

Worked on path planning through genetic algorithm and workspace analysis of Cable Driven Parallel Robots

Dynamic optimization considering cable tensions and non-negligible cable mass. Cable sagging and Collision constraints are also considered

Feb 2019
Oct 2018

Optimal Flow Planning in Water Distribution Networks
Mathematics Department, IIT Roorkee, India

Accepted:ASME Fluids Engineering Division Summer Meeting (FEDSM 2020)

Worked on optimal flow planning based on Electrical analogy using least impedance path and maintaining flow pressure

Developed Dynamic Series-Parallel Cost function based Least Cost Algorithm

Publications

Oct 2020 Mishra, UA, & Bansal, A. "Quasi-Photon Monte Carlo on Radiative Heat Transfer: An Importance Sampling Approach." Proceedings of the ASME 2020 Heat Transfer Summer Conference. Virtual, Online. July 13–15, 2020. V001T02A012. ASME. https://doi.org/10.1115/HT2020-8950

Oct 2020 Soni, B, Mishra, UA, & Nayak, AK. "Optimal Control Strategy to Distribute Water Through Loop-Like Planar Networks." Proceedings of the ASME 2020 Fluids Engineering Division Summer Meeting, Volume 2: Fluid Mechanics; Multiphase Flows. Virtual, Online. July 13–15, 2020. V002T03A025. ASME. https://doi.org/10.1115/FEDSM2020-20097

Sep 2020 U. A. Mishra, I. Chawla and P. M. Pathak, "On Determining Shortest Path in Joint Space of a Cable-Driven Parallel Robot for Point-to-Point Motion," 2020 28th Mediterranean Conference on Control and Automation (MED), Saint -Raphaël, France, 2020, pp. 984-989, doi: 10.1109/MED48518.2020.9183198.

Team Projects

Oct 2020
Sep 2020

Analyse the mental health of India during COVID
Group Project for Spotle AIthon 2020

Classified Mood based on grayscale facial expression images by using VGG-like architecture

Performed Exploratory Data Analysis on Twitter data from Sep 18-22

Multinomial NB model was used along with Tfidf Vectorizer to train the model with a stratified Cross-validation Strategy

Aug 2020 – Jul 2020 | Design, Simulation and Motion Planning for Quadrotor
Group Project for Flipkart GRID 4.0

Designing and Structural Analysis, followed by proper URDF modelling

Integrated sensors and stereo-camera based localization and mapping using RTabMap

Dynamic Modelling is done and appropriate probablistic conformal lattice based planner is formulated More Information

Present – Jan 2018 | IIT Roorkee Motorsports Electric 2019 (RMSE'19) FS Prototype
IIT Roorkee Motorsports , Formula Student Team of IIT Roorkee

Experience of Designing and Fabricating an Electric Vehicle from scratch. Manufactured RMSE'19 Formula Electric Prototype

As a member of the Autonomous Algorithms Subsystem, dedicated to vision-based Localization, Mapping and motion planning for our upcoming proposed vehicle

Key Courses

2020	Robotics and Control (Cur.)		Vibration and Noise (9/10)
	Dynamics of Mechanical Systems (Cur.)		Machine Drawing (10/10)
	Automatic Control (8/10)	2018	Engineering Analysis and Design (8/10)
	Machine Design (9/10)		Kinematics of Machines (9/10)
2019	Dynamics of Machines (10/10)		Numerical Methods (10/10)
		2017	Programming and Data Structures (10/10)

Skills

Programming:	C++, Python, Tensorflow,
Softwares:	ROS, Gazebo, MATLAB, Simulink, OpenSim, Visual Studio, Solidworks, Ansys (Design, Meshing, Structural, Fluent)
Others:	Linux(Ubuntu), LaTeX

Awards and Achievements

Jan 2020	Secured Second Runners Up position in Formula Green 2020 with IIT Roorkee Motorsports
May 2019	Selected for the SPARK Research Internship Program by IIT Roorkee (Certificate)
May 2017	Joint Entrance Examination, Advanced (Indian Institute of Technology) All India Rank **2223, 98.99 percentile**
May 2017	Awarded the prestigious KVPY Scholarship (Kishore Vaigyanik Protsahan Yojana) in-stream SX (2016) (Certificate)
May 2017	Achieved Merit Certificate in Physical Education in the CBSE AISSCE 2017 (Standard 12) **(top 0.1%of examinees)**(Certificate)

Position of Responsibilities

Current	Aerodynamic SubSystem head at IIT Roorkee Motorsports
Jan 2019	Undergraduate Teaching Assistant, Academic Reinforcement Program, Teaching Assistant for the course MAN-004 Numerical Methods.
Dec 2018	Developer and WoC Mentor at Mobile Development Group, IIT Roorkee
Aug 2017	National Cadet Corps, 3UK NCC IIT Roorkee, India Successfully gave the Guard of Honour to our Institute's Director on the occasion of Independence Day

References

Dr. N. Sukavanam
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Mathematics Department
Indian Institute of Technology Roorkee
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Dr. Pushparaj Mani Pathak
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