

Résumé

Utkarsh Aashu Mishra

EDUCATION

INDIAN INSTITUTE OF TECHNOLOGY (IIT) ROORKEE

BTECH IN MECHANICAL ENGINEERING

Expected May 2021 | Roorkee, India

Cum. GPA: 9.069/10

[Transcripts](#)

LINKS

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COURSEWORK

UNDERGRADUATE

Robotics and Control
Dynamics of Mechanical Systems
Automatic Control
Machine Design
Numerical Methods
Electromagnetic Theory
C++ Data Structures

INTERESTS

Robotics
Perception and Planning
Autonomous Vehicles
Optimal Control
Reinforcement Learning

SKILLS

PROGRAMMING

Languages:

C++ • Python • Matlab • \LaTeX

Softwares:

MuJoCo • ROS • Gazebo •
Matlab-Simulink • OpenSim
• SCONE • Bullet • Solidworks
• Ansys

Frameworks:

Tensorflow • Pytorch

OS:

Linux(Ubuntu) • Windows

BACHELOR THESIS

EPFL BIOROBOTICS LABORATORY | THESIS COLLABORATION

Sept 2020 – Present | Switzerland, Remote (Covid'19)

Primary Supervisor: Prof. Dr. Pushparaj M. Pathak, MIED, IIT Roorkee

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

- Collaborating with Dr. Dimitar Stanev and simulating Healthy Movements using Predictive Simulation
- Developing Robust Control Policies using Deep Reinforcement Learning to effectively control a full body skeletal model and achieve the desired gait.
- [Intro Video](#)

INTERNSHIPS

SWAAYATT ROBOTS | REINFORCEMENT LEARNING INTERN

April 2020 – July 2020 | India, Remote (Covid'19) | [More Information](#)

- Constructed Observation, States and Environment for Behavioral Planning DRL framework using the Perception Stack (Lidar, Camera)
- Conducted experiments with DDPG and PPO algorithms for velocity prediction agent on CARLA Simulator with ROS Bridge

SPARK FELLOWSHIP | UNDERGRADUATE RESEARCH INTERN

May 2019 – July 2019 | IIT Roorkee, India | [Conference Article](#)

Supervisor: Prof. Dr. Ankit Bansal, MIED, IIT Roorkee

- Implemented Quasi Photon Monte Carlo with Importance Sampling and further reduced computation time with pseudo random sequences

RESEARCH | UNPUBLISHED

INDIAN INSTITUTE OF SCIENCE | COLLABORATOR

Nov 2020 – Present | India

Supervisor: Prof. Dr. Shishir Kolathaya, EECS, IISc

- Working on bipedal RABBIT Locomotion in MuJoCo on Non-flat terrain with Policy optimization based on Augmented Random Search (ARS).
- Generalizing methodology to DIGIT (by Agility Robotics) in collaboration with Prof. Dr. Ayonga Hereid, MAE, OSU.

NANTES LABORATORY OF DIGITAL SCIENCES | COLLABORATOR

July 2020 – Nov 2020 | France, Remote (Covid'19)

Supervisor: Dr. Stéphane Caro, ROMAS, LS2N

- Worked with path planning of a Cable Driven Parallel Robot in complex obstacle-cluttered environments under objectives of Maximizing Stability and Manipulability. **Publication Accepted at ICRA 2021.** [Pre-Print Video](#)
- Unsupervised Forward Kinematics for Under-constrained suspended Cable Driven Parallel Robot

MATHEMATICS DEPARTMENT | ROBOTICS PROJECT STUDENT

Jan 2020 – Nov 2020 | IIT Roorkee

Supervisor: Prof Dr. N. Sukavanam, Mathematics Department, IIT Roorkee

- Working on a 9-DOF Toe-Foot Bipedal Robot Model.
- Developed Unsupervised Inverse Kinematics, Novel Trajectory planning strategies and an Optimal Tracking controller.
- Extending to Reinforcement Learning based tracking control for disturbance rejection and push recoveries

RESPONSIBILITIES

PRESENT

Aerodynamics Head
Autonomous Team member
@IITR Motorsports

2018

Teaching Assistant,
Academic Reinforcement Program
(MAN-004 Numerical Methods)

Android Developer
Winter of Code Mentor
@ Mobile Development Group
IIT Roorkee

REFERENCES

DR. STÉPHANE CARO

CNRS Research Director
Team Leader: ROMAS
Nantes Laboratory of Digital Sciences
France
Stephane.Caro@ls2n.fr

DR. N. SUKAVANAM

Professor, Head of Department
Mathematics Department
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DR. PUSHPARAJ M. PATHAK

Professor
Mechanical Engineering Department
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DR. DIMITAR STANEV

Scientist
BioRobotics Laboratory
School of Engineering
Swiss Federal Institute of Technology
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ARTICLES | [C] - CONFERENCE [J] - JOURNAL [P] - PREPRINT

[P] Bhardwaj, G.*[†], Mishra, U. A.[†], Sukavanam, N., & Balasubramanian, R. (2020). Cycloidal Trajectory Realization on Staircase with Optimal Trajectory Tracking Control based on Neural Network Temporal Quantized Lagrange Dynamics (NNTQLD). <http://arxiv.org/abs/2012.01417>

[P] Bhardwaj, G.*[†], Mishra, U. A.[†], Sukavanam, N., & Balasubramanian, R. (2020). Planning Brachistochrone Hip Trajectory for a Toe-Foot Bipedal Robot going Downstairs. <http://arxiv.org/abs/2012.02301>

[C] 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](https://doi.org/10.1109/MED48518.2020.9183198). [Article](#)

[C] 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. doi: <https://doi.org/10.1115/FEDSM2020-20097>. [Article](#)

TEAM PROJECTS

IIT ROORKEE MOTORSPORTS | FORMULA STUDENT ELECTRIC

IITR Motorsports Electric 2019 (RMSE'19) FS Prototype | Jan. 2018 – Present

- Experience of Designing and Fabricating an Electric Vehicle from scratch. Manufactured RMSE'19 Formula Electric Prototype
- Member of Autonomous Algorithms Subsystem, formulating SLAM base for autonomous endeavors in future

SPOTLE AI-THON 2020 | SPOTLE.AI DATA SCIENCE PROJECT

Analyse the mental health of India during COVID | Sept. 2020 – Oct. 2020

- Classified Mood based on grayscale facial expression images by using VGG-like architecture
- Multinomial NB model was used along with Tfidf Vectorizer to train the model with a stratified Cross-validation Strategy [Certificate](#)

FLIPKART GRID 4.0 2020 | ROBOTICS PROJECT

Design, Simulation and Motion Planning for Quadrotor | Jul. 2020 – Sept. 2020

- Designing and Structural Analysis, followed by proper URDF modelling Integrated sensors and stereo-camera based SLAM
- Implemented Dynamic Modelling and probabilistic conformal lattice based planner [Presentation Video](#)

AWARDS

- 2020 Secured 3rd position in 5th Formula Green 2020 with [IIT Roorkee Motorsports](#)
- 2019 Selected for the SPARK Research Fellowship Program by IIT Roorkee
- 2017 All India Rank **2223, 99.72 %ile** in Joint Entrance Examination Advanced(IITJEE)
- 2017 Awarded the prestigious KVPY Scholarship (Kishore Vaigyanik Protsahan Yojana) in-stream SX (2016) (All India Rank **780, 99.48 %ile**)