Lokesh Krishna Rajan

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EDUCATION

- **University of Southern California** *Aug 2022 - Present*
  Ph.D. in Mechanical Engineering
- **Indian Institute of Technology Varanasi** *2022*
  B.Tech in Electronics Engineering Overall GPA: 8.68/10

SKILLS AND INTERESTS

Key competencies: *Robotics, Controls, Deep Reinforcement learning, Optimisation*
Languages: *Python, C, C++*
Tools and frameworks: *Pytorch, Stable baselines, MuJoCo, Git, PyBullet, RAISIM, CMake, LaTeX*
Areas of interests: *Learning based and optimal control, Athletic intelligence and dynamic motor skills of robots, Legged locomotion*

PUBLICATIONS

ICRA 2022 + RA-L (accepted) **Linear Policies are Sufficient to Realize Robust Bipedal Walking on Challenging Terrains** IEEE Xplore, Video
Lokesh Krishna*, *Guillermo Castillo**, *Utkarsh Mishra, Ayonga Hereid, Shishir Kolathaya*

IROS 2021 (accepted) **Learning Linear Policies for Robust Bipedal Locomotion on Terrains with Varying Slopes** arXiv, Video
Lokesh Krishna*, *Utkarsh Mishra, Guillermo Castillo, Ayonga Hereid, Shishir Kolathaya*

CoRL 2020 (accepted) **Robust Quadrupedal Locomotion on Sloped Terrains: A Linear Policy Approach**
Kartik Paigwar, ***Lokesh Krishna****, Sashank Thirumala,Naman Khetan, Aditya Varma Sagi, Shalabh Bhatnagar, Ashitava Ghosal, Bharadwaj Amrutur, Shishir Kolathaya* arXiv, Video

RESEARCH EXPERIENCE

Graduate Research Assistant Aug 2022 – Present
Dynamic Robotics and Control Laboratory, USC Viterbi Lab's webpage
Student Collaborator Dec 2021 – Jun 2022
Movement Control Lab, MIT Lab's webpage
Guest Researcher Mar 2021 – Feb 2022
Movement Generation and Control Group, MPI-IS, Germany Lab's webpage
Student Researcher Mar 2020 – Jan 2022
Stoch Lab, RBCCPS, Indian Institute of Science Lab's webpage

PROJECTS

hmm: a mujoco framework for learning humun motor models with Deep RL Jan 2022 – Jun 2022
Supervisor: Dr Nidhi Seethapathi, MIT ***Github (request access),***

· Developed a mujoco-based framework for seamless experimentation and modelling of human motor control and loco motor adaptation through Deep RL. The framework includes custom tools for integration with marker-based mocap data, model scaling, inverse kinematics and dynamics.

Agile Bipedal Locomotion Through Trajectory Driven Multi Stage Learning Mar 2021 – Feb 2022
Supervisor: Dr Majid Khadiv, MPI-IS ***Github (request access), Video***

- Extended a controller framework for robust and agile bipedal manoeuvres through two-stage policy training. Stage 1 incorporated motion imitation from a reference motion generated through trajectory optimisation. Stage 2 involved further robustifying the policy to **contact uncertainties** and **pose perturbations** while integrating a few hardware quality costs to leverage sim-to-real transfer.

JerBot – a bio-mimetic bipedal robot Oct 2019 – Sep 2021
Under: Science and Technology Council, IIT Varanasi ***Github, Video***

- Formulated an alternate design for addressing the problem of biped locomotion, mimicking the agile and superior locomotion skills of **Jerboa** .Fabricated our first prototype and did the mechanical validation of our hardware through **PID control, load testing, disturbance rejection,etc** and later built a custom **Open AI Gym environment** for experimenting with various Deep RL algorithms to learn optimal control strategies

AADOpt: Antenna Array Design and Synthesis through Optimisation Jan 2020 - Jun 2021
Supervisor:Dr. Manoj Kumar Meshram, IIT Varanasi ***Github, Report***

- Proposed a novel design framework for the fabrication of Antenna Arrays by formulating it as an optimisation problem and solved it using the model-free and gradient-free Genetic Algorithm(GA).
- The end result is a novel design pipeline, with a threefold contribution, 1) A flexible and generalised design toolkit 2) allows the formulation of task-specific costs 3) accounts for various topological constraints

Intelligent Picking and Transportation Robot Jun 2020 – Aug 2020
Under: Group Project ***Video***

- Designed a unique and cost-efficient industrial robot that could autonomously identify and displace objects inside a work space of enormous dimensions **4 x 2 x 0.9** m^3 payloads upto **2 kg**, to be deployed in warehouses.
- Developed a novel Software pipeline using **Over head Object Detection(Using Yolo V3) and 3D Grasp Estimation(using GR-ConvNet)** which could easily be deployed in any industrial robot.

TOWRpy - a simulation test bed for TOWR May 2020
Supervisor: Dr.Shishir N. Y. Kolathaya, IISc ***Github***

- Built a **Simulaion Test Bed** in **Pybullet**, for validating the trajectories generated by **Trajectory Optimizer for Walking Robots(TOWR)**-*an open-source C++ library for trajectory optimization.*
- Developed both **visualization and simulation tools** that could be used for experimenting with **learning based techniques** to bridge the inherent sim to real gap in realizing TOWR generated trajectories.

RELEVANT COURSES TAKEN:

MA-101, 102 Engineering Mathematics(Real analysis, Differential Equations and Linear Algebra), **MA-202** Probability and Statistics, **CSO-101** Computer Programming, **EE-211** Linear Control Systems

ACHIEVEMENTS AND EXTRA CURRICULAR ACTIVITIES:

- Qualified for the **National Finale of Flipkart Grid 2.0 Robotics Challenge**(and emerged as one of the **top 3 teams all over India** under the problem statement **Intelligent Picking.Certificate**
- Won the **IIT Color**, and **Certificate of Merit** at **Gymkhana Awards 2021-22, 2019-20** from the IIT(BHU) Gymkhana, for my contribution to robotics in the institute.
- Won the **IBGAA Graduate Study Application Scholarship** from the IIT(BHU) Alumni Association.
- **Winner** of Pixelate a robotics event, held in **Technex 2019, IIT Varanasi. Certificate, Video**.
- **Winner** of **Mosaic** and Funkit, techincal events held in **Udyam 2019 by the Department of Electronics Engineering, IIT Varanasi.Certificate 1, Github, Video, Certificate 2**, .
- Showcased our project **JerBot** in **Engineer's Conclave** and represented the institute team in **DRDO SASE's UAV Fleet challenge** held in **Inter IIT Tech Meet 8.0, 2019**, hosted by **IIT Roorkee**
- Founded a student research group named **RoboReG** at IIT Varanasi, and successfully mentored projects from various domains of robotics **Group's Website**.