Lokesh Krishna

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EDUCATION

- **Indian Institute of Technology Varanasi** — *July 2018 - Present*
  Junior; B.Tech in Electronics Engineering — Overall GPA: 8.53/10
- **D.A.V. Boys Senior Secondary School, Mogappair** — *2018*
  Class XII; Central Board of Secondary Education — 95.6%
- **D.A.V. Hr. Secondary School, Mogappair** — *2016*
  Class X; Tamil Nadu Board of Secondary Education — 98.6%

SKILLS AND INTERESTS

Key competencies: *Robotics, Deep Reinforcement learning*
Languages: *Python, C, C++*
Tools and frameworks: *Pytorch, Stable baselines, OpenCV, Mujoco, Git, PyBullet, RAISIM, CMake, LaTeX*
Areas of interests: *Learning based Robot Control and Planning, Adaptive and Intelligent Systems*

PUBLICATION(S)

IROS 2021 (accepted) **Learning Linear Policies for Robust Bipedal Locomotion on Terrains with Varying Slopes** arXiv, Video
***Lokesh Krishna**, Utkarsh A. Mishra, Guillermo A. 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

Guest Researcher — March 2021 – Present
Movement Generation and Control Group, MPI-IS, Germany — Lab's webpage

Student Researcher — July 2020 – Present
Stoch Lab, RBCCPS, Indian Institute of Science — Lab's webpage

Research Intern — March 2020 – July 2020
Stoch Lab, RBCCPS, Indian Institute of Science — Project page

PROJECTS

JerBot – a bio-mimetic bipedal robot — October 2019 – Present
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**.
- Built a custom **Open AI Gym environment** for experimenting with various Deep RL algorithms to learn optimal control strategies. Currently using **Proximal Policy Optimization (PPO)**, to make the agent learn a robust gait sequence by **Reward shaping** in our simulated environment.

AADOpt: Antenna Array Design and Synthesis through Optimisation — January 2020 - Present
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 June 2020 – August 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.

Study and Implementaition of ANN's in Low Powered Embedded Systems April 2020
Supervisor:Dr.Amritanshu Pandey, IIT Varanasi ***Github, Report***

- Implemented a **framework for deploying Artificial Neural Networks** in low level embedded systems like **Arduino Nano** and compared it with state of the art Python based framework(Pytorch).
- Studied a set low level problems that could be effectively and efficiently fullfilled by leveraging the capabilities of a micro controller. (tasks like colour detection,sensor filtering,etc)

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 in environments for experimenting with **learning based techniques** to bridge the inherent gap in realizing TOWR generated trajectories and thereby learn optimal control strategies.

RaisimStoch2 - a simulation environment for Stoch2 in RAISIM April 2020
Supervisor: Dr.Shishir N. Y. Kolathaya, IISc ***Github***

- Transferred the pre-existing simulation and testing code base of our in house robot Stoch2 from Pybullet to the relatively faster and accurate **RAISIM (Robotics and AI Simulation) simulation platform**.
- Developed simulation testbeds in the native implementation of **RAISIM** in C++ and the available python wrapper **RaisimPy** in order to quantify the trade off in **simulation time vs ease of implementation**.

RELEVANT COURSES TAKEN:

MA-101 Engineering Mathematics-I(Real analysis), **MA-102** Engineering Mathematics-II(Differential Equations and Linear Algebra), **MA-202** Probability and Statistics, **CSO-101** Computer Programming, **EE-211** Linear Control Systems (ongoing),**Deep RL Boot camp by UC Berkley**(unofficially)

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**
- **Winner** of Pixelate, an image processing based robotics event held in **Technex 2019, IIT Varanasi. Certificate, Video**.
- **Winner** of Mosaic, a machine learning-based computer vision event **(Certificate, Github, Video)**and Funkit a digital circuit fabrication event**(Certificate)**, held in **Udyam 2019 by the Department of Electronics Engineering, IIT Varanasi.**.
- Showcased the hardware implementation of our project **JerBot** in **Engineer's Conclave** and **DRDO SASE's UAV Fleet challenge** held in **Inter IIT Tech Meet 8.0, 2019**, hosted by **IIT Roorkee**
- A panel member and active participant of the **Robotics Club, IIT Varanasi**.Conducted various workshops and camps in robot simulation,control and learning.**Summer Camp 20, and 21**.
- Founded a student research group named **RoboReG** at IIT Varanasi, and successfully mentored projects from various domains of robotics **Group's Website**.