RAGHAV SONI

+91-9149222275 | Indian Institute of Technology (BHU), Varanasi
raghav.soni.ece19@iitbhu.ac.in | LinkedIn | GitHub

EDUCATION

Indian Institute of Technology (BHU), Varanasi July 2019 - Present
Bachelor of Technology - Electronics Engineering; **CGPA : 9.53**

St. Mary's Convent School, Vikasnagar, 2018
Class XII - Central Board of Secondary Education (CBSE); **Percentage : 97**

St. Mary's Convent School, Vikasnagar, 2016
Class X - Central Board of Secondary Education (CBSE); **CGPA : 10.0**

SKILLS

Programming Languages	C, C++, Python
Tools and Frameworks	Tensorflow, Keras, PyTorch, Scikit, Mujoco, PyDrake, Sympy, Stable Baselines, GIT
Areas of Interests	Machine Learning, Reinforcement Learning, Computer Vision, Robotics

PUBLICATIONS

MELP : Model Embedded Linear Policies for Robust Bipedal Hopping
***Raghav Soni**, Guillermo A. Castillo, Lokesh Krishna, Ayonga Hereid, Shishir Kolathaya*
Submitted to : 2023 IEEE ICRA (Under review) Paper | Video

End-to-End Reinforcement Learning for Torque Based Variable Height Hopping
***Raghav Soni**, Daniel Harnack, Shivesh Kumar, Frank Kirchner*
Submitted to : 2023 IEEE ICRA (Under review) Paper | Video

RESEARCH EXPERIENCE

Robotics Innovation Center, DFKI Bremen, Germany
Supervisor: Dr. Shivesh Kumar *May 2022 - September 2022*

- Developed reinforcement learning based controllers for underactuated systems like Single Hopping leg, acrobot and torque limited simple pendulum using algorithms like PPO and SAC.
- Developed a novel method to do system identification in order to narrow down the reality gap between simulation and reality and exhibited effortless simulation to reality transfer for RL policies.

Stochastic Robotics Lab, RBCCPS, IISc Bangalore, India
Supervisor : Dr. Shishir Kolathaya *August 2021 - September 2022*

- Developed a novel solution to make a humanoid execute hopping gait by learning the feedback gains and template model parameters for robust hopping using SLIP template as reference trajectory through linear policies and Augmented Random Search (ARS) for bipedal robot Digit by Agility Robotics.
- Implemented a finite state machine based controller to implement the gait on hardware with minimum sensory feedback.

Artifical Intelligence and Mechatronics Lab, IIT Bhubaneswar Bhubaneswar, India
Supervisor : Dr. Pandu Ranga *May 2021 - July 2021*

- Formulated a reference trajectory for Humanoid walking using a simple Linear Inverted Pendulum (LIP) model with ability to dynamically adjust step length for agile motion.
- Deployed the Humanoid robot (named Thormang3) in PyBullet simulation and developed a PD controller to track the trajectories added dynamic turning and obstacle avoidance with the help of sensors like depth cameras.

PROJECTS

Autonomous Intelligent Pick and Place Industrial Robot GitHub | Video | Report
Flipkart Grid 2.0 Robotics Challenge - National Finalists *July 2020 - January 2021*

- Designed an intelligent object picking robot in simulation to be operated in an industrial environment with deep learning based techniques for object detection and pose estimation.
- The design of the bot was brainstormed and custom made. It was inspired by the working of a 3D printer. The design enabled it to work over a large workspace and with loads of upto 2kgs. A custom made URDF was developed using tools like SOLIDWORKS and Blender.
- YOLOv3(You Only Look Once) algorithm was used for Object detection and Generative Residual Convolutional Neural Network(GR-ConvNet) to generate robust antipodal grasps from images of an RGB-D camera.

Adversarial Chase and Run Cars GitHub | Report
Research Project - Under Science and Technology Council, IIT (BHU) *December 2021 - March 2022*

- Developed an Adversarial Chase and Run Cars custom gym environment, to test and develop algorithms related to Multi Agent Systems, especially those related to Multi-Agent Reinforcement Learning.
- Tested various Multi-Agent Reinforcement Learning algorithms including a custom version of DQN and MADDPG.

Handwritten Character Segmentation and Recognition GitHub | Report
Exploratory project - Under the supervision of Dr. AK Singh, IIT (BHU) *August 2021 - December 2021*

- Developed a computer vision based solution to remove noise from the handwritten words and segment characters individually using morphological operations among other image processing tools.
- Trained a custom made CNN (experimentally adjusted for maximum accuracy) using EMNIST extended dataset to take in each segmented character and predict it from the visual image.
- Optimised the CNN as well as segmentation algorithms to work with rotated, thin, thick and various kind of noisy characters.

LEADERSHIP

- **Joint Secretary 2021-22** - *Robotics Club, IIT (BHU)*
- **Technical Lead 2021-22** - *RoboReG, IIT (BHU)* - Lead RoboReG, a robotics research focused group at the institute and helped develop an aptitude for research among the group members.
- **Co-Coordinator, Mosaic** - *Udyam '21, IIT (BHU)* - Contributed in managing the overall logistics of the event and brought in companies to sponsor the event.

HONOURS AND ACHIEVEMENTS

- **DAAD-WISE Scholar** - Got nominated by DAAD-WISE program for a fully funded research internship in Germany.
- **National Finalist (among top 9 teams out of 2000)** - Flipkart Grid 2.0 Robotics Challenge
- Secured an **AIR of 2257** in JEE Advanced 2019
- **School topper** with 97% marks in Class 12th Board Examinations

EXTRA-CURRICULAR ACTIVITIES

- Delegate of **Model United Nations - IIT(BHU)** 2019 - SPECPOL committee.
- Member of the **Electronics Department, IIT (BHU) Football team**.
- Active member of the **Dramatics Club, IIT (BHU)**.