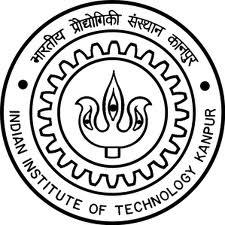
**Students’ Placement Office, IIT Kanpur**

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| **Title of the Project** | Shared Autonomy via deep reinforcement learning and Formal Methods |
| **Commencement Date** | May 2019 |
| **Completion Date** | Present |
| **Project Supervisor** | Prof. Indranil Saha |
| **Organization/Institution where the Project was accomplished** | IIT Knapur |
| **Project Description** (You can use extra A4 sheets in case you run out of space however the extra sheets should also have the seal & signature of the Project Supervisor or the relevant authority ) | |
| Project Overview:  –Project is aimed at developing an autonomous system which can work with humans and help them to do challenging and life threatening tasks.  –Developed a surveillance system for rescue operations so that robot can navigate in an unstructured environment.  –There is a human in the loop to take critical decisions and to take control of the robot at any instant if robot does not take appropriate decisions.  –The Robot will continuously learn from the actions taken and update its weight parameters based upon experience.  –Used Deep reinforcement learning algorithms along with formal methods to solve this problem. Trained the robot in an environment and test it in a different unstructured environment.  Current Work:  –Used Astra Depth camera and odometry data on Turtlebot2 via ROS network to sense the environment.  –Used Gazebo for simulating Turtlebot in a real environment like situation.  –Applied Dueling Deep Q-Learning algorithm to train the robot to navigate in an environment without the need of any human intervention.  –Applied Soft Actor-Critic Algorithm to train robot with RGB image, and depth image as input for the actor to predict an action for Turtlebot, later on this action gets added with human input (if provided) to command a safe action to the robot.  –Also uses human input in the critic part to criticize the actor action.  –Used TensorFlow library in D-DQN algorithm and Pytorch library for Soft Actor-Critic algorithm. | |

**Project Verification Form**

**By appending your signatures to this form you acknowledge and agree that:**

* This form along with the certificate would serve as the official document between the project supervisor and Students Placement Office, IIT Kanpur regarding verification of the student’s project work
* The student will provide additional information and documentation relevant to his/her project upon request by the Students’ Placement Office
* The student has clearly defined his/her individual role in projects done in cooperation with other students, faculty, groups or company personnel.
* Incorrectly over-stating the reach, impact and/or quantitative/qualitative results of a project is unethical.
* In case of violation of any of the above rules, Students’ Placement Office, IIT Kanpur reserves the right to take necessary action including de-registering the student from the placement season and reporting the misconduct to the Institute Authorities.

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| **Submitted by:-** | **Project Supervisor Details:-** |
| Name: Vivek Agrawal | Name: Prof. Indranil Saha |
| Roll No: 170808 | Designation: Professor at Department of Computer Science and Engineering at IIT Kanpur |
| Signature: | Signature: |