Dvij Kalaria

Ahmedabad, Gujarat,
Indian Institute of Technology, Kharagpur
West Bengal, India - 721302

Email-id : **dvij.kalaria@gmail.com**
Mobile No.: **+91 9687654090**
Github: https://github.com/dvij542/

ACADEMIC DETAILS

Education	Institute	Year	CPI / %
B. Tech: Computer Science and Engineering	IIT Kharagpur	June'18 - Present	**9.05 / 10**

TECHNICAL SKILLS

- **Languages** Python, C | C++, JAVA, SQL, LaTeX
- **Libraries and Tools** PyTorch, Casadi, OpenCV, ROS, Gazebo, Unity, MATLAB, VRXPERIENCE, Blender
- **Relevant Coursework** Deep Learning, Reinforcement Learning, Machine Learning, Algorithms-1&2, Operating Systems, Scalable Data Mining, Artificial Intelligence, Image Processing, Probability and Statistics

MANUSCRIPTS

- **Local NMPC on Global Optimised Path for Autonomous Racing** *Dvij Kalaria, Parv Maheshvari, Animesh Jha, Arnesh Kumar, Debashish Chakravarty, Sohel Anwar, Andres Tovar* (Autonomous racing workshop, IEEE International Conference on Robotics and Automation (ICRA) 2021)
- **Delay-aware Robust Control for Safe Autonomous Driving** *Dvij Kalaria, Qin Lin, John Dolan* (Under review at International Conference on Robotics and Automation (ICRA) 2022)
- **Detecting Adversaries, yet Faltering to Noise? Leveraging Conditional Variational AutoEncoders for Adversary Detection in the Presence of Noisy Images** *Dvij Kalaria, Aritra Hazra, Partha Pratim Chakrabarti* (Under review at AAAI 2022)
- **Gated Graph Convnets based Interaction-awareTrajectory Prediction for Autonomous Driving** *Dvij Kalaria, Parv Maheshwari, Animesh Jha, Debashish Chakravarty* (Under review at ML for autonomous driving workshop, NeurIPS 2021)

RESEARCH EXPERIENCE

- **Robotics Institute Summer Scholar (RISS) program, Carnegie Mellon University**
  (Mentor: Dr. John M. Dolan, Dr. Qin Lin, June'21 - Present) **[paper] [poster] [video]**
  - Implemented a delay aware Model Predictive Control which compensates for delays observed in autonomous vehicles due to computation, actuator command processing and actuator dynamics
  - Formulated a control algorithm plan to compensate for actuator dynamic delay and computation delay for a deploying a blackbox learning based controller on a real system
- **Autonomous Ground Vehicles (AGV), IIT Kharagpur**
  (Mentor: Dr. Debashish Chakravarty, Dec'19 - Mar'21)
  - **Eklavya 7.0 for IGVC 2019, Jun'19-July'19**
    - Incorporated Localization module on ROS using EKF (Extended Kalman Filter) and UKF (Uncentred Kalman Filter) techniques taking as input from odometry, IMU and GPS sensors.
    - Worked under Path Planning module, costmap generation, waypoint generation, ramp detection, pothole detection, sensor integration.
  - **Hybrid A* Motion Planner, Aug'19-Dec'19**
    - Implemented the conventional path planner on ROS C++ to run on Gazebo simulation software with planned path visualized on RviZ.
    - Installed voronoi field into heuristic cost function to plan path with additional safety while not compromising admissibility
    - Tested the code successfully on Husky industrial prototype, Mahindra e2o for static obstacle course.
  - **Deep Learning based trajectory prediction, Mar'20-Dec'20**
    - Reproduced results for state of the art methods like SGAN, CS-LSTM, GRIP++, TraPHic
    - Experimented with using Graph convolution layers and outperformed the state of the art model on Apolloscape and NGSIM dataset by 10% on WSADE loss (custom MSE loss defined by apolloscape).
- **IUPUI-IITKGP-USB team, Indy Autonomous Challenge (IAC)**
  (Guide: Dr. Sohel Anwar, Dr. Andres Tovar, July'20 - Mar'21)
  - Implemented the Model Predictive Control (MPC) control with a more complex vehicle model suitable at very high speeds to consider objectives for overtaking, optimal racing line keeping and making use of drafting

- **Explainable AI, B-tech Term Project**
  (Guide: Dr. Pratim Partha Chakravarthy, Dr. Aritra Hazra, Mar'21 - ongoing)
  - Experimented a novel Conditional-VAE network for detecting white box and black box adversarial attacks as well as correcting them to get the corresponding refined image on which the target network is able to detect adversarial examples.
  - Comparable results are observed on Cifar10, MNIST dataset with the state of the art methods with added advantage of not detecting an image with random noise as an adversary which other detection methods are prone to.
  - Currently experimenting on Cifar100 dataset and focusing on also refining the adversarial example after having detected it

INDUSTRY EXPERIENCE

- **PreImage**
  DL engineer, Dec'21-Feb'21
  - Incorporated a generative DL model to generate different 3D shapes of a particular class
  - Worked on DL based auto-calibration of raw images to correct barrel and pincushion distortion
  - Worked on DL based image matching and clustering to get clusters of images capturing common scene with different views

- **Oracle**
  Technical staff intern
  - Simulated an uncertainty aware active learning workflow to assist manual labelers on image detection task. Used a modified YOLOv5 network to consider epistemic uncertainty in the confidence score of the label predicted
  - Implemented image clustering on the input batch of images to present images in clusters with common image features to remove fatigue for manual labelers
  - Touched upon extending the uncertainty aware active learning workflow to NLP Named Entity Recognition (NER) task

OTHER PROJECTS

- **EasyDataLabeler Android App**
  Guide: Prof. Debasis Samanta, Apr'20-May'20
  - Deployed fully functional android app incorporating use cases like access, label, upload data images, download labelled images with current support for adding bounding box and polygon labels, free line semantic segmentation from android phone on a real-time database.
  - Employed industrial software development techniques including preparing SRS, DFD, Class and other UML diagrams.

- **SpaceMania Android game**
  Computer Graphics Lab, IIT Kharagpur, Jan'20-Feb'20
  - Completely developed the game including most of the graphics from scratch using Unity Game Engine and graphics development in Blender 3d, Photoshop.
  - Used various path planning strategies for enemy attacks and powerups. Used opencv library to generate maps.

MENTORSHIP AND TEACHING

- **IEEE Winter Workshop, IIT Kharagpur** : Mentored a week long IEEE certified IP Workshop attended by more than 100 first years on topics related to image processing

- **Kharagpur Winter of Codes (KWoC), IIT Kharagpur** : Mentored for a pygame project with 5 first year mentees involved, conducted by KOSS, IIT Kharagpur

ACADEMIC AWARDS

- **JEE Advanced, All India Rank 245 (Among top 0.1%),** *Indian Institute of Technology (IITs), 2018*

- **JEE Mains, All India Rank 393 (Among top 0.01%)** *Central Board For Secondary Education (CBSE), 2018*