Yash Goel

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Education

University of Bonn **Oct. 2019 – Feb. 2022**
M.Sc. Geodetic Engineering (Mobile Sensing & Robotics), 1.1, Distinction *Bonn, Germany*

Indian Institute of Technology Roorkee **Jul. 2014 – Apr. 2018**
B.Tech. Mechanical Engineering *Roorkee, India*

Publications

- **Y. Goel***, N. Vaskevicius, L. Palmieri, N. Chebrolu, K. A. Orras, C. Stachniss, **"Semantically Informed MPC for Context-Aware Robot Exploration"** at *IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems* (IROS 2023). **[Paper]** **[WS Paper]**
- P. S. N. Jyotish*, **Y. Goel***, A. V. S. S. B. Kumar , K. M. Krishna, **"PIVO: Probabilistic Inverse Velocity Obstacle for Navigation under Uncertainty"** at *28th IEEE Intl. Conf. on Robot & Human Interactive Communication* (ROMAN 2019). **[Paper]**
- P. S. N. Jyotish*, **Y. Goel***, A. V. S. S. B. Kumar , K. M. Krishna, **"IVO: Inverse Velocity Obstacles for Real Time Navigation"** at *Proceedings of the Advances in Robotics 2019* (AIR 2019). **[Paper]**

Experience

SafeAD GmbH **Apr 2022 – Present**
CV & ML Engineer *Karlsruhe, DE*

- Developed a transformer-based model for detection and tracking of dynamic objects, traffic signs, and traffic lights, as well as semantic map segmentation on a custom dataset. Evaluated multi-task learning techniques, including GradNorm and uncertainty weighting.
- Created an online approach for vector-based HD map prediction across cities with varying and dense road markings.
- Contributed to model deployment by exporting the online model to TensorRT and implementing Python bindings for different perception pipeline modules.

Robert Bosch Corporate Research **May 2021 – Feb 2022**
Master Thesis Student *Renningen, DE*

- Implemented a novel technique of costmap prediction for object goal navigation in indoor environment using semantics.
- Integrated MPC based continous control along with mid-level visual priors which led to a 7% increase in success. Work published in **IEEE IROS 2023**.

Stachniss Lab, University of Bonn **Mar 2020 – Mar 2021**
Graduate Student Assistant, HiWi *Bonn, DE*

- Implemented mapping techniques from scratch, including TSDF and Poisson Surface Reconstruction.
- Developed an incremental mapping pipeline by extending Poisson Surface Reconstruction with Dirichlet boundary conditions in the Laplace solution.

Robotics Research Centre, IIIT Hyderabad **Jun 2018 – Jun 2019**
Research Assistant *Hyderabad, IN*

- Developed dynamic obstacle avoidance for Parrot Bebop using collision cone-based optimization for evasive maneuvers.
- Applied probabilistic methods to enhance dynamic obstacle avoidance with control and object pose uncertainty.
- Built a deep network to learn non-linear MPC control for trajectory tracking within ROS.

Projects

Social Robot Navigation in Real Life **[Video]**[Report] **Oct 2020 – Mar 2021**

- Worked on comparing human motion prediction techniques - SocialGAN and maximum entropy method in ROS.
- Implemented MPC for navigation of KUKA **youbot** in real-life dynamic human environment.

Bag of Visual Words **Aug 2020**

- Implemented bag of visual words (BoVW) algorithm for image matching in C++.

Autonomous Control of Quadcopter Using Deep RL [Video][Paper] **Oct 2017 – Apr 2018**

- Worked on autonomous navigation of quadcopter in AirSIM using depth image as input exploring rewards.
- The control policy was learned using DQN and the work was published in IEEE AUTEEE '19.

IIT Roorkee Motorsports **Jul 2015 – Apr 2018**

- Led the Powertrain Division of the Formula SAE team, developing a formula-style electric race car.
- Responsible for design, FEA analysis, CAD packaging and manufacturing of drivetrain parts of 2017 car, Saber.
- Worked on designing vehicle dynamics models and controller design including yaw rate controller and torque vectoring.

Technical Skills

Languages: Python, C++, CUDA, MATLAB, LaTeX
Packages: ROS, OpenCV, PyTorch, Open3D, TensorRT, ONNX

Achievements & Others

Selected for the CIFAR Deep Learning + Reinforcement Learning (DLRL) Summer School 2020
Secured an **All-India-Rank of 1693** in JEE Advanced 2014 amongst 150,000 candidates
Secured **Rank of 21** in Science Open Merit Test 2012
Reviewer: IROS 2023, IROS 2024