Nitish A Gupta

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EDUCATION

North Carolina State University — Raleigh, NC

Ph.D. *in Computer Science (GPA: 4.0)* — *Aug. 2021 – Present*

Advisors: Dr. Zhishan Guo

Research: Autonomous Systems, Real-time Systems, Optimal Control & Reinforcement Learning

University of Central Florida — Orlando, FL

M.S. *in Computer Engineering (GPA: 3.84)* — *Aug. 2016 – Aug. 2018*

Thesis: Real-time SIL Emulation Architecture for Cooperative Automated Vehicles

Advisor: Dr. Yaser P. Fallah

Research: Intelligent Transportation Systems, Robotics & Automation, Vehicular Networks, ADAS

University of Mumbai — Mumbai, India

Bachelors *in Electronics Engineering (GPA: 3.90)* — *Aug. 2010 – May 2014*

Ranked *1st* amongst 120 students in the Electronics dept.

Creative team head at Annual college festival – *Pegasus*

TEACHING

CSC 216 Software Development Fundamentals Lab — Raleigh, NC

North Carolina State University — *Aug. 2022 – Dec. 2022*

CSC 714 Real-Time Computer Systems Lectures — Raleigh, NC

North Carolina State University — *Aug. 2022 – Dec. 2022*

EECS 140 Introduction to Digital Logic Design Lab — Lawrence, KS

University of Kansas — *Jan. 2021 – May. 2021*

WORK EXPERIENCE

Unknot.id — Orlando, FL

Research Scientist — *May. 2022 - Aug. 2022*

- Development of multi-modal data acquisition and visualization user tool with experiment management features
- Research and implementation of policy-based deep reinforcement learning algorithms for real-time localization via map-matching

Knights Auto Team at UCF — Orlando, FL

Founder & Interim President — *Jan. 2022 - Aug. 2022*

- Built a first of it's kind multi-disciplinary community of students in Orlando aiming at developing Autonomous vehicles of different scales
- Joined by $\sim$ 50 students within two weeks of launch, team advised & sponsored by two professors at UCF
- Actively leading, organizing & hosting workshops, and races along with website & resource management

Real-Time & Intelligent Systems Lab — Orlando, FL

Graduate Research Assistant — *Aug. 2021 - Present*

- Leading the F1tenth-autonomous racing platform development team
- Exploring and collaborating research in applications of ML and RL in real-time cyber-physical systems
- Enabled communication & research collaboration of UCF with my previous employer NHK-I

NHK International Corporation — Novi, MI

Research Engineer II - Research & Analysis Team — *Nov. 2018 - July 2020*

- Prototyping and development of factory automation systems based on robotics and SOTA computer vision algorithms for a highly dynamic industrial environment
- Developed pipeline to acquire point cloud data from sensor, integration with ROS, point cloud segmentation, model fitting using RANSAC and ICP, model perception, robot motion & path planning with MoveIt

CAVREL at UCF Orlando, FL

Graduate Research Assistant *Feb. 2017 - Aug. 2018*

- **Real-Time SIL Emulator for ADAS Testing and Validation** – *Sponsor: Ford Motor Company*
  Designed and developed a unique and easily configurable emulation/simulation architecture to allow Software-In-Loop testing and validation of connected vehicle applications
- **Small-scale Connected Autonomous Vehicle** – *Sponsor: NSL*
  Mentored a team of 5 undergraduate students to build a fleet of vision sensors equipped small-scale autonomous vehicles to navigate using advanced planning algorithms and thus provide a test-bed for V2X safety applications
- **Vehicle Safety Communications Applications** – *Sponsor: CAMP*
  Research and development in DSRC based V2V Safety Networks, Model-based Information Networking for situation awareness in Automated vehicles

Giant Health Events Remote

Machine Learning Intern *May 2017 - June 2017*

Tata Consultancy Services Ltd. Mumbai, India

Business Intelligence Developer *Sept. 2014 - July 2016*

AWARDS

Recipient of 2021 Dean's Fellowship @UCF
Recipient of 2021 Hoglund Fellowship @KU
Recipient of 2014 Dean's Award @PCE

ONLINE DEGREES

Machine Learning by Andrew Ng @Coursera
Self-Driving Car Nanodegree @Udacity
Robotics Engineer Nanodegree @Udacity

TECHNICAL SKILLS

Languages: Python, C++, C, MATLAB
Hardware: LiDAR, Depth Cameras, NVidia Jetsons, Arduino, Raspberry Pi, FPGA
Libraries: TensorFlow, Keras, PyTorch, OpenAI Gym, PCL, VTK, OpenCV, Eigen, Pandas
Tools: ROS 1 & 2, Git, Gazebo, Moveit, CloudCompare, NS3, SUMO simulator, Qt, VSCode

PROJECTS

Vehicle Detection and Tracking *Oct. 2017 – Nov. 2017*

- Trained an SVM classifier to distinguish between car and non-car images with 98.56 % accuracy
- Accurately tracked vehicles using a stream of sliding bounding boxes of different scales
- Developed a heat-map of all positively detected vehicles to remove false positive based on a threshold

Driver's Behavior Cloning *Sep. 2017 – Oct. 2017*

- Designed a CNN to predict steering wheel angles in a challenging simulated environment based on the human driving behavior (Validation Loss $< 0.35\%$)

Traffic Sign Classification using Camera *Aug. 2017 – Sep. 2017*

- Built and fine-tuned a CNN over a small dataset to classify traffic signs, using a mounted camera
- Attained 97% test accuracy on a German traffic sign dataset

Autonomous Rescue Robot *Feb. 2017 – Apr. 2017*

- Built a 4-wheeled autonomous car for search and rescue operations in a disaster-affected area to explore and identify victims
- Programmed ROS (Robot Operating System) nodes for gathering the odometry data along with the scans from a Kinect sensor (to create 2D Occupancy maps) into a raspberry pi
- Implemented a Particle Filter for localization and a Path Planning algorithm for navigation to various goals using offline maps created during the training phase

Path Planning and Q-Learning in a grid world *Feb. 2017 – Mar. 2017*

- Implemented A-star path planning algorithm with Manhattan and Euclidean distance choice in an interactive grid world GUI using python's tkinter library
- Designed a Reinforcement learning engine with deterministic and stochastic behavior in the grid world

Concurrent Physics Engine *Oct. 2016 – Nov. 2016*

- Linearized a Physics Engine consisting of circles moving with random velocities around the screen and colliding with each other
- Implemented concurrent (Lock-free) version of SAP (Sweep and Prune) and Hash grid

Surveillance based on Tracking and Targeting *Oct. 2013 – Mar. 2014*

- Built a MATLAB based security system to tackle the situations like 2008 Mumbai attacks
- Led a team of three members to develop a real-time object detection and tracking algorithm, which controlled a camera-laser mounted robotic arm to continuously track and target the suspect

PUBLICATIONS

1. **N. Gupta**, K. Wilson, and Z. Guo, Optimizing Real-Time Performances for Timed-Loop Racing under F1TENTH. Proceedings of the 43rd IEEE Real-Time Systems Symposium (RTSS), Industry Challenge, Houston, US, Dec. 2022
2. G. Shah, R. Valiente, **N. Gupta**, SM Gani, B. Toghi, Y. P. Fallah, S. D. Gupta, Real-Time Hardware-In-the-Loop Emulation Framework for DSRC-based Connected Vehicle Applications, 2nd IEEE Connected and Automated Vehicles Symposium, Sept., 2019
3. **N. Gupta**, Real-time SIL Emulation Architecture for Cooperative Automated Vehicles (2018). Electronic Theses and Dissertations, University of Central Florida. 6047.
4. N. Gupta, S. J. A. Raza, G. R. Sukthankar, N. Chitalaya, Real-World Modeling of Path Finding Agent Using Robot Operating System (ROS), FCRAR, vol.30, May 2017