

Gopi Krishna Tummala

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Summary

Highly motivated software developer with interests in designing algorithms related to Computer Vision, Machine Learning, Deep Learning, Mobile systems and Autonomous vehicles. Skilled in programming with C++ (3+ years), Python (7+ years) Java (2 years), HTML, CSS, JavaScript and MySQL.

Education

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|----|---------------------------------|-------------------------|---------|-----|----------|
| 1. | IIT, Madras, India | Electrical Engineering. | B. Tech | 3.6 | May 2012 |
| 2. | Ohio State University, Columbus | Computer Science | MS | 3.6 | May 2018 |
| 3. | Ohio State University, Columbus | Computer Science | PhD | 3.6 | Aug 2019 |

Work Experience

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| 1. | Senior Systems Engineer | Qualcomm, San Diego, CA | Jan '19 – Present |
| 2. | Engineering Intern | Qualcomm, San Diego, CA | May '18 – Aug '18 |
| 2. | Research Assistant | Ohio State University, Columbus, OH | May '13 – Dec'18 |
| 3. | Research Intern | Microsoft Research, Bangalore, IN | May '16 – Aug'16 |
| 4. | Teaching Assistant | Ohio State University, Columbus, OH | May '13 – May'15 |
| 5. | Software Analyst | Standard Chartered Bank, Chennai, IN | Jun '12 – May'13 |
| 6. | Project Intern | Tata Elxsi Chennai, Chennai, IN | May '11 – Aug'11 |

Technical Skills

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- Languages and Scripting: Python, C/C++, Java, SQL, Shell/Bash, HTML/CSS.
- Others: GNU Radio, NS3, Arduino, Wireshark, SUMO, OpenCV, ROS-Framework, TensorFlow, Keras, XGBoost, MATLAB, SUMO.
- Project and Software Managements: JIRA, Git, Fisheye

Software and Research Projects

1. **[2019 to Now]** Designing machine learning based algorithms for Behavior Planning and Prediction of Autonomous vehicles.
 - a. Developed behavior prediction algorithms; Implemented end-to-end system and demonstrated superior performance. (*prototyping in python and implemented end-to-end system in C++*). [Aug 2019 - Now]
 - b. Written simulation framework for developing Behavior Planning and Prediction algorithms. (*Python, ROS and C++ experience*). [Feb 2019 – Aug 2019]
 - c. Designed a framework for analyzing the driving behavior by selectively aggregating the driving events. (*Python based analysis pipeline*). [June 2018 – Aug 2019]
 - d. Developed algorithms which are responsible for yielding to the cut-in vehicles for Autonomous vehicles. (*ROS and C++*). [Aug 2019 – Oct 2019]
 - e. Developed noise models for the sensors-fusion output. Developed ML based learning models which can synthesize artificial noise. [May 2018 – Aug 2018]
2. **[2013 to 2018]** Advancing Vehicular Navigation and Manufacturing by Exploring Location services. (Supervised by Prasun Sinha and Rajiv Ramnath, The Ohio State University).

- a. Designed a system *DashCalib* for hands-free Dashboard camera calibration. (*Python based prototype and Android, CV based application*)
 - b. Designed a system *VMaps* for generating Local Vehicular Neighborhood Map with Frequency-Pair Analysis. (*GNU Radio Python wrappers, MATLAB data processing pipeline*)
 - c. Designed a system *Soft-Swipe* for Enabling High-Accuracy Pairing of Vehicles to Lanes using COTS Technology. Real-time system implemented in C++. (Patent bought by Honda)
 - d. Designed a system *RoadView* for viewing the Road Ahead through Collaboration of vehicles and improves vehicles sensed by a factor of 1.8x. (*Implemented in C++ using NS3, SUMO simulator libraries*).
 - e. Designed a system *RoadMap* for mapping vehicles observed over a dashboard camera to respective IP-Addresses. (*Implemented in C++ using NS3, SUMO simulator libraries*).
3. **[Summer of 2018]** Behavior planning and prediction research for Autonomous vehicles (Supervised by Monu Surana, Ahmed Sadek, Arunandan Sharma and Feng Han, Qualcomm, San Diego, CA).
 - a. Developed different concepts to evaluate the behavior of Autonomous vehicles.
 - b. Developed a VIRES Virtual Test Drive (VTD) based autonomous vehicle simulator to pipeline testing of different behavior planning and prediction algorithms. (*Implemented in python*).
 - c. Designed calibration error, sensors fusion noise models based on several real-world driving runs of Qualcomm autonomous vehicle (*MATLAB*).
4. **[2016 to 2017]** Designing Automatic Traffic Camera calibration techniques. (Supervised by Ramjee Ramachandran, Ganesan Ramalingam and Prasun Sinha, Microsoft Research, India)
 - a. Designed a scalable system AutoCalib for hands-free traffic camera calibration with speed estimation errors of <10%. (*Python based implementation running on azure*)
5. **[2016 to 2017]** Indoor Navigation and sensing solutions for People with Visual Disabilities. (Supervised by Prasun Sinha, The Ohio State University)
 - a. Designing a system *CaneScanner* for low powered object detection using smart white canes. (*Implemented using Raspberry Pi and OpenCV*)
 - b. Designed a system Vision-Track for accurate Indoor tracking of a moving camera with < 3% tracking errors. (*Android and OpenCV integration*)
6. **[2013 to 2014]** Implementation and Evaluation of Wireless cutthrough routing. (Supervised by Kannan Srinivasan, The Ohio State University, USA)
 - a. Implemented Full-Duplex analog and digital cancellation modules on NI PXI. (*LabView*)
 - b. Designed a large-scale wireless network simulator for testing different routing algorithms based on real world channel traces and interference models. (*MATLAB*)
7. **[2011 to 2013]** Efficient algorithms for computing Null space of Block Convolution Matrix. (Supervised by K. Giridhar Department of Electrical Engineering, IIT Madras, India)
 - a. Designed efficient algorithms for computing Null-Space of MIMO-OFDM channel matrix (block convolution matrix) exploiting its special structure. (*MATLAB*)
 - b. Reduced matrix inversion run-time complexity from cubic order to linear.
8. **[2011 to 2012]** Run-time optimization for LTE Downlink (PDCCH) blind decoding problem (Supervised by Pradeep J. R, Tata Elxsi, Chennai, India)
 - a. Surveyed LTE protocols and identified the bottleneck runtime problems for the LTE stack.
 - b. Designed optimal run-time algorithms for Downlink Control Channel (PDCCH) blind search and DCI coding problem (carrier aggregation problem).

Honors

1. **Best paper awards:** ACM BuildSys 2017, IEEE MiSeNet 2018
2. **Best demo awards:** ACM BuildSys 2017
3. **NSF Travel awards:** ACM SenSys/BuildSys 2018, IEEE SECON 2017
4. **Royalty:** Received 40% share of royalty awarded by Honda North America.
5. **Merit Scholarship:** IIT Madras Merit cum Means (MCM) Scholarship (2008 -2012) Award. KKR Educational Intuitions Merit Scholarship, top 50 of the state Andhra Pradesh, India (2006 – 2008).

6. **Academic ranks:** All India Rank-274 IIT JEE, Top 200 (top 1%) in Indian Physics & Math Olympiads.

Academic and Volunteer activities.

1. **Reviewer/TPC/PC:** IEEE/ACM Transactions on Sensor Network (TOSN) journal, IEEE/ACM Transactions on Mobile Computing (TMC) journal, Paper Management System Administrator for IEEE SECON 2016
2. **Positions of responsibility:** Mess Secretary, IIT Madras 2010-2011. Equipment Coordinator for SHASTRA, IIT Madras annual TechFest.

Thesis Publications.

1. Tummala, Gopi Krishna. *Automatic Camera Calibration Techniques for Collaborative Vehicular Applications*. Diss. The Ohio State University, 2019.
2. Tummala, Gopi Krishna. *Null Space of Channel Matrix*. Diss. Indian Institute of Technology (IIT) Madras, 2012.

Journal Publications.

1. Romil Bhardwaj (Co-Primary), Gopi Krishna Tummala (Co-Primary), Ganesan Ramalingam, Ramachandran Ramjee and Prasun Sinha, "AutoCalib: Automatic traffic Camera Calibration at Scale," in **Proc. of ACM TOSN** March 2018

Selected Conference Publications.

1. Gopi Krishna Tummala, Tanmoy Das, Prasun Sinha and Rajiv Ramnath "SmartDashCam: Automatic Live Calibration for DashCams", in Proc. Of **ACM IPSN 2019**
2. Gopi Krishna Tummala (Co-Primary), Romil Bhardwaj (Co-Primary), Ganesan Ramalingam, Ramachandran Ramjee and Prasun Sinha, "AutoCalib: Automatic traffic Camera Calibration at Scale," in **Proc. of Buildsys**, Delft, Netherlands, Nov 2017,
3. Gopi Krishna Tummala, Dong Li, Prasun Sinha, "Live View of On-Road Vehicular Information", **IEEE SECON 2017**
4. Gopi Krishna Tummala, Dong Li, Prasun Sinha, "RoadMap: Mapping Vehicles to IP Addresses using Motion Signatures", **ACM CarSys 2016**
5. Gopi Krishna Tummala, Istdeo Singh and K Giridhar, Null-Space of Block Convolution Matrix", In **Proc. of IEEE National Conference on Communications**, Delhi, India, Feb [15-17] 2013.

Patents

1. *Gopi Krishna Tummala*, Derrick Cobb, Prasun Sinha and Rajiv Ramnath, Methods and Apparatus for enabling Mobile communication device based Secure Interaction from Vehicles through Motion Signatures", **U.S. Patent No. 10,032,370**.
2. Tanmoy Das, *Gopi Krishna Tummala* and Prasun Sinha, Scalable RFID Communication through Multi-Frequency Analysis", Patent Application No. **PCT/US18/58167**.
3. Ganesan Ramalingam, Ramjee Ramachandran, Romil Bharadwaj and *Gopi Krishna Tummala* "Automatic Camera Calibration.", **U.S. Patent Application No. 15/946,731**.

Teaching

1. Lecturer for Introduction to Computer Programing in Java [Spring-2014], [Fall-2014, 2015].
2. Grader for Introduction to Low-Level Programming and Computer Organization [Fall-2013].
3. Grader for The UNIX Programming Environment [Fall-2013]