

# Sagar Suhas Joshi

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## RESEARCH INTERESTS

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Intelligent decision-making for robots, Search-based motion planning, Deep learning for planning, Reinforcement learning, Planning for robotic manipulators, autonomous vehicles.

## EDUCATION

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### PhD in Robotics

*Advisor: Panagiotis Tsiotras*

**Atlanta, GA**

*August 2017-May 2022*

### Masters in Computer Science (ML specialization)

*Georgia Institute of Technology*

### B.Tech and M.Tech in Engineering Design (Automotive)

*Indian Institute of Technology (IIT)-Madras*

**Chennai, India**

*July 2017*

(Top rank in Department)

## AWARDS

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- Two IIT-Madras institute merit awards for exemplary academic performance (2017,2016 India)
- Institute convocation award for highest CGPA in all five years (2017 India)
- DAAD (German Academic Exchange Service) scholarship winner (2015 India)

## PUBLICATIONS

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- **Sagar Joshi**, Seth Hutchinson and Tsiotras, P., "TIE: Time-Informed Exploration for Robot Motion Planning", IEEE Robotics and Automation Letters (ICRA + RA-L), 2021 (accepted) [[pdf](#)]
- **Sagar Joshi** and Tsiotras, P., "Relevant Region Exploration On General Cost-Maps for Sampling-Based Motion Planning," IEEE/RSJ IROS 2020, Las Vegas, USA [[pdf](#)]
- **Sagar Joshi** and Tsiotras, P., "Non-Parametric Informed Exploration for Sampling-Based Motion Planning," IEEE ICRA, Montreal, Canada, 2019 [[pdf](#)]
- **Sagar Joshi**, Niko Maas, and Dieter Schramm, "A Vehicle Dynamics Based Algorithm for Driver Evaluation", IEEE ISCO, Coimbatore, India, 5-6 January, 2017

## RESEARCH EXPERIENCE

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### Planning for Robots

*Graduate Research Assistant*

**Georgia Tech, USA**

*August 2017 -*

- Deep learning and heuristics based methods for intelligent exploration in motion planning
- Implementing the algorithms using popular frameworks such as ROS, Pytorch, Gym, OMPL and MoveIt!

### Pipe Routing and Optimization Algorithm

*A.I Research Intern*

**Caterpillar Inc, India**

*January - May 2016*

- Designed a A\* based algorithm for routing considering piping constraints
- Formulated and solved an integer programming problem for segmenting the route

## Motion Planning and Control of Autonomous Ground Vehicles

IIT-Madras, India

Research Assistant, Masters Thesis Project

May 2016 - May 2017

- Used Hybrid A\* algorithm to generate feasible, obstacle free path for non-holonomic vehicles
- Designed a LQR optimal path tracking algorithm considering steering wheel (motor) dynamics
- Simulated the developed controller on a detailed nonlinear plant using IPG CarMaker

## Vehicle Dynamics Based Algorithm for Driver Evaluation

University of Duisburg, Germany

Research Intern

May - July 2015

- Formulated a novel algorithm for generating a real time driver performance metric using vehicle data
- Evaluated driver's steering input for lane keeping, pedal activity for tire slip and acceleration for passenger comfort

## ROBOTS

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### RACECAR

August 2017-

- Developing a ROS based autonomous navigation software for the RACECAR robot
- Please find a small [video here](#)

### Robotic Manipulators

August 2018-May 2019

- Applied the developed planning algorithms on 7 DOF Panda, 14 DOF Baxter robots in ROS simulator
- Used OMPL and MoveIt! frameworks for implementation and benchmarking against the state-of-art

## DESIGN PROJECTS

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### P.A.L Game

Jan-April 2014

- Designed a computer game using PyGame-Python intended to help ADD/ADHD children
- Used the principle of paired associate learning (P.A.L) for designing a flash card memory game
- The application was presented at EuroPython conference, Berlin, 2014

### Novel Computer Interface for physically disabled

2015

- Designed a computer interface for one arm and visually challenged users consisting of a glove keyboard
- Low cost input device with 26 copper patches as keys on the palm of the glove. Thin copper wires carrying information to an Arduino micro-controller.

## PROGRAMMING SKILLS

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- Python
- C++
- ROS
- PyTorch
- Gym
- OMPL/MoveIt!
- Matlab/Simulink

## LEADERSHIP AND MENTORING

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- **Head teaching assistant** for the course Mathematical Principles of Planning and Decision-making at Georgia Tech, USA. Designed the course project relating to autonomous navigation for racecar robot
- Mentored a team of undergraduate students at Georgia Tech for a Racecar robotics project
- **Institute basketball captain** of the undergraduate team at IIT-Madras
- Robotics workshop coordinator at Technical festival organized by IIT-Madras