

# Jayam Patel

PH.D. CANDIDATE · ROBOTICS ENGINEERING · WORCESTER POLYTECHNIC INSTITUTE

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## Research Interests

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Swarm Robotics · Multi-Robot Systems · Human-Robot Interaction · Real-Time Systems · Human Factors & Ergonomics · Cognitive Engineering · Augmented Reality · Mixed Reality · Virtual Reality · Human Interfaces · Collective Transport · Robot Localization

## Education

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### Formal Education

#### Ph.D. in Robotics Engineering

WORCESTER POLYTECHNIC INSTITUTE (WPI)

• Thesis: Improving Human Performance in Multi-Human Multi-Robot Interaction

Worcester, MA, USA

Feb. 2021

#### Certificate in College Teaching

HIGHER EDUCATION CONSORTIUM OF CENTRAL MASSACHUSETTS (HECCMA)

• Professional training on the trends of teaching methods and student psychology

Worcester, MA, USA

May 2019

#### M.S. in Robotics Engineering

WORCESTER POLYTECHNIC INSTITUTE (WPI)

• Thesis: Gesture-Based Navigation and Localization of a Smart Wheelchair using Fiducial Markers

Worcester, MA, USA

May 2016

#### B.Eng. in Electronics and Communication Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

• Final Project: Advanced Reliable Intelligent and Efficient Security System (ARIESS) (Applied for Patent)

Ahmedabad, GJ, India

May 2012

### Further Education

#### Reinforcement Learning Specialization

UNIVERSITY OF ALBERTA, COURSERA Specialization

• Four course specialization covering concepts of reinforcement learning.

USA

Exp. May. 2021

#### Deep Learning Specialization

DEEPLARNING.AI, COURSERA Specialization

• Five course specialization covering different types of Neural Networks and parameter tuning.

USA

Jul. 2020

#### Introduction to Psychology

UNIVERSITY OF TORONTO, COURSERA Certification

• Online course covering concepts of psychology, social psychology and mental illness.

USA

Jul. 2020

#### Machine Learning

STANFORD UNIVERSITY, COURSERA Certification

• Online course covering concepts of machine learning and algorithms.

USA

Jun. 2020

## Research Experience

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#### Ph.D. Candidate, NEST Lab, Worcester Polytechnic Institute

SUPERVISOR: PROF. CARLO PINCIROLI

- Worked on multi-human multi-robot framework to investigate methods and devices for an effective interaction
- Built a mixed reality-based and a cloud-based interface for testing human operators' usability and behaviour
- Investigated the impact of mixed-granularity of control, information transparency, human communication and loss of information on human operators' performance

Worcester, MA, USA

Aug. 2016 - PRESENT

## M.S. Thesis, RIVeR Lab, Worcester Polytechnic Institute

SUPERVISOR: PROF. TASKIN PADIR

- Worked on a gesture-based navigation technique to manipulate a smart wheelchair for the elderly and the specially-abled
- Implemented an indoor localization technique using April Tags as fiducial markers
- Designed a simulator to test and verify results for all the test cases

Worcester, MA, USA

Aug. 2014 - Apr. 2016

## Researcher, Ahmedabad Robot Club

SUPERVISOR: DR. RONAK SHODHAN

- Worked on various robotics and automation projects
- Designed a security system to isolate the residents of the house to avoid any fatality (Patent Applied)
- Trained 100+ Students (9-35 year old) in "Basics of Robotics" (Line and Wall Following Robots)

Ahmedabad, GJ, India

Aug. 2008 - May 2013

## Teaching

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### Graduate Courses

#### Course Instructor, Swarm Intelligence, WPI

INSTRUCTORS: PROF. CARLO PINCIROLI, JAYAM PATEL

Worcester, MA, USA

Spring 2020

#### Teaching Assistant and Guest Lecturer, Swarm Intelligence, WPI

INSTRUCTOR: PROF. CARLO PINCIROLI

Worcester, MA, USA

Spring 2019, Spring 2018.

#### Teaching Assistant, Robot Dynamics, WPI

INSTRUCTOR: PROF. MAHDI AGHELI, PROF. WILLIAM R. MICHALSON

Worcester, MA, USA

Fall 2018.

#### Teaching Assistant and Guest Lecturer, Robot Control, WPI

INSTRUCTOR: PROF. MAHDI AGHELI

Worcester, MA, USA

Fall 2018, 2017.

#### Course Assistant, Foundations of Artificial Intelligence, University of Southern California

INSTRUCTOR: PROF. SHEILA TEJADA

Los Angeles, CA, USA

Spring 2014.

### Undergraduate Courses

#### Teaching Assistant, Frontiers Program, Physics, WPI

INSTRUCTOR: PROF. P. K. ARAVIND

Worcester, MA, USA

Summer 2017.

#### Teaching Assistant and Lab Lecturer, General Physics-Mechanics, WPI

INSTRUCTOR: PROF. P. K. ARAVIND

Worcester, MA, USA

Spring 2017, 2016. Fall 2016, 2015.

#### Teaching Assistant and Lab Lecturer, General Physics-Electricity And Magnetism, WPI

INSTRUCTOR: PROF. P. K. ARAVIND

Worcester, MA, USA

Spring 2017, 2016. Fall 2016, 2015.

#### Teaching Assistant and Lab Lecturer, Embedded Computing in Engineering Design, WPI

INSTRUCTOR: PROF. SUSAN JARVIS

Worcester, MA, USA

Spring 2015.

#### Teaching Assistant and Lab Lecturer, Introduction to Digital Circuit Design, WPI

INSTRUCTOR: PROF. XINMING HUANG

Worcester, MA, USA

Spring 2015.

#### Lecturer and Mentor, Basics of Robotics, Ahmedabad Robot Club

SUPERVISOR: DR. RONAK SHODHAN

Ahmedabad, GJ, India

2008 - 2013.

## Honors & Achievements

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### Patent Applied (#1584/MUM/2013)

ADVANCED RELIABLE INTELLIGENT AND EFFICIENT SECURITY SYSTEM

Ahmedabad, GJ, India

2013

### Academic Excellence (B.Eng. Batch Topper)

GUJARAT TECHNOLOGICAL UNIVERSITY

Ahmedabad, GJ, India

2012

### Recognition by Mr. Narendra Modi, Prime Minister of India

FOR INTELLECTUAL CONTRIBUTION TO THE FIELD OF AUTOMATION AND ROBOTICS

Ahmedabad, GJ, India

2011

## Publications

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- [5] Jayam Patel, Prajankya Sonar and Carlo Pinciroli. **On Multi-Human Multi-Robot Remote Interaction: A Study of Transparency, Inter-Human Communication and Information Loss in Remote Interaction.** *Under Review. Submitted to the Springer Journal of Swarm Intelligence*
- [4] Jayam Patel, Tyagaraja Ramaswamy, Zhi Li and Carlo Pinciroli. **Level of Transparency in Multi-Human Multi-Robot Interaction.** *Under Review. Submitted to the IEEE Transactions on Human-Machine Systems (THMS).*
- [3] Jayam Patel, Tyagaraja Ramaswamy, Zhi Li and Carlo Pinciroli. **Inter-Human Communication in Multi-Human Multi-Robot Interaction.** *Under Review. Submitted to the IEEE Robotics and Automation Letters (RA-L).*
- [2] Jayam Patel and Carlo Pinciroli. **Improving Human Performance Using Mixed Granularity of Control in Multi-Human Multi-Robot Interaction.** *In IEEE International Conference on Robot and Human Interactive Communication (RO-MAN). 2020.*
- [1] Jayam Patel, Yicong Xu and Carlo Pinciroli. **Mixed-Granularity Human-Swarm Interaction.** *In IEEE/RSJ International Conference on Robotics and Automation (ICRA). 2019.*

## Presentations

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- [7] **Improving Human Performance Using Mixed Granularity of Control in Multi-Human Multi-Robot Interaction.** Paper Presentation, *IEEE International Conference on Robot and Human Interactive Communication (RO-MAN). 2020.*
- [6] **Improving Human Performance Using Mixed Granularity of Control in Multi-Human Multi-Robot Interaction.** Poster Presentation, *Northeast Robotics Colloquium (NERC). 2019.*
- [5] **Improving Human Performance Using Mixed Granularity of Control in Multi-Human Multi-Robot Interaction.** Poster Presentation, *WPI Robotics Engineering 10-Year Anniversary Research Symposium. 2019.*
- [4] **Mixed-Granularity Human-Swarm Interaction.** Paper Presentation, *IEEE/RSJ International Conference on Robotics and Automation (ICRA). 2019.*
- [3] **Mixed-Granularity Human-Swarm Interaction.** Poster Presentation (Finalist), *Graduate Research Innovation Exchange (GRIE), WPI. 2019.*
- [2] **Mixed-Granularity Human-Swarm Interaction.** Presentation, *Robotics Engineering Department Colloquium, WPI. 2019.*
- [1] **Human-Swarm Interaction for Disaster Management.** Poster Presentation, *Graduate Research Innovation Exchange (GRIE), WPI. 2018.*

## Awards

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- 2019** ICRA Travel Award, \$500  
**2019** WPI Travel Award, \$500

## Key Projects

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### Multi-Human Multi-Robot Interaction

NEST LAB, WPI

- Designed an augmented reality-based and a cloud-based interface for multi-human multi-robot interaction
- Evaluated various research aspects with 8 user studies involving 122 participants

*Worcester, MA, USA*

*Jan. 2019 - Present*

### Human Swarm Interaction for Disaster Management

NEST LAB, WPI

- Implement Human Interaction devices to interface with Swarm Robots
- Interfaces include: MYO (EMG Band), Leap Motion, Augment Reality, Hand-held tablets, Magic Leap One

*Worcester, MA, USA*

*Jan. 2016 - Present*

### Author Age and Gender Prediction from Written Samples

ARTIFICIAL INTELLIGENCE COURSE PROJECT (TEAM OF 4)

- Predicted age and gender of an author using Machine Learning
- Implemented algorithms - k-Nearest Neighbours, Decision Tree and Support Vector Machine

*Worcester, MA, USA*

*Aug. 2016 - Dec. 2016*

## Gesture-Based Navigation & Localization of a Smart Wheelchair

M.S. THESIS, RIVER LAB, WPI

- Built EMG interface to control wheelchair navigation
- Designed indoor localization of wheelchair using an of the shelf camera and APRIL Tags

Worcester, MA, USA

Aug. 2015 - May 2016

## Gesture-Based sensor fusion SLAM

ADVANCED ROBOT NAVIGATION COURSE PROJECT (TEAM OF 2)

- Implemented MATLAB-ROS Communication
- Designed PID controller to generate smooth trajectory for turtle bot

Worcester, MA, USA

Jan. 2016 - May. 2016

## ROS-GAZEBO Modeling of Neurosurgery Robot

ROBOT DYNAMICS COURSE PROJECT (TEAM OF 4)

- Created ROS-Gazebo bridge for simulating a no-go region for collision avoidance
- Designed an algorithm to plan a collision free trajectory of the MRI robot

Worcester, MA, USA

Jan. 2015 - May. 2015

## Editorial Activities

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### Journal Reviewer

- Springer Journal on Swarm Intelligence.
- IEEE Robotics and Automation Letters (RA-L).
- Journal of Virtual Reality & Intelligent Hardware (VRIH).

### Conference Reviewer

- The Association for the Advancement of Artificial Intelligence Conference (AAAI). 2020.
- International Conference on Robotics and Automation (ICRA). 2019, 2020.
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS). 2020.
- International Symposium on Multi-Robot and Multi-Agent Systems. 2019.
- International Conference on Intelligent Robots and Systems (IROS). 2019.
- Genetic and Evolutionary Computation Conference (GECCO). 2018.
- International Conference on Swarm Intelligence (ANTS). 2018.

## Invited Talks

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- [16] **“Robotics: Today and Tomorrow! (Webinar)”**, Government Engineering College, Bharuch, GJ, India. Sep. 29, 2020.
- [15] **“Robotics in Industry 4.0 (Webinar)”**, KJ Somaiya College Of Engineering, Mumbai, MH, India. Jun. 29, 2020.
- [14] **“ECE Opportunities in India, USA and Canada (Webinar)”**, Indus University, Ahmedabad, GJ, India. May. 30, 2020.
- [13] **“Robotic applications around the world (Webinar)”**, Knowledge Studio, Surat, GJ, India. May. 12, 2020.
- [12] **“Research and Development in the field of Robotics”**, KJ Somaiya College Of Engineering, Mumbai, MH, India. Jan. 8, 2020.
- [11] **“Research and Development in the field of Robotics”**, Sankalchand Patel University, Visnagar, GJ, India. Jan. 2, 2020.
- [10] **“Today in Robotics.”**, Mechanical Engineering Department, Government Polytechnic, Ahmedabad, GJ, India. Dec. 30, 2019.
- [9] **“Today in Robotics.”**, Electrical and Computer Engineering Department, Government Polytechnic, Ahmedabad, GJ, India. Dec. 20, 2019.
- [8] **“Research and Development in the field of Robotics”**, Silver Oak College of Engineering and Technology, Ahmedabad, GJ, India. Dec. 19, 2019.
- [7] **“How to make simple Robots!”**, Government Polytechnic For Girls, Surat, GJ, India. Dec. 18, 2019.
- [6] **“Today in Robotics.”**, Government Polytechnic For Girls, Surat, GJ, India. Dec. 13, 2019.
- [5] **“Advancements in the Field of Robotics.”**, St. Kabir School, Drive-In New Branch, Ahmedabad, GJ, India. Jan. 16, 2019.
- [4] **“Advancements in the Field of Robotics.”**, St. Kabir School, Drive-In Old Branch, Ahmedabad, GJ, India. Jan. 16, 2019.
- [3] **“Robotics Research Tools and Technologies”**, National Institute of Technology (NIT), Surat, GJ, India. Jan. 9, 2019.
- [2] **“Advancements in the Field of Robotics.”**, St. Kabir School, Naranpura Branch, Ahmedabad, GJ, India. Jan. 5, 2019.
- [1] **“Advancements in the Field of Robotics.”**, St. Kabir School, Navrangpura Branch, Ahmedabad, GJ, India. Jan. 4, 2019.

## Supervising

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### Graduate Students

**Prajankya Sonar**, Human Swarm Interaction Interface Development

GRADUATE DIRECTED RESEARCH, CO-SUPERVISOR

*Worcester, MA, USA*

*Nov. 2019 - Present*

**Tyagaraja Ramaswamy**, Localization for Swarm Robots

GRADUATE DIRECTED RESEARCH, CO-SUPERVISOR

*Worcester, MA, USA*

*Jan. 2019 - May. 2020*

**Christopher Dalessio**, Motion Planning for Swarm Robots

GRADUATE DIRECTED RESEARCH, CO-SUPERVISOR

*Worcester, MA, USA*

*Jan. 2019 - May. 2019*

**Yicong Xu**, Goal Based Human-Swarm Interaction for Collaborative Transport

M.S. THESIS, CO-SUPERVISOR

*Worcester, MA, USA*

*Aug. 2017 - May. 2018*

### Undergraduate Students

**Harrison James, Paul Mara, Vlad Stelea**, swARm Project

UNDERGRADUATE MAJOR QUALIFYING PROJECT, CO-SUPERVISOR

*Worcester, MA, USA*

*Aug. 2020 - Present*

**Eula Zhong, Kent Libby, Noah Van Stralen**, Diagnostic Tools for Swarm Robots

UNDERGRADUATE MAJOR QUALIFYING PROJECT, CO-SUPERVISOR

*Worcester, MA, USA*

*Aug. 2019 - May. 2020*

**Danny Sullivan, Eric Arthur, Przemek Gardias**, Gestures for Human Swarm Interaction

UNDERGRADUATE MAJOR QUALIFYING PROJECT, CO-SUPERVISOR

*Worcester, MA, USA*

*Aug. 2019 - May. 2020*

**Alexandra Wheeler, Erika Snow, Jerish Brown, Josiah Boucher**, Diagnostic Tools for Swarm Robots

UNDERGRADUATE MAJOR QUALIFYING PROJECT, CO-SUPERVISOR

*Worcester, MA, USA*

*Aug. 2018 - May. 2019*

**Members of Ahmedabad Robot Club**, 100+ Students, Maze Solving Robot

ROBOTICS PROJECT, SUPERVISOR

*Ahmedabad, GJ, India*

*Aug. 2008 - May. 2013*

## Press Coverage

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- [5] **Tej Gujarati**. (Aug. 29, 2020). "Guiding young minds in the field of Robotics." (Original article in Gujarati)
- [4] **Education Times, The Times of India Newspaper**. (Sep. 3, 2012). "The likeness in learning."
- [3] **Daily News and Analysis (DNA) Newspaper**. (Aug. 30, 2011). "Robotics enthusiasts of Ahmedabad test their mean machines."
- [2] **The Indian Express Newspaper**. (Aug. 28, 2011). "Robot slugfest attracts hundreds to city."
- [1] **City Bhaskar Gujarati Newspaper**. (Aug. 20, 2011). "Robots made by students ran with pride." (Original article in Gujarati)

## Skills

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**Programming** C++, C#, Buzz, Python, C, MATLAB, JAVA, HTML, LaTeX

**Robotic Tools** ARGoS, ROS, Gazebo, RVIZ, MoveIt

**Hardware** Atmel, Arduino, MSP430, ARM, 89cXX-80xx Series, PIC, Basic Stamp, Lego Mindstorm

**Software Tools** Unity, Vuforia, SPSS, VS Code, SVN, Git, QtCreator, Eclipse, MATLAB & Simulink, AVR Studios, Keil µvision

## Organization Memberships

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- **Member**, IEEE
- **Member**, IEEE Robotics and Automation Society
- **Member**, IEEE Systems, Man, and Cybernetics Society
- **Member**, ACM

## Language Proficiency

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**Hindi** Native  
**Gujarati** Native  
**English** Fluent

## Extracurricular Activity

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### Leadership

#### IEEE Robotics and Automation Society, WPI Chapter

HEAD OF TECHNICAL EVENTS

*Worcester, MA, USA*

*2020 - PRESENT*

#### Rho Beta Epsilon, Robotics Honor Society, WPI

MEMBER AND VOLUNTEER

*Worcester, MA, USA*

*2019 - PRESENT*

#### South Asian Student Association(SASA), WPI

PRESIDENT

*Worcester, MA, USA*

*2015 - 2016*

### Student Outreach

#### Boarding Pass for Success

TECHNICAL ADVISOR AND MENTOR FOR SCHOOL AND COLLEGE STUDENTS

*USA, Canada and India*

*2018 - PRESENT*

#### Independent Activities for Awareness in the Field of Robotics

MENTOR AND GUIDE STUDENTS OF ALL AGES TO HELP THEM FIND A CAREER IN THE FIELD OF ROBOTICS

*USA, Canada and India*

*2009 - PRESENT*

### Community Service

#### YUVA Unstoppable at LJ Engineering (NGO)

COLLEGE AMBASADOR

*Ahmedabad, GJ, India*

*2009 - 2012*

#### PRAYAS at LJ Engineering (NGO)

VOLUNTEER

*Ahmedabad, GJ, India*

*2008 - 2012*

#### YUVA Unstoppable (NGO)

COLLEGE AMBASADOR

*Ahmedabad, GJ, India*

*2006 - 2009*

#### Independent Activities with My Mother

THANK YOU, MOM (PRAGNA PATEL)

*Ahmedabad, GJ, India*

*2000 - 2013*

### Life Guidance and Counselling

#### Reiki and Tarot Cart Practitioner

USUI AND KARUNA REIKI MASTER, THE INTERNATION CENTER OF REIKI TEACHING (ICRT) LICENSED

*USA, Canada and India*

*2006 - PRESENT*