Last updated: May, 2020.

# DIVYA HARESH SHAH


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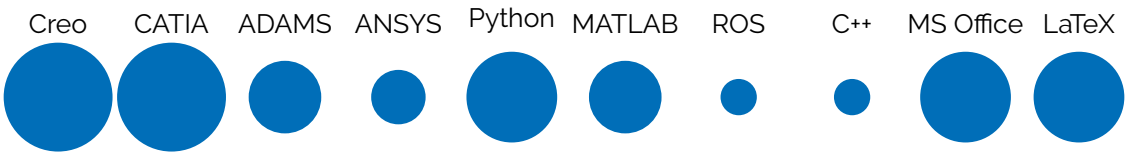
## Roboticist | Doctoral Researcher

### BIO

I am an Indian, born and brought up in Mumbai. I developed a passion for designing and building robots during my involvement with the undergrad collegiate robotics club. I then moved to Europe to pursue higher education in robotics and currently, I am a PhD student with the iCub Tech Facility at IIT in Genova. My main research area is mechanism design for robotics with primary focus on parallel kinematics and tendon-driven mechanisms for humanoid wrists for dexterous applications.


### EDUCATION

2017 – 2021 **Doctorate of Philosophy in Bioengineering and Robotics**
Curriculum: Advanced and Humanoid Robotics
- Department of Informatics, Bioengineering, Robotics and Systems Engineering (DIBRIS), University of Genoa &
- iCub Tech Facility, Italian Institute of Technology (IIT), Italy

2015 – 2017 **Erasmus+ European Masters on Advanced Robotics (EMARO+)**
-Master in Robotics Engineering, University of Genoa, Italy ($1^{st}$ year) **Avg.: 92.41%**
-Master of Science in Control and Robotics: Advanced Robotics, École Centrale de Nantes, France ($2^{nd}$ year) **Avg.: 86.70%**

2011 – 2015 **Bachelor of Technology in Mechanical Engineering** **CPI: 8.18/10.00**
Sardar Patel College of Engineering (SPCE), University of Mumbai, India

### RESEARCH EXPERIENCE

11/2017 – present **Robot Design for Dexterous Manipulation** **Ph.D. Student Fellow**
Doctoral thesis
The Ph.D. project aims towards design and development of a 2-DOF wrist mechanism for the next version of the *iCub Humanoid*. It focuses on employing parallel orientational mechanisms for increasing the range of motion and the payload-to-weight ratio thus also improving the manipulation dexterity [J2, B1, C2].
`Creo Parametric / Python / ADAMS / MATLAB / 3D Printing / MS Ofice / LaTeX`

Advisors: **Alberto Parmiggiani**, *Technologist-Facility Coordinator*, Italian Institute of Technology
**Giorgio Metta**, *Scientific Director*, Italian Institute of Technology

07/2019 – 10/2019
Period abroad

**Design of Tendon Routing Mechanism through Pronation/ Supination Joint for Decoupled Motions** — **Visiting Researcher**

Collaborative project for idea generation, concept design and prototyping for a novel tendon routing mechanism through the pronation/supination (elbow) joint for multiple wrist actuating tendons in order to allow decoupled motions between the wrist and the elbow [C3].

`Creo Parameteric / Seimens NX / 3D Printing`

Advisor: **Yong-Jae Kim**, *Assisstant Professor*, Interactive Robotics & Innovative Mechanism (IRIM) Lab at Korea University of Technology and Education (KOREATECH)

02/2017 – 08/2017
Master thesis

**Increased Productivity of an Automated Tape Winding System - SPIDE TP Platfrom** — **Master Thesis Intern**

Collaborated on increasing the productivity of a kinematically redundant industrial platform for automated tape winding process. Focused on developing robust collision detection within workcell components and implementing time-optimal trajectories previously developed using dynamic programming principle. The simulations promised to reduced the overall processing time to one-third [C1].

`CATIA / DELMIA / MATLAB / MS Office / LaTeX`

Advisors: **Benoît Courtemanche**, *Engineer*, Centre Technique des Industries Mécaniques (CETIM)
**Stéphane Caro**, *Researcher-HDR*, Centre National de la Recherche Scientifique (CNRS)
**Anatol Pashkevich**, *Professor*, Institut Mines-Télécom Atlantique

05/2016 – 08/2016
Group project

**Development of a Flight Control Software Architecture for a Quadrotor** — **Graduate Student**

Developed and implemented a modular flight control software architecture for autonomous tracking and landing of a quadrotor on a mobile platform using velocity control with feedback from motion capture system.

`ROS / C++ / MS Office`

Advisor: **Marco Baglietto**, *Professor*, DIBRIS, University of Genova

12/2015 – 04/2016
Group project

**Modelling of Bi-manual Human Gestures with Wearable Inertial Sensors** — **Graduate Student**

Modelled several common human motion primitives involving concurrent or synchronous use of both hands with inertial data from wearable sensors. Compared different classification techniques and analyzed the recognition performance achieving 80% accuracy [J1].

`MATLAB / C++ / LaTeX`

Advisor: **Fulvio Mastrogiovanni**, *Associate Professor*, DIBRIS, Univeristy of Genova

09/2014 – 04/2015
Bachelor thesis

**Design, fabrication and Control of an Articulated Robotic Arm** — **Undergraduate Student**

Studied mechanical design, fabrication, kinematic control and performance analysis for a 6-axis articulated serial robot and developed a prototype to demonstrate basic manipulation (pick and place) of objects.

`CATIA / ANSYS / MATLAB / Prototyping / MS Office`

Advisor: **Rajesh Buktar**, *Professor*, SPCE, University of Mumbai

## CO-CURRICULAR ACTIVITIES

06/2012 – 04/2014
Undergraduate level

**Team SPCE Robocon for ABU Robocon India** — **Mumbai, India**

Actively involved with the collegiate robotics club participating at the ABU Robocon-India; national leg of the international undergraduate robotics competition. Contributed towards the conceptual design and fabrication of the robots required to perform a specified set of time-bound tasks. Also, lead the team for the year 2013-14 with additional responsibilities of organizing work schedules and managing in-hand funds and resources.

`Mechanism Design / CATIA / Fabrication / Arduino`

Advisor: **Dattatray Jadhav**, *Assosciate Professor*, SPCE, University of Mumbai

## JOURNAL ARTICLES

2019 [J2] Divya Shah, Yuanqing Wu, Alessandro Scalzo, Giorgio Metta and Alberto Parmiggiani;
***A Comparison of Robot Wrist Implementations for the iCub Humanoid***;
Multidisciplinary Digital Publishing Institute (MDPI) **Robotics**, 8(1), 11. DOI

2018 [J1] Divya Shah, Ernesto Denicia, Tiago Pimentel, Barbara Bruno and Fulvio Mastrogiovanni;
***Detection of Bimanual Gestures Everywhere: Why it matters, What we need and What is missing***;
Elsevier **Robotics and Autonomous Systems**, 99, 30 - 49. DOI

## BOOK CHAPTERS

2018 [B1] Divya Shah, Giorgio Metta and Alberto Parmiggiani;
***Comparison of Workspace Analysis for Different Spherical Parallel Mechanisms***;
Springer **Mechanisms and Machine Science**, 66, 193-201, for IFToMM Symposium on Mechanism Design for Robotics (MEDER), *Udine, Italy*. DOI

## CONFERENCE PROCEEDINGS

2020 [C3] Divya Shah, Alberto Parmiggiani and Yong-Jae Kim;
***Constant Length Tendon Routing Mechanism through Axial Joint [In Press]***;
IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), ~~*Boston, USA*~~ *Virtual* DOI

2018 [C2] Divya Shah, Giorgio Metta and Alberto Parmiggiani;
***Workspace Analysis and the Effect of Geometric Parameters for Parallel Mechanisms of the N-UU Class***;
ASME International Design Engineering Technical and Conferences/Computers and Information in Engineering Conference (IDETC/CIE), *Quebec City, Canada* DOI

2017 [C1] Divya Shah, Jiuchun Gao, Anatol Pashkevich, Stéphane Caro and Benoît Courtemanche;
***Computer-Aided Design and Optimization of a Redundant Robotic System for Automated Fiber Placement Process***;
AIP Proceedings for the International Conference on Mechanical Engineering (ICOME), *Surabaya, Indonesia* DOI

## SCHOOLS ATTENDED

01/2020 **IFToMM International Winter School on Mechanism Design and Motion Planning (ROBOzen)**
*Bolzano-Bozen, Italy*

09/2018 **LIRMM/ LS2N International Summer School on Parallel Kinematic Manipulators (PKM)**
*Montpelier, France*

## LANGUAGES

**English** - proficient
**Italian** - rudimentary
**French** - introductory
**Gujarati, Hindi** - native

## HOBBIES/INTERESTS

**Swing Dancing**
Hiking
Cricket
Ukulele

## PLACES LIVED

Mumbai, India
Genova, Italy
Nantes, France
Cheonan, South Korea