DIVYA SHAH, PH.D.

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SUMMARY

With over five years of research & development background, I have experience in mechanical design, simulation, rapid prototyping and testing of mechatronic systems for humanoid robots along with effective communication and documentation skills through collaborations and scientific publications.

SKILLS

Hardware: **DC/BLDC/PMSM Motors**, **Strain wave gears**, Optical/Magnetic Encoders, Hysteresis Dynamometer, Motion Capture System

Fabrication: **Additive manufacturing**, **Drawing**, Machining, Assembly, Soldering

Theoretical: **Robot kinematics**, **Optimization techniques**, System modeling, Rigid-body dynamics, Control theory, Finite element analysis

Design: **PTC Creo Parametric**, **CATIA**, DELMIA, SolidWorks, AutoCAD

Simulation: **Simulink**, **Simmechanics**, ANSYS, ADAMS, Gazebo

Programming: **MATLAB**, **Python**, Arduino, RaspberryPi, YARP, ROS, Docker, C++

Documenting: **LateX**, **MS Office**, **Github**, Markdown, Inkscape

Languages: **English** (Fluent), **Italian** (Intermediate), Gujarati/Hindi (Native), **French** (Beginner)

CORE EXPERIENCE

Postdoc — *Design, testing & development of joint modules for ergoCub*,
iCubTech Facility, Italian Institute of Technology (IIT),
Genoa, Italy.   Jul. 2021 – Present

- Designed mechanical assembly for compact and powerful humanoid joint modules using PTC Creo Parametric.
- Collaborated with other teams on M-CAD/E-CAD design and integration of mechanical & electrical components within an agile framework.
- Created precise drawings using GD&T for manufacturing prototype test setup.
- Contributed to the creation of a digital twin using MATLAB & Simulink for simulations to develop torque estimation algorithms.
- Defined experiments for characterizing motor and joint parameters, performed using YARP and analyzed results using MATLAB.
- Developed modular joints with increased payload-to-weight ratio and torque density.
- Preparing for deployment on forthcoming versions of ergoCub & iCub robots.

Ph.D. — *Design, simulation & analysis of dexterous wrist mechanism for*
iCub, *iCubTech Facility, IIT, Genoa, Italy.*   Nov. 2017 – Jun. 2021

- Conducted research on state-of-the-art wrist mechanisms for humanoids.
- Designed and simulated multiple kinematic architectures using PTC Creo Parametric to compare their behavior [3].
- Proposed a 2 degree of freedom parallel orientational mechanism modeled using rigid body closed-loop kinematics.
- Fabricated & assembled prototypes using additive manufacturing techniques.
- Defined and performed experiments to verify range of motion and isotropy of the mechanism using Python with Raspberry Pi.
- Resulted in a promising candidate mechanism for a dexterous wrist that produces hemispherical and singularity-free motions [1].

Visiting Researcher — *Concept design & prototyping of forearm mechanism*,
IRIM Lab, KOREATECH, Cheonan, South Korea.   Jul. 2019 – Oct. 2019
  - Conducted research on state-of-the-art tendon-driven mechanisms for robots.
  - Conceptualized a novel tendon routing mechanism for forearm pronation supination and designed it using PTC Creo Parametric.
  - Performed experiments on a rapid prototype for proof-of-concept.
  - Resulted in a mechanism that allows full circle rotation and decoupled routing for 4 tendons simultaneously [2].

Graduate Thesis Intern — *Simulation & optimization for productivity of fiber placement process*, *Centre Technique des Industries Mécaniques (CETIM), Nantes, France.*   Feb. 2017 – Aug. 2017
  - Designed a mechanism model of the industrial workcell using DS CATIA V5.
  - Simulated the fiber placement process on the model using DS DELMIA.
  - Collaborated on optimization of robot trajectories using MATLAB.
  - Developed a framework that produces optimal trajectories to increase productivity by reducing overall processing times to one-third [4].

EDUCATION

PhD in Bioengineering and Robotics – Advanced and Humanoid Robots
University of Genoa, Italy.   Nov. 2017 – Jun. 2021

EMARO+ Erasmus+ European Masters on Advanced Robotics
  - **Master of Science in Control and Robotics**   (Avg.: 86.70%)
    École Centrale de Nantes, France.   Sep. 2016 – Aug. 2017
  - **Master in Robotics Engineering**   (Avg.: 92.41%)
    University of Genoa, Italy.   Sep. 2015 – Aug. 2016

Bachelor of Technology in Mechanical Engineering   (GPA: 8.18/10)
Sardar Patel College of Engineering, University of Mumbai   Jun. 2011 – May 2015

SELECTED PUBLICATIONS

[1] **D. Shah**, *"Design of Wrist and Forearm Mechanisms for Enhanced Humanoid Dexterity"*; **Doctoral Thesis**. [(DOI)](#)   Jun. 2021
[2] **D. Shah**, *et al.*, *"Constant Length Tendon Routing Mechanism through Axial Joint"*; **IEEE/ASME Conference AIM**. [(DOI)](#)   Jul. 2020
[3] **D. Shah**, *et al.*, *"A Comparison of Robot Wrist Implementations for the iCub Humanoid"*; **MDPI Robotics Journal**. [(DOI)](#)   Feb. 2019
[4] **D. Shah**, *et al.*, *"Computer-Aided Design & Optimization of Redundant Robotic System for Automated Fiber Placement Process"*; **AIP Conf. ICOME**. [(DOI)](#)   Oct. 2017
       See full publications list on: [Google Scholar](#).

ADDITIONAL EXPERIENCE

Leadership and Project Management   2012 – 2014
  - Lead a team of students at the undergrad level to design & build robots to participate at the national level robotics competition (ABU ROBOCON India).

Public Outreach   2018 – Present
  - Presented scientific articles & posters at various conferences & workshops.

Event Organization   2014 – 2022
  - Co-organized technical competitions, exhibitions and career development events at bachelor and postdoc levels.

EXTRA-CURRICULARS

Practicing swing dances such as lindy hop & jazz roots since late 2018.

PERSONAL INFORMATION

Residence: Genoa, Italy (Work Permit) | Applied for long-term EU residency.