

# SANDESH G. BHAT, PH.D.

DrSGBhat.github.io

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Sandesh Bhat is a Ph.D. graduate from the Arizona State University currently working as a Research Fellow at Mayo Clinic. He has worked on many proposals with Dr. Sangram Redkar in the field of Dynamical systems, Prostheses, and Mechanical design. With his experience in working on new ideas and projects, he understands the efforts needed to bring an idea to fruition. His academic and professional details are as listed below:

## EDUCATION

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### **Doctor of Philosophy in Systems Engineering**

*January 2018 - May 2021*

Specialization in Robotics, Dynamics & Biomechanics

GPA: 4/4

Ira A. Fulton Schools of Engineering

Arizona State University, U.S.A.

### **Master of Science in Mechanical Engineering**

*August 2016 - December 2017*

Specialization in Robotics & Control

GPA: 3.44/4

Department of Mechanical and Aerospace Engineering

Arizona State University, U.S.A.

### **Bachelor of Engineering**

*August 2012 - May 2016*

Specialization in Mechanical Engineering

CGPA: 7.71/10

Department of Mechanical Engineering

University of Mumbai, India

## EXPERIENCE

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### **Post-Doctoral Research Fellow**

*May 2021 - present*

*Mayo Clinic*

- Post-Doctoral Research Fellow in the Orthopedics Department under Dr. Kenton R. Kaufman.

### **Graduate Teaching Assistant**

*August 2018 - December 2019*

*Arizona State University*

- Teaching Assistant for EGR 217 and EGR 343. Both courses revolved around Mechanics and Strength of Materials.
- Instructed and guided undergraduate students in Matlab, C and other computational programming languages for EGR 219: Computational Modelling of Engineering Systems.

### **Graduate Research Assistant**

*August 2017 - December 2018*

*Arizona State University*

- Worked in the Robotics, Dynamical Systems and Controls Group as a Ph.D. student under Dr. Sangram Redkar and Dr. Thomas Sugar.
- Designed and Developed a Passive Prosthetic Ankle under a Small Business Innovation Research grant.
- Worked on Universal Robots 5 and Baxter platforms and guided undergraduate students on the same.
- Worked on multiple proposals with Dr. Redkar.

### **Technical Intern**

*May 2017 - Dec 2018*

*NextGen Aeronautics*

*Unpaid Volunteer*

- Tested a new motion capture system against the state of the art.
- Gained operational experience with a variety of motion capture systems.

### **Control System Modelling and Simulation Engineer**

*September 2016 - June 2017*

*AZLoop*

*Hyperloop Competition Team*

- Led the Control System Modelling and Simulation sub-team of 8 engineers at AZLoop for the SpaceX Hyperloop Competition.

- Worked on the levitation system control modelling and simulation.

## PROJECTS

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<b>Upper Extremity Exoskeleton</b>	2021
· Project ongoing with the Mayo Clinic.	
<b>Invariant Manifolds in Human Walking Gait</b>	2019
· Worked on proving the existence of invariant manifolds in human walking data and its various applications. Used dynamical system theory, Lypunov-Floquet theory, and invariant manifold theory.	
<b>Mechanical Design of an Elbow Exoskeleton</b>	2019
· Designed the mechanism for an elbow exoskeleton using Bowden cables. Prototyped the said design and conducted tests to judge it's efficacy.	
<b>Periodic Force Applied to the Hip During Normal Human Gait</b>	2018
· Applied a periodic force to the hip of several test subjects during normal gait. Collected various kinematic, kinetic, and physiological data for analysis to prove the effectiveness of such a force in reducing metabolic cost.	
<b>Topology Optimization of Automotive Lower Control Arm</b>	2018
· Designed a lower control arm for automobile suspension. Optimized the design using Nastran-Patran to reduce the amount of mass and material used in manufacturing. Compared the design to a generic control arm.	
<b>Application of Genetic Algorithm and Various Optimization Routines</b>	2018
· Utilized the Genetic algorithm and various constrained and non constrained optimization routines to optimize the parameters for a curve fitting technique.	
<b>Development of an IMU Based Motion Capture System</b>	2017-18
· Aided the development of an IMU based motion capture system. Tested and validated the system comparing it to various other optical, IMU, and magnetic motion capture systems.	
<b>Design/Development of a Passive Prosthetic Ankle</b>	2017
· Designed a passive prosthetic ankle using coil springs in place of the Tibialis-Anterior and Gastrocnemius muscle groups. Developed a testing jig for healthy human subjects to wear the prosthesis and conducted various experiments.	
<b>Hyper-loop Control System modelling and Simulations</b>	2017
· Designed the control system for the levitation system for a hyper-loop competition team. Modelled the control system on Simulink and Matlab for simulation purposes.	

## ORGANIZATIONAL POSITIONS

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<b>Director of Outreach</b>	August 2020 - April 2021
<i>Graduate and Professional Student Association</i>	<i>Arizona State University</i>
· Organized events on the Polytechnic campus for the Graduate student body.	
· Acted as a point of communication for the campus administration and the student body.	
<b>Engineering Assembly member</b>	August 2019 - May 2020
<i>Graduate and Professional Student Association</i>	<i>Arizona State University</i>
· Elected Assembly member for The Polytechnic School.	
· Served in the Engineering Committee and the Special Projects Committee.	
<b>Student President</b>	August 2015 - May 2016
<i>Mechanical Engineering Students Association</i>	<i>Mumbai University affiliated college</i>

- Handled the day-to-day operations of the association.
- Spearheaded a 2-tier team of 30 people to successfully conduct professional shows, exhibitions and talks for Yantram 2016 (a technical event).
- Organised event related to technical and professional advancement.

#### **Treasurer**

*Mechanical Engineering Students Association*

August 2014 - May 2015

*Mumbai University affiliated college*

- Handled the monetary operations and the budgeting for the association.

### **SKILLS**

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**Programming Skills** (Matlab and Simulink, Python, C, C++, ROS, XML scripts, etc)

**CAD/CAM** (SolidWorks, Fusion 360, ProE.)

**Operation of various Manipulator Arms** (Baxter Dual-Arm Robot, UR5, Dobot Magician and self-built arm.)

**Bio-mechanical Analysis** (Open-Sim, Biomechanics toolkit.)

**Motion Capture and Data Analysis** (Vicon, Optitrack, IMU based systems.)

**Embedded Systems**

**Fabrication of Various Devices**

### **PUBLICATIONS**

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**Dynamical Systems Theory and its Application to Human Gait Analysis**

**Sandesh G Bhat.**

Ph.D. Dissertation, Arizona State University.

**Application of Floquet Theory to Human Gait Kinematics and Dynamics.**

**Sandesh G. Bhat,** Susheelkumar C Subramanian, Thomas G. Sugar, Sangram Redkar.

Journal of Mechanisms & Robotics.

**Reconstruction Of Ground Reaction Force Data Using Lyapunov Floquet Theory And Invariant Manifold Theory.**

**Sandesh G. Bhat,** Thomas G. Sugar, Sangram Redkar.

ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.

**Invariant Manifolds In Human Joint Angle Analysis During Walking Gait.**

**Sandesh G. Bhat,** Thomas G. Sugar, Sangram Redkar.

ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.

**Design and Analysis of an Auto-Parametrically Excited Platform for Active Vibration Control.**

Thao Le, **Sandesh G Bhat,** Susheelkumar C Subramanian, Peter MB Waswa, Sangram Redkar.

ASME 2019 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.

**Analysis of a periodic force applied to the trunk to assist walking gait.**

**Sandesh G Bhat,** Susheelkumar Cherangara, Jason Olson, Sangram Redkar, Thomas G. Sugar.

2019 Wearable Robotics Association Conference.

**Volitional control of an active prosthetic ankle: a survey.**

**Sandesh G Bhat,** Sangram Redkar.

International Robotics and Automation Journal 2018.

**Design and Development of an Unmanned Underwater Vehicle (UUV) in the Form of a Cuttlefish.**

Susheelkumar Cherangara Subramanian, Thao Le, Jason Olson, **Sandesh G Bhat,** Sangram Redkar.

ASME 2018 International Mechanical Engineering Congress and Exposition.

**Development of a Passive Prosthetic Ankle With Slope Adapting Capabilities**

**Sandesh G Bhat,** Sangram Redkar, Thomas G Sugar.

ASME 2018 International Mechanical Engineering Congress and Exposition.

**Design and Development of a Passive Prosthetic Ankle**

**Sandesh G Bhat.**

Master of Science Theses, Arizona State University.