SANDESH G. BHAT, PH.D.

DrSGBhat.github.io
Rochester, MN
480-410-9626 ⋄ mr.sandesh.bhat@gmail.com

Experienced researcher with a proven track record of driving innovative projects and leading multidisciplinary teams in biomechanics and robotics. Adept at translating complex concepts into practical solutions, contributing to advancements that shape the forefront of human motion analysis and biomechanics.

1. PRESENT ACADEMIC RANK AND POSITION

Assistant Professor of Biomedical Engineering Dec 2024 - present
Department of Physiology and Biomedical Engineering, Mayo Clinic, Rochester, MN

- Appointed to the rank of Assistant Professor in recognition of my research, teaching, and scholarly contributions.

Senior Research Fellow July 2023 - present
Motion Analysis Laboratory, Mayo Clinic, Rochester, MN

- Sustained active involvement in pioneering research within the dynamic intersection of biomechanics and robotics.
- Acquired valuable grant writing experience through collaboration with Dr. Kenton Kaufman and Dr. Alexander Shin.
- Actively participated in the submission of research proposals to prestigious institutions including NIH, NSF, DoD, and various foundations, demonstrating a strong command of the grant application process.

2. EDUCATION

Arizona State University, Tempe, AZ 2021
Doctor of Philosophy GPA: 4/4
Systems Engineering

Arizona State University, Tempe, AZ 2017
Master of Science GPA: 3.44/4
Mechanical Engineering

University of Mumbai, Mumbai, India 2016
Bachelor of Engineering CGPA: 7.71/10
Mechanical Engineering

3. HONORS/AWARDS

Finalist, Jennifer Jowsey Research Fellow Award 2024
Department of Orthopedic Surgery, Mayo Clinic *Rochester, MN, U.S.A.*

- Ranked top 3 for my research article "Enhanced Function Using a Powered Upper Extremity Exoskeleton in Patients with Brachial Plexus Injuries" within the Department of Orthopedic Surgery.

Kelly Research Fellowship 2023-24
Department of Orthopedic Surgery, Mayo Clinic *Rochester, MN, U.S.A.*

- Received a merit-based endowed fellowship ($60000) for the project "Real World Data Based Surgical and Rehabilitation Outcome Measures".

Finalist, Jennifer Jowsey Research Fellow Award 2023
Department of Orthopedic Surgery, Mayo Clinic *Rochester, MN, U.S.A.*

- Ranked top 3 for my research article "Voluntary Control of Gracilis Free Functioning Muscle Transfer for Elbow Flexion: Spinal Accessory vs. Intercostal Nerve" within the Department of Orthopedic Surgery.

Julian M. Bruner Award 2023
American Society for Surgery of the Hand *Toronto, Canada*

· Received the award for outstanding poster on "Voluntary neuromuscular control of the Gracilis free functioning muscle transfer for elbow flexion: Spinal Accessory Nerve vs. Intercostal Nerve"

Outstanding Abstract and Poster 2023
Department of Physiology and Biomedical Engineering, Mayo Clinic *Rochester, MN, U.S.A.*

· Received the award for outstanding abstract and poster on "Design and development of a powered elbow exoskeleton for neuromuscular injuries".

Clinical Bio-mechanics Award 2022
North American Congress on Bio-mechanics *Ottawa, Canada*

· Received the award for outstanding new biomechanics research targeting a contemporary clinical problem on "Characterization of elbow flexion recovery following surgery for traumatic brachial plexus injury".

4. PREVIOUS PROFESSIONAL POSITIONS

Research Fellow 2021 - 2023
Motion Analysis Laboratory, Mayo Clinic, Rochester, MN

· Acquired valuable research exposure under the guidance of Dr. Kenton Kaufman in the Motion Analysis Laboratory.
· Developed proficiency in the execution of clinical trials.
· Assisted in data collection, analysis, and interpretation, fostering a deeper understanding of biomechanics and motion analysis techniques.

Graduate Teaching Assistant 2019
Arizona State University, Mesa, AZ

· Provided valuable support to instructors and students in the Mechanics and Strength of Materials courses (EGR 217 and EGR 343).
· Assisted in leading lectures, facilitating discussions, and conducting hands-on lab sessions.
· Graded assignments and exams, providing constructive feedback to enhance student understanding.

Graduate Teaching Assistant-Instructor of Record 2018 - 2019
Arizona State University, Mesa, AZ

· Taught the Computational Modelling of Engineering Systems course (course code: EGR 219).
· Guided undergraduate students through the complexities of Matlab, C, and other computational programming languages.
· Developed engaging lectures, assignments, and projects to foster a comprehensive understanding of the subject matter.
· Supported student learning by providing one-on-one assistance and constructive critique on coding practices.

Graduate Research Assistant 2017 - 2018
Arizona State University, Mesa, AZ

· Collaborated closely with Dr. Sangram Redkar and Dr. Thomas Sugar in the field of robotics and dynamical systems as a dedicated Ph.D. student.
· Successfully conceptualized, designed, and executed a Passive Prosthetic Ankle project funded by a Small Business Innovation Research Grant.
· Performing well and contributing to the development of projects on the Universal Robots 5 and Baxter platforms.
· Demonstrated leadership by mentoring and guiding undergraduate students in their work involving Universal Robots 5 and Baxter platforms.
· Actively participated in proposal development alongside Dr. Redkar, participating in the creation of multiple proposals aimed at advancing research in the field.

Engineering Intern 2017 - 2018
NextGen Aeronautics, Torrance, CA

· Tested a new markerless motion capture system and compared it with popular motion capture systems.
· Gained operational experience with a variety of motion capture systems.

5. SERVICE

A. COMMUNITY MEMBERSHIPS AND SERVICES

Oraculi, Rochester, MN
Mentor 2021 - present

Alliance of Chicanos, Hispanics, and Latin Americans (ACHLA), Rochester, MN
Volunteer Mechanic 2023

B. PEER REVIEW

Ad hoc Reviewer

Archives of Rehabilitation Research and Clinical Translation	2025
PLOS ONE	2025
IEEE Transactions on Neural Systems and Rehabilitation Engineering	2024
Archives of Rehabilitation Research and Clinical Translation	2024
Annual Meeting of American Society of Biomechanics	2024
PLOS ONE	2024
International Conference on Robotics and Automation	2020
IEEE Robotics and Automation Letters	2020
International Conference on Intelligent Robots and Systems	2020

6. PROFESSIONAL MEMBERSHIPS AND SOCIETIES

American Society for Biomechanics (ASB)
Member 2023 - Present

Orthopedic Research Society (ORS)
Member 2023 - 2024

The American Society of Mechanical Engineers (ASME)
Member 2018 - 2021

7. EDUCATIONAL INTERESTS AND ACCOMPLISHMENTS

A. TEACHING

Musculoskeletal Research Conference Mar 2025
Featured Online Presenter, Department of Orthopedic Surgery *Mayo Clinic, Rochester, MN*

· Presented my research on the neuromuscular control, outcome measures, and assistive devices for the brachial plexus injury population.

Upper extremity neuromuscular control in the aging population Sept 2024
Guest Lecturer, The Katies for Aging Research and Equity (KARE) program *St. Catherine University, MN*

· Explored the application of biomechanics and the study of neuromuscular control in the elderly.

Musculoskeletal Research Conference Jan 2024
Featured Online Presenter, Department of Orthopedic Surgery *Mayo Clinic, Rochester, MN*

· Presented the applicability of at-home accelerometry as a diagnostic measure of limb use post surgery

Biomedical Applications of Engineering Principles Dec 2023
Guest Lecturer, Graduate School of Biomedical Engineering and Physiology *Mayo Clinic, Rochester, MN*

· Explored the basics of mechatronics engineering with possible applications to biomedical engineering

Engineering Mechanics Fundamentals (EGR 217)
Mechanics of Solid Materials (EGR 343) Fall 2019
3 credits: In person teaching assistant *Arizona State University, Mesa, AZ*

· Provided valuable support to instructors and students
· Assisted in leading lectures, facilitating discussions, and conducting hands-on lab sessions

· Graded assignments and exams, providing constructive feedback to enhance student understanding

Computational Modeling of Engineering Systems (EGR 219) Fall 2018 - Spring 2019
3 credits: Lecturer (In person and hybrid) *Arizona State University, Mesa, AZ*

· Guided undergraduate students through the complexities of Matlab, C, and other computational programming languages
· Developed engaging lectures, assignments, and projects to foster a comprehensive understanding of the subject matter
· Supported student learning by providing one-on-one assistance and constructive critique on coding practices

B. MENTORSHIP

Individual and Position	Timeframe	Outcomes
Ninow, Hadley (Summer Undergraduate Research Fellowship Student)	05/2024 - 08/2024	Conducted a scoping review on the patient reported outcomes currently used in clinical trials for elbow orthoses, focusing on their reliability and validity

8. INSTITUTIONAL/DEPARTMENTAL ADMINISTRATIVE RESPONSIBILITIES

Graduate and Professional Student Association, Arizona State University
Director of Outreach 2020 - 2021
Engineering Assembly member 2019 - 2020

Mechanical Engineering Students Association, University of Mumbai
Student President 2015 - 2016
Treasurer 2014 - 2015

9. PRESENTATIONS EXTRAMURAL

A. ORAL PRESENTATION
National/ International

Enhanced Functionality Using a Powered Upper Extremity Exoskeleton August 2024
2024 Military Health System Research Symposium
Kissimmee, FL

Improvement in function for patients with brachial plexus injuries using a powered elbow orthosis August 2024
American Society of Biomechanics 2024 Annual Meeting
Madison, WI

Stability analysis for the quantitative assessment of progressive supranuclear palsy affected gait August 2023
American Society of Biomechanics 2023 Annual Meeting
Knoxville, TN

Real-world evidence-based measurement of upper extremity activity June 2023
Gait and Clinical Movement Analysis Society 2023 Annual Meeting
High Point, NC

Invariant manifolds in human joint angle analysis during walking gait August 2020
2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference
Virtual Conference

Reconstruction of ground reaction force data using Lyapunov Floquet theory and invariant manifold theory August 2020
2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference
Virtual Conference

Development of a passive prosthetic ankle with slope adapting capabilities November 2018
2018 International Mechanical Engineering Congress and Exposition

Pittsburgh, PA

Design and development of an unmanned underwater vehicle (UUV) in the form of a cuttlefish — November 2018
2018 International Mechanical Engineering Congress and Exposition
Pittsburgh, PA

B. POSTER PRESENTATION
National/ International

Voluntary neuromuscular control of gracilis free functioning muscle transfer for elbow flexion: Spinal Accessory Nerve vs Intercostal Nerve — February 2024
Orthopedic Research Society 2024 Annual Meeting
Long Beach, CA

Design and development of a powered elbow exoskeleton for neuromuscular injuries — August 2023
2023 Military Health System Research Symposium
Kissimmee, FL

Analysis of a periodic force applied to the trunk to assist walking gait — March 2019
2019 Wearable Robotics Association Conference
Scottsdale, AZ

10. RESEARCH INTERESTS

Robotic Prosthetics/Orthotics
Biomechanical Robot Design
Rehabilitation Science
Upper Extremity Function Enhancement
Translational Biomechanics
Application of Nonlinear dynamics to gait and balance

11. RESEARCH GRANTS AWARDED

A. COMPLETED GRANTS
Federal

Responsibility	Grant title	Active date
Postdoctoral Research Fellow	Myoelectrically-Controlled Power-Assist Upper-Extremity Exoskeleton. Funded by U.S. Army Medical Research Acquisition Activity. (W81XWH-20-1-0923)	09/2020 - 06/2024

B. ONGOING GRANTS
Federal

Responsibility	Grant title	Active date
Postdoctoral Research Fellow (IPA)	Intraoperative Optimization and Validation of Musculoskeletal Reconstruction. Funded by the U.S. Department of Veterans Affairs (RX-002462-01-A1)	09/2024 - 06/2025

12. BIBLIOGRAPHY

Shared first authorship is marked by *, Mentored articles and mentees are marked by #

A. PEER REVIEWED ARTICLES

1. Kumar R, Hamouda AM, Pennington Z, Astudillo MD, Shafi M, Hallak H, **Bhat SG**, Rezaei A, Jusué-Torres I, Graff-Radford J, Jones DT, Botha H, Cutsforth-Gregory JK, Ali F, Cogswell PM, Kaufman KR, Elder BD. Evaluating longitudinal changes of gait parameters following shunt placement in patients with idiopathic normal pressure hydrocephalus. Journal of Neurosurgery. 2025 (in-press)

2. **Bhat SG***, Miller EJ*, Kane PH, Hollander K, Vignola C, Shin AY, Sugar TG, Kaufman KR. Enhanced functionality using a powered upper extremity exoskeleton in patients with brachial plexus injuries. IEEE Transactions on Neural Systems and Rehabilitation Engineering. 2025 Feb 13 vol. 33, pp. 780-786

3. Miller EJ, **Bhat SG**, Kane PH, Shin AY, Kaufman KR. Myoelectric performance of the reconstructed elbow flexor in patients with brachial plexus injuries. Journal of Electromyography and Kinesiology. 2024 Nov 9:102944.

4. Rezaei A, **Bhat SG**, Cheng CH, Pignolo RJ, Lu L, Kaufman KR. Age-related Changes in Gait, Balance, and Strength Parameters: A Cross-sectional Study. PLoS ONE. 2024 Oct; 19(10): e0310764.
5. **Bhat SG**, Kaufman KR. Dynamical systems theory applied to short walking trials. Journal of Biomechanics. 2024 Sep 21:112331.
6. Vignola C*, **Bhat SG***, Hollander K, Kane P, Miller E, Martin WB, Shin AY, Sugar TG, Kaufman KR. Design and Development of a Powered Myoelectric Elbow Orthosis for Neuromuscular Injuries. Military Medicine. 2024 Sep;189(Supplement 3):585-91.
7. **Bhat SG**, Shin AY, Kaufman KR. Upper extremity asymmetry due to nerve injuries or central neurologic conditions: a scoping review. Journal of neuroengineering and rehabilitation. 2023 Nov 9;20(1):151.
8. **Bhat SG**, Miller EJ, Shin AY, Kaufman KR. Muscle activation for targeted elbow force production following surgical reconstruction in adults with brachial plexus injury. Journal of Orthopaedic Research®. 2023 Sep;41(9):2032-9.
9. **Bhat SG**, Noonan EJ, Mess G, Miller EJ, Shin AY, Kaufman KR. Characterization of elbow flexion torque after nerve reconstruction of patients with traumatic brachial plexus injury. Clinical Biomechanics. 2023 Apr 1;104:105951.
10. **Bhat SG**, Subramanian SC, Redkar S. Order reduction of nonlinear quasi-periodic systems subjected to external excitations. International Journal of Non-Linear Mechanics. 2022 Jun 1;142:103994.
11. Subramanian SC, **Bhat SG**, Redkar S. Applications of symbolically computed Lyapunov-Floquet transformation. International Journal of Nonlinear Dynamics and Control. 2022;2(2):97-115.
12. **Bhat SG**, Subramanian SC, Sugar TS, Redkar S. Application of Floquet theory to human gait kinematics and dynamics. Journal of Mechanisms and Robotics. 2021 Dec 1;13(6):061003.
13. **Bhat SG**, Sugar TG, Redkar S. Invariant manifolds in human joint angle analysis during walking gait. In International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2020 Aug 17 (Vol. 83914, p. V002T02A031). American Society of Mechanical Engineers.
14. **Bhat SG**, Sugar TG, Redkar S. Reconstruction of ground reaction force data using Lyapunov Floquet theory and invariant manifold theory. In International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2020 Aug 17 (Vol. 83990, p. V010T10A047). American Society of Mechanical Engineers.
15. Le T, **Bhat SG**, Subramanian SC, Waswa PM, Redkar S. Design and analysis of an auto-parametrically excited platform for active vibration control. In International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2019 Aug 18 (Vol. 59261, p. V006T09A046). American Society of Mechanical Engineers.
16. **Bhat SG**, Cherangara S, Olson J, Redkar S, Sugar TG. Analysis of a periodic force applied to the trunk to assist walking gait. In 2019 Wearable Robotics Association Conference (WearRAcon) 2019 Mar 25 (pp. 68-73). IEEE.
17. **Bhat SG**, Redkar S, Sugar TG. Development of a passive prosthetic ankle with slope adapting capabilities. In ASME International Mechanical Engineering Congress and Exposition 2018 Nov 9 (Vol. 52026, p. V003T04A018). American Society of Mechanical Engineers.
18. Cherangara Subramanian S, Le T, Olson J, **Bhat SG**, Redkar S. Design and Development of an Unmanned Underwater Vehicle (UUV) in the Form of a Cuttlefish. In ASME International Mechanical Engineering Congress and Exposition 2018 Nov 9 (Vol. 52040, p. V04BT06A020). American Society of Mechanical Engineers.
19. **Bhat SG**, Redkar S. Volitional control of an active prosthetic ankle: a survey. International Robotics and Automation Journal. 2018 Nov 27;4:380-8.

B. ABSTRACTS

1. **Bhat SG**, Shin AY, Kaufman KR. Voluntary neuromuscular control of gracilis free functioning muscle transfer for elbow flexion: spinal accessory nerve vs intercostal nerve. In Orthopedic Research Society 2024 Annual Meeting, February 2024, Long Beach, CA; Paper No. 1166

2. **Bhat SG**, Shin AY, Kaufman KR. Voluntary neuromuscular control of gracilis free functioning muscle transfer for elbow flexion: spinal accessory nerve vs intercostal nerve. In Scientific ePoster Abstract Book, American Society for Surgery of the Hand, October 2023, Toronto, Canada; p 42, ePoster 20
3. **Bhat SG**, Ali F, Hogen CA, Josephs KA, Whitwell J, Kaufman KR. Stability analysis for quantitative assessment of progressive supranuclear palsy affected gait. In Orals Part 1, American Society of Biomechanics, August 2023, Knoxville, TN; p 5.
4. Noonan EJ, **Bhat SG**, Mess G, Miller EJ, Kane P, Shin AY, Kaufman KR. Characterization of elbow flexion recovery following surgery for traumatic brachial plexus injury. In North American Congress on Biomechanics, August 2022, Ottawa, Canada; Winner of Clinical Biomechanics Award.
5. **Bhat SG**, Shin AY, Kaufman KR. Real-world evidence of upper extremity asymmetry. In North American Congress on Biomechanics, August 2022, Ottawa, Canada; Poster P1-189

C. THESIS

1. **Bhat SG**. Dynamical Systems Theory and its Application to Human Gait Analysis. Doctoral dissertation, Arizona State University; 2021.
2. **Bhat SG**. Design and Development of a Passive Prosthetic Ankle. Master's Thesis, Arizona State University; 2017.

13. SOCIETAL AND POLICY IMPACTS

1. Taylor Nicioli, CNN
   How long can you stand like a flamingo? The answer may reflect your age, new study says.
   https://edition.cnn.com/2024/10/23/health/balance-one-leg-old-age-wellness/index.html.
   Study cited: https://doi.org/10.1371/journal.pone.0310764
   Similar news articles appeared on over 300 news outlets (including the Washington Post, Al Jazeera, MSN Health, WebMD, and Dr. Radio on SiriusXM) internationally