Keya Ghonasgi

POSTDOCTORAL FELLOW | GEORGIA INSTITUTE OF TECHNOLOGY
keya.g@gatech.edu | www.keyaghonasgi.com

Research Interests

Human-robot interaction, motor control & learning, intelligent robot control, robot-based training & rehabilitation.

Education

Ph.D. in Mechanical Engineering *Aug. 2018 – Aug. 2023*
The University of Texas at Austin, Advisor: Dr. Ashish Deshpande Austin, TX
Dissertation: *Practice Makes Perfect: Leveraging Exoskeleton Interactions To Elucidate The Motor Learning Process*

M.S. in Mechanical Engineering, Robotics and Controls *Aug. 2016 – Jan. 2018*
Columbia University, Advisor: Dr. Sunil Agrawal New York City, New York
Thesis: *Walking With a Weighted Pelvic Belt Versus an Equivalent Pure Downward Force on the Pelvis*

B.E. in Mechanical Engineering, M.S. in Mathematics *July 2011 – July 2016*
Birla Institute of Technology and Science - Pilani, Advisors: Dr. P. Seshu, Dr. Anirban Guha Goa, India
Thesis: *Bipedal Walking Robots*, thesis advisors:

Recent Experience

Postdoctoral Fellow *Sept. 2023 – Present*
EPIC lab, Georgia Institute of Technology | PI: Aaron Young Atlanta, GA
- Lower-limb exoskeleton control: Mechanical design & control, haptic biofeedback, musculoskeletal modeling
- Inverse Reinforcement Learning: Reinforcement learning, data analysis, human behavior modeling
- Evaluating Gait Behaviors in Chronic Stroke Population: Clinical assessments, experiment design

Graduate Research Assistant *Aug. 2018 – Aug. 2023*
ReNeu Robotics lab, The University of Texas at Austin | Advisor: Ashish Deshpande Austin, TX
- Motor Control and Training Using an Upper-Limb Exoskeleton[J1, C1, C2, C6]: Human and robot kinematics and dynamics, force control, virtual reality
- Human Behavior Characterization[C3, C4, C11]: EMG biosignal processing, time-series signal analysis
- Human-Robot Interaction Interface Design[J2, C5, C9]: Mechanical design, human system identification, force-sensitive resistors

Research Scientist Intern, Part-time Student Researcher *May 2022 – Nov. 2022*
Meta Reality Labs | Manager: Sonny Chan Redmond, WA
- Virtual Interaction Characterization: Virtual reality, EMG biosignal processing, statistical analysis

Teaching Assistant *Fall 2018, Spring 2019, Spring 2020*
The University of Texas at Austin Austin, TX
- Mechanical Engineering Senior Design: Guiding undergraduate teams in the completion of their capstone project
- Materials Lab: Teaching undergraduate experiments on material property analyses

Summer Intern *May 2018 – July 2018*
Intel, Packaging R&D | Manager: Pramod Malatkar Chandler, AZ
- Ultrasonic die crack detection: acoustic detection methods, data analysis and clustering

Graduate Research Assistant *January 2017 – December 2017*
ROAR Lab, Columbia University | Advisor: Sunil Agrawal New York City, NY
- Pelvic exoskeleton control[J3, J4]: Experimental design and analysis, healthy and impaired (cerebral palsy) gait

Fellowships, Honors, and Awards

Best Lightning Presentation- College of Engineering *Fall 2023*
Invited presentation as part of Georgia Tech's Postdoctoral Research Symposium.

Caltech Young Investigators Lecturer *Spring 2023*
Invited seminar as part of Caltech's YILS showcasing outstanding early career research.

University Graduate Continuing Fellowship *Academic year 2022-23*
Financial support for the academic year awarded by the University of Texas at Austin.

Rising Star in Mechanical Engineering 2022 at Stanford University *October 2022*
Selected to attend the workshop for women interested in a career in academia.

Best Student Poster - Coursework *April 2019*
Awarded for a joint poster presentation at the university-wide CARE Day 2019.

Professional Development Award *Fall 2019 & Fall 2022*
Travel grants awarded by the UT Austin graduate school to attend RO-MAN 2019 and IROS 2022.

Invited Talks

Arizona State University | Host: Arts, media & Engineering Department *April, 2024*
Intelligent Wearable Systems for Synergistic Human-Robot Interactions

University of Southern California | Host: Aerospace and Mechanical Engineering Department *March, 2024*
Intelligent Wearable Systems for Synergistic Human-Robot Interactions

University of Massachusetts, Amherst | Host: Mechanical and Industrial Engineering Department *February, 2024*
Intelligent Wearable Systems for Synergistic Human-Robot Interactions

Rice University | Host: Mechanical Engineering Department *January, 2024*
Intelligent Wearable Systems for Synergistic Human-Robot Interactions

Tufts University | Host: Mechanical Engineering Department *January, 2024*
Intelligent Wearable Systems for Synergistic Human-Robot Interactions

Georgia Institute of Technology | Host: ATLNeuromechanics *December, 2023*
Practice Makes Perfect: Leveraging Exoskeleton Interactions To Elucidate The Motor Learning Process

Columbia University | Host: Robotics and Rehabilitation (RoAR) Lab, Dr. Sunil Agrawal *August, 2023*
Engineering Intelligent Physical Human-Robot Interactions

California Institute of Technology | Host: CalTech YILS, Dr. Aaron Ames *April, 2023*
Exoskeleton-Based Training for Novel Motor Skill Acquisition

New York University | Host: ECE Department, Dr. S. Farokh Atashzar *March, 2023*
Engineering Intelligent Physical Human-Robot Interactions

Georgia Institute of Technology | Host: EPIC Lab, Dr. Aaron Young *March, 2023*
Engineering Intelligent Physical Human-Robot Interactions

Publications

Peer-reviewed Journal Articles

[J1] **Keya Ghonasgi**, Reuth Mirsky, Nisha Bhargava, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Kinematic Coordinations Capture Learning During Human-Exoskeleton Interaction. *Scientific Reports* 13, 10322, 2023.

[J2] **Keya Ghonasgi***, Saad N. Yousaf*, Paria Esmatloo, and Ashish D. Deshpande. A Modular Design for Distributed Measurement of Human-Robot Interaction Forces in Wearable Devices. *Sensors*, 2021, 21(4), 1445.

[J3] Jiyeon Kang, **Keya Ghonasgi**, Conor J Walsh, and Sunil K Agrawal Simulating Hemiparetic Gait in Healthy Subjects Using TPAD With a Closed-Loop Controller. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 2019, 27(5), 974-983.

[J4] **Keya Ghonasgi**, Jiyeon Kang, and Sunil K. Agrawal. Walking With a Weighted Pelvic Belt or With an Equivalent Pure Downward Force on the Pelvis: Are These Different? *IEEE Robotics and Automation Letters*, 2018, 4(2), 309-314.

Peer-reviewed Conference Articles

[C1] **Keya Ghonasgi**, Reuth Mirsky, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. A Novel Control Law for Multi-joint Human-Robot Interaction Tasks While Maintaining Postural Coordination. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

[C2] **Keya Ghonasgi**, Reuth Mirsky, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Quantifying Changes in Kinematic Behavior of A Human-Exoskeleton Interactive System. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022.

[C3] Paria Esmatloo, **Keya Ghonasgi**, Raymond King, and Ashish D. Deshpande. Dynamic Finger Task Identification Using Electromyography. *IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, 2022.

[C4] Rhet O Hailey, Ana C De Oliveira, **Keya Ghonasgi**, Bob Whitford, Robert K. Lee, Chad G. Rose, and Ashish D. Deshpande. Impact of Gravity Compensation on Upper Extremity Movements in Harmony Exoskeleton. *International Conference on Rehabilitation Robotics (ICORR)*, 2022.

[C5] Saad Yousaf, **Keya Ghonasgi**, Paria Esmatloo, and Ashish D. Deshpande. Human-Robot Interaction: Muscle Activation and Angular Location Affect Soft Tissue Stiffness *IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, 2022.

[C6] **Keya Ghonasgi**, Reuth Mirsky, Sanmit Narvekar, Bharath Masetty, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Capturing Skill State in Curriculum Learning for Human Skill Acquisition. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021, pp. 771-776.

[C7] Saad N. Yousaf, **Keya Ghonasgi**, Paria Esmatloo, and Ashish D. Deshpande. An Actuated Indenter for Characterization of Soft Tissue Towards Human-Centered Design. *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, 2021, pp. 1243-1248.

[C8] Saad N. Yousaf, Paria Esmatloo, **Keya Ghonasgi**, and Ashish D. Deshpande. A Method for the Analysis of Physical Human Robot Interaction. *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, 2021, pp. 1249-1254.

[C9] **Keya Ghonasgi**, Chad G. Rose, Ana C. De Oliveira, Rohit John Varghese, and Ashish D. Deshpande. Design and Validation of a Novel Exoskeleton Hand Interface: The Eminence Grip. *IEEE International Conference on Robotics and Automation (ICRA)*, 2021, pp. 3707-3713.

[C10] Stefano Dalla Gasperina, **Keya Ghonasgi**, Ana C. de Oliveira, Marta Gandolla, Alessandra Pedrocchi, and Ashish D. Deshpande. A Novel Inverse Kinematics Method for Upper-Limb Exoskeleton Under Joint Coordination Constraints. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020, pp. 3404-3409.

[C11] **Keya Ghonasgi**, Ana C. de Oliveira, Anna Shafer, Chad G. Rose, and Ashish D. Deshpande. Estimating the Effect of Robotic Intervention on Elbow Joint Motion. *IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*, 2019, pp. 1-6.

[C12] **Keya Ghonasgi**, Jiyeon Kang, and Sunil K. Agrawal. Walking With a Weighted Pelvic Belt or With an Equivalent Pure Downward Force on the Pelvis: Are These Different? *IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*, 2018, pp. 318-323.

[C13] **Keya Ghonasgi**, Kalpit Bakal, and Kiran D. mali. A Parametric Study on Free Vibration of Multi-perforated Rectangular Plates *Procedia Engineering*: 144, 2016 60-67.

Symposia & Workshop Extended Abstracts

[W1] **Keya Ghonasgi** and Aaron Young. Quantifying Personalized Intervnal Rewards During Exoskeleton-Assisted Walking Using Inverse Reinforcement Learning. American Society of Biomechanics 2024 meeting (Poster).

[W2] **Keya Ghonasgi**, Reuth Mirsky, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. The Role of Evaluation Environments in the Assessment of Human Behavior During Robot Interactions. 5th workshop on Ergonomic Human-Robot Collaboration: How Cognitive and Physical Aspects Come Together, IEEE IROS 2022 (Poster and demo).

[W3] **Keya Ghonasgi**, Reuth Mirsky, Sanmit Narvekar, Bharath Masetty, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Reach ninja: A Test-bed for Curriculum Learning for Motor Skill Acquisition. International Joint Conference on Artificial Intelligence, 2021 (Presentation and demo). [Game Demo] [Video]

[W4] **Keya Ghonasgi**, Reuth Mirsky, Bharath Masetty, Sanmit Narvekar, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Leveraging Reinforcement Learning for Human Motor Skill Acquisition. Workshop on Social AI for Human-Robot Interaction of Human-care Service Robots, IEEE IROS 2020 (Presentation).

[W5] **Keya Ghonasgi**, Saad N. Yousaf, Paria Esmatloo, and Ashish D. Deshpande. Design and Validation of a Sensorized Physical Human-Robot Interface for Distributed Force Measurements. 3rd Workshop on Ergonomic Human-Robot Collaboration: Opportunities and Challenges, IEEE IROS 2020 (Presentation).

[W6] **Keya Ghonasgi**, Reuth Mirsky, Bharath Masetty, Sanmit Narvekar, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande. Leveraging Reinforcement Learning for Human Motor Skill Acquisition. 13th International Workshop on Human Friendly Robotics, 2020 (Presentation).

Videos and Demos

- A Novel Control Law for Multi-Joint Human-Robot Interaction Tasks While Maintaining Postural Coordination
  IROS2023: Talk
- Kinematic Coordinations Capture Learning During Human-Exoskeleton Interaction
  Scientific Reports 2023: Supp. Video
- Kendama and the Harmony Exoskeleton
  IROS2022: Demo
- Quantifying Changes in Kinematic Behavior of a Human-Exoskeleton Interactive System
  IROS2022: Supp. Video | Talk
- Capturing Skill State in Curriculum Learning for Human Skill Acquisition
  IROS 2021: Supp. Video
- Design and Validation of a Novel Exoskeleton Hand Interface: The Eminence Grip
  ICRA2021: Supp. Video
- A Novel Inverse Kinematics Method for Upper-Limb Exoskeleton Under Joint Coordination Constraints
  IROS2020: Supp. Video
- Reach ninja: A Test-bed for Curriculum Learning for Motor Skill Acquisition
  IJCAI2021: Game Demo | Talk
- Towards Leveraging Reinforcement Learning for Human Motor Skill Acquisition
  HFR2020: Talk

Technical Skills

Software: Matlab/Simulink, LabView, SolidWorks, Unity, Unreal Engine, OpenSim, Motive and Vicon
Programming Languages: Matlab, Python, Javascript, C++, C#

Funding Experience

- **Curriculum Learning for Robot-mediated Training of Novel Motor Tasks.**
  Google Brain academic partnership grant (2022), PI: Ashish D. Deshpande.
  Contribution: Proposal conceptualization and writing based on Ph.D. thesis.
- **Reinforcement Learning for Motor Training Curriculum Design with Robot Exoskeletons.**
  NSF Award# 2019704 (2019), PI: Ashish D. Deshpande and Peter H. Stone.
  Contribution: Validation experiments, pilot data collection and analysis, figure generation.

Teaching Experience

- **Teaching Assistant for Mechanical Engineering Senior Design, UT Austin**: Undergraduate level, TA rating 4.6/5
  ME 266K | Dr. Richard H. Crawford | Spring 2019, Spring 2020
  Managed a total of 16 design teams across 2 semesters.
- **Teaching Assistant for Materials Engineering Lab, UT Austin**: Undergraduate level, TA rating 4.7/5
  ME 134L | Dr. Desiderio Kovar | Fall 2018
  Guided lab work including tensile tests, use of phase diagrams, and microscopy for micro-structural analysis.
- **Course Assistant for Modeling and Identification of Dynamic Systems, Columbia University**: Graduate level
  ME 4439 | Dr. Nicolas W. Chbat | Fall 2017
  Conducted office hours and homework evaluations for Matlab-based modeling assignments for 10 students.
- **Course Assistant for Digital Manufacturing, Columbia University**: Undergraduate level
  ME 4606 | Dr. Hod Lipson | Spring 2017
  Taught students to use various digital manufacturing devices including laser cutter, 3D printer, and mills.
  Assisted teams with the semester-long food 3D printing project.
- **Professional Assistant for Machine Design and Drawing, BITS-Pilani, Goa campus**: Undergraduate level
  MDD | Dr. D.M. Kulkarni | Spring 2015
  Assisted in running computer lab sessions for mechanical design with Pro-Engineering (Pro-E) CAD software.

Mentorship Experience

- **Alex Khair** (Graduate student, the University of Texas at Austin)
  Technical training, Harmony exoskeleton.
  Conducting human subject experiments, study design, data analysis.
- **Nisha Bhargava** (Undergraduate intern, Carnegie Melon University)
  Summer 2022 undergraduate internship
  Conducting human subject experiments with the Harmony exoskeleton.
- **Kanishka Mitra** (Undergraduate and graduate student, the University of Texas at Austin)
  Technical training, Harmony exoskeleton.
  Introduction to research processes and writing, experiment design.
- **Saad Yousaf** (Graduate student, the University of Texas at Austin)
  Designing ergonomic interfaces for human-exoskeleton interaction.
  Research ideation, collaborative project.
- **Instrumented Kendama Senior Design Team** (Undergraduate students, Spring 2020)
  Team members: Morgan Cook, Matthew Rizzolo, Reese Roehrig, Tucker Roerner.
  Co-sponsored and mentored a senior design team to sensorize a 3D-printed Kendama (independent of T.A. responsibilities).
- **Karma Desai** (High school student, Liberal Arts & Science Academy, Austin, Texas)
  Designing ergonomic interfaces for human-exoskeleton interaction: Sensorized cuff design.
  Research aptitude, summer

Research Service

- Associate Editor, International Conference on Biomedical Robotics and Biomechatronics (BioRob 2024)
- Program Committee Member, International Symposium on Technological Advancements in Human-Robot Interaction (TAHRI 2024)
- Session Chair (filling in for Dr. Ashish Deshpande), Human Estimation and Pose session at IEEE IROS 2023.
- Session Chair, Medical Robots and Systems I session at IEEE IROS 2021.
- Peer-review:
  - Journals: RA-L (2018, 2021, 2022, 2023, 2024), THRI (2022), TNSRE (2023, 2024).
  - Conferences: ICRA (2021, 2022, 2023, 2024), IROS (2022, 2023).
  - Workshops: Human-Friendly Robotics (2022).

Volunteer and Outreach Service

- **Texas Robotics Graduate Students Organization** (Co-founder and President 2021-22, Vice President 2022-23): Led a team of graduate students in organizing community-building professional and social events for graduate students affiliated with the Texas Robotics partnership at the University of Texas at Austin.
- **Explore UT 2019 and Girl Day 2019, Girl Day 2023 at the University of Texas at Austin**: Demonstrated the design and application of robots to encourage K-12 students, especially girls, to take up STEM education through tours and activities.
- **Mechanical Engineering Graduate Association (MEGA)**: Board member of the graduate student association for mechanical engineering at Columbia University, 2017.
- Volunteer at IEEE International Symposium on Robot and Human Interactive Communication, RO-MAN 2016.