Seyed Mostafa Rezayat Sorkhabadi

PhD Candidate, Research Assistant
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Education

- **Arizona State University** — Tempe, AZ
  Ph.D. in Mechanical Engineering (GPA: 4.0) — *Aug. 2018 – Present*
- **Arizona State University** — Tempe, AZ
  M.Sc. in Mechanical Engineering (GPA: 3.90) — *Aug. 2016 – Jul. 2018*
- **Sharif University of Technology** — Tehran, Iran
  B.Sc. in Mechanical Engineering(GPA 3.60) — *Sep. 2011 – Jun. 2016*

Technical Skills

- **Expertise**: Human-Robot Interaction, Wearable Sensors and Robotics, State Estimation and (IMU) Sensor Fusion, System Dynamics and Control, Robot-aided Gait Rehabilitation, Motion Planning, Optimization, Statistical Learning (Learning from Demonstration), Tactile Sensing, Gait Analysis and Biomechanical Characterization, Human Motion Capture and Muscle Activity (EMG), Embedded Systems Programming
- **Programming Language**: MATLAB, Python, C/C++, LabVIEW
- **Modeling, Simulation, and Analysis Tools**: SolidWorks, Simulink, VICON Nexus, OpenSIM, ANSYS, Linux
- **Embedded Systems**: Raspbian, Debian (Ubilinux), Arduino

Professional Experience

- **Robotic and Intelligent Systems (RISE) lab** — Arizona State University, AZ
  Research Assistant — *Aug 2018 - Present*
  - **Human State (Motion) Estimation**: Estimation of human global pose and velocity during different activities by (IMU) sensor fusion techniques using invariant extended Kalman filtering (InEKF)
  - **Learning from Demonstration for Robot-aided Gait Rehabilitation**: Developing a comprehensive portable wearable sensor system (including soft tactile sensing) for collecting physical human-human interaction (kinetics and kinematics) in gait training, and integrating that for formulating an impedance learning framework for robot-aided rehabilitation, using GMM and GMR, and biomechnical characterization (Funded by NSF and in collaboration with Barrow Neurological Institute, BNI, Phoenix, AZ)
  - **Human-Robot Gait Stability Analysis**: Stability analysis of walking with a knee exoskeleton using VICON motion capture system, dynamical system theory and time-series analysis
  - **Locomotion Mode Classification**: Human walking speed and slope classification using sEMG sensors and K-means clustering
  - **Fall Risk Assessments of Older Adults using Wearable Sensors**: Collecting data of older adults at both lab and participants community using wearable sensors, for fall risk assessment. In colloboration with CIHRA (Center for Innovation in Healthy and Resilient Aging) group, ASU.
- **RISE lab** — Arizona State University, AZ
  Research Student — *Jan 2017 - Aug 2018*
  - **Knee Exoskeleton Control and Trajectory planning**: Design and implementation of the low-level control of a knee assistive exoskeleton. Conducting human-robot (exoskeleton) data collection for lower-limb kinematic and muscle activity study and validation.
- **SEMTE (Gradute Student Department)** — Arizona State University, AZ
  Teaching Assistant and Grader — *Jan 2017 - Dec 2017*
  - **MAE 322 (Mechanical Engineering Lab)**: Instructor: Hanqing Jiang
  - **MAE 318 (System Dynamics and Controls)**: Instructor: Hamid Marvi
  - **MAE 215 (Introduction to MATLAB programming)**: Instructor: Ehsan Izadi
- **RCSTIM Robotic Surgery Group** — Sharif University of Technology, Tehran, Iran
  Research Assistant — *Dec 2014 - July 2015*
  - **Accuracy Assessment of Tracking Cardiac Normal Motion**: Evaluate NDIs Polaris optical tracking system for measuring and tracking cardiac motion in the robotic surgery of beating Heart.

Publication

Journal

- Assessment of Human Dynamic Gait Stability with a Lower Extremity Assistive Device: P. T. Chinimilli*, **S. M. Rezayat Sorkhabadi***, and Wenlong Zhang. *IEEE Transactions on Neural Systems and Rehabilitation Engineering (2020).* [Equal contribution]
- Gait Training via Biomechanical Characterization and Learning from Demonstration, for Robotic Applications: **S. M. Rezayat Sorkhabadi***, M. Smith*, R. Khodambashi, T. Maruyama, R. O'Hara-Lopez, M. Raasch, and W. Zhang *Under submission to IEEE Transactions on Neural Systems and Rehabilitation Engineering. [Equal contribution]*
- Design and Evaluation of an Invariant Extended Kalman Filter for Human Locomotion Estimation with Sensor Misalignment:Z. Zhu*, **S. M. Rezayat Sorkhabadi***, Y. Gu, and W. Zhang. *Submitted to IEEE/ASME Transactions on Mechatronics. [Equal contribution]*
- Understanding Personal and Contextual Factors in Fall Risks Assessments in Older Adults using Smart Shoes: **S. M. Rezayat Sorkhabadi**, J. Mattingly, R. Yousefi, E. K. Chiou , W. Zhang *Submitted to PLOS One.*
- Automatic virtual impedance adaptation of a knee exoskeleton for personalized walking assistance: P. T. Chinimilli, Z. Qiao, **S. M. Rezayat Sorkhabadi**, V. Jhawar, I. H. Fong, and W. Zhang. *Robotics and Autonomous Systems 114 (2019): 66-76.*

Conference

- Invariant Extended Kalman Filtering for Human Motion Estimation with Imperfect Sensor Placement: Z. Zhu*, **S. M. Rezayat Sorkhabadi***, Y. Gu, and W. Zhang *(Accepted and to be published) In 2022 American Control Conference (ACC) [Equal contribution]*
- Human Locomotion Activity and Speed Recognition Using Electromyography Based Features: **S. M. Rezayat Sorkhabadi**, P. T. Chinimilli, D. Gaytan-Jenkins, and W. Zhang. *In 2019 Wearable Robotics Association Conference (WearRAcon), pp. 80-85. IEEE, 2019.*
- Human Learning and Coordination in Lower-limb Physical Interactions: S. Amatya, **S. M. Rezayat Sorkhabadi**, and W. Zhang. *In 2020 American Control Conference (ACC) (pp. 557-562). IEEE*
- ROBOTIC SHOE: AN ANKLE ASSISTIVE DEVICE FOR GAIT PLANTAR FLEXION ASSISTANCE: M. Schaller **S. M. Rezayat Sorkhabadi**, and W. Zhang. *In 2020 Design of Medical Devices Conference. American Society of Mechanical Engineers Digital Collection.*
- Predictive Modeling of Periodic Behavior for Human-Robot Symbiotic Walking: G. Clark, J. Campbell, **S. M. Rezayat Sorkhabadi**, W. Zhang and H. B. Amor. *In 2020 IEEE International Conference on Robotics and Automation (ICRA), 2020, pp. 7599-7605.*
- Design and Control of SQUEEZE: A Spring-augmented QUadrotor for intEractions with the Environment to squeeZE-and-fly: K. Patnaik, S. Mishra, **S. M. Rezayat Sorkhabadi**, and W. Zhang. *In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), accepted, 2020.*

*Refers to the authors with equal contribution

Patent

- "ROBOTIC ANKLE SYSTEM FOR GAIT DISORDER PATIENTS", **U.S. Provisional Pat. Ser. NO. 62/979,621, filed 02/21/2020.**
- "SYSTEMS AND METHODS FOR A SPRING-AUGMENTED QUADROTOR FOR INTERACTIONS WITH CONSTRAINED ENVIRONMENTS", **U.S. Provisional Pat. Ser. NO. 63/091,114, filed 10/13/2020.**

Academic Service

- **IEEE Robotics and Automation Letters**: Reviewer (2021,2020).
- **IEEE International Conference on Intelligent Robots and Systems**: Reviewer (2021,2020,2019).
- **ASME Dynamic Systems and Control Conference**: Reviewer (2019).