

# Madi Babaiasl

Curriculum Vitae  
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<https://madibabaiasl.github.io>

*Last Revised: April 2024*

## EDUCATION

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| <b>Washington State University</b><br>Ph.D. in Mechanical Engineering (Robotics) | Pullman, WA<br><i>May 2016 – Aug. 2020</i>   |
| <b>University of Tabriz</b><br>M.Sc. in Mechatronics Engineering                 | Tabriz, Iran<br><i>Sep. 2011 – Sep. 2013</i> |
| <b>University of Tabriz</b><br>B.Sc. in Electrical Engineering (Control)         | Tabriz, Iran<br><i>Sep. 2006 – Sep. 2010</i> |

## ACADEMIC POSITIONS

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| <b>Saint Louis University</b><br>CBL Assistant Professor of Robotics & Autonomous Systems<br>Department of Aerospace and Mechanical Engineering<br>Mecharithm Lab<br><i>Research on Developing Robots for Healthcare &amp; Education</i> | St. Louis, MO<br><i>July 2023 – Now</i>      |
| <b>Washington State University</b><br>Graduate Research Assistant<br>School of Mechanical Engineering & Material Science<br>M3 Robotics Lab<br><i>Research on Design, Modeling, and Control of Steerable Needles</i>                     | Pullman, WA<br><i>May 2016 – Aug. 2020</i>   |
| <b>University of Tabriz</b><br>Graduate Research Assistant<br>Mechatronics Engineering Department<br>Mechatronics Lab<br><i>Research on the Design, Modeling, and Control of Rehabilitation Robots</i>                                   | Tabriz, Iran<br><i>Sep. 2011 – Sep. 2013</i> |

## MEDIA COVERAGE, HONORS & AWARDS

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- **Featured in RSIP Vision Magazine** Jan. 2022  
*This prestigious magazine features role models, who can serve as examples to younger students and professionals.*
- **Featured in Society of Women Engineers (SWE)'s website** Apr. 2022  
*All Together is the blog of the SWE, and features a day in the life of an engineer to inspire younger generations.*
- **Featured on the cover of both MME Department and Robotics Initiative magazines at WSU** Aug. 2019
- **Featured in WSU Insider Magazine** July 2019  
*for my research on Steerable Needles*

• **Wanda Munn Scholarship from SWE**  
for outstanding academic achievement as well as strong  
engineering potential

May 2019

• **Featured in Daily Evergreen Magazine**  
for my research on Steerable needles

Feb. 2018

## JOURNAL PUBLICATIONS

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- [J7] **Babaiasl, M.**, Yang, F. and Swensen, J.P., 2022. Robotic needle steering: state-of-the-art and research challenges. *Intelligent Service Robotics*, pp.1-33.
- [J6] Chen, Y., Ding, J.L., **Babaiasl, M.**, Yang, F. and Swensen, J.P., 2022. Characterization and modeling of a thermoplastic elastomer tissue simulant under uniaxial compression loading for a wide range of strain rates. *Journal of the Mechanical Behavior of Biomedical Materials*, 131, p.105218.
- [J5] **Babaiasl, M.**, Boccelli, S., Chen, Y., Yang, F., Ding, J.L. and Swensen, J.P., 2020. Predictive mechanics-based model for depth of cut (DOC) of waterjet in soft tissue for waterjet-assisted medical applications. *Medical & Biological Engineering & Computing*, 58(8), pp.1845-1872.
- [J4] Jabbari Asl, H., **Babaiasl, M.** and Narikiyo, T., 2020. Neural network-based asymptotic tracking control of unknown nonlinear systems with continuous control command. *International Journal of Control*, 93(4), pp.971-979.
- [J3] Yang, F., **Babaiasl, M.** and Swensen, J.P., 2019. Fracture-directed steerable needles. *Journal of Medical Robotics Research*, 4(01), p.1842002.
- [J2] **Babaiasl, M.**, Mahdioun, S.H., Jaryani, P. and Yazdani, M., 2016. A review of technological and clinical aspects of robot-aided rehabilitation of upper-extremity after stroke. *Disability and Rehabilitation: Assistive Technology*, 11(4), pp.263-280.
- [J1] **Babaiasl, M.**, Ghanbari, A. and Noorani, S., 2014. Anthropomorphic mechanical design and Lyapunov-based control of a new shoulder rehabilitation system. *Engineering Solid Mechanics*, 2(3), pp.151-162.

## PEER-REVIEWED CONFERENCE PAPERS

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- [C7] **Babaiasl, M.**, Yang, F. and Swensen, J.P., 2020, November. Duty Cycling of Waterjet Can Improve Steerability and Radius-of-Curvature (ROC) for Waterjet Steerable Needles. In *2020 International Symposium on Medical Robotics (ISMR)* (pp. 50-56). IEEE.
- [C6] Yang, F., **Babaiasl, M.**, Chen, Y., Ding, J.L. and Swensen, J.P., 2020. Resultant Radius of Curvature of Stylet-and-Tube Steerable Needles Based on the Mechanical Properties of the Soft Tissue, and the Needle. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (pp. 3200-3207). IEEE.
- [C5] **Babaiasl, M.**, Yang, F., Boccelli, S. and Swensen, J.P., 2020. Fracture-directed waterjet needle steering: Design, modeling, and path planning. In *2020 8th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)* (pp. 1166-1173). IEEE.
- [C4] **Babaiasl, M.**, Yang, F., Chen, Y., Ding, J.L. and Swensen, J.P., 2019, April. Predicting depth of cut of water-jet in soft tissue simulants based on finite element analysis with the application to fracture-directed water-jet steerable needles. In *2019 International Symposium on Medical Robotics (ISMR)* (pp. 1-7). IEEE.

[C3] **Babaiasl, M.**, Yang, F. and Swensen, J.P., 2018, August. Towards water-jet steerable needles. In *2018 7Th IEEE international conference on biomedical robotics and biomechatronics (biorob)* (pp. 601-608). IEEE.

[C2] **Babaiasl, M.**, Goldar, S.N., Barhaghtalab, M.H. and Meigoli, V., 2015, October. Sliding mode control of an exoskeleton robot for use in upper-limb rehabilitation. In *2015 3rd RSI International Conference on Robotics and Mechatronics (ICROM)* (pp. 694-701). IEEE.

[C1] **Babaiasl, M.**, Ghanbari, A. and Noorani, S.M.R., 2013, December. Mechanical design, simulation and nonlinear control of a new exoskeleton robot for use in upper-limb rehabilitation after stroke. In *2013 20th Iranian Conference on Biomedical Engineering (ICBME)* (pp. 5-10). IEEE.

## SUBMITTED PUBLICATIONS

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[S1] Sikorski, P., Yu, K., Billadeau, L., Esposito, F., AliAkbarpour, H., and **Babaiasl, M.**, 2024. Enhanced Robot Arm at the Edge with NLP and Vision Systems. *Submitted to International Conference on Intelligent Robots and Systems (IROS 2024)*.

## INVITED TALKS AND PRESENTATIONS

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- **Duty Cycling to Improve Steerability of Waterjet Steerable Needles**  
*Oral Presentation at ISMR Conference* Nov. 2020
- **Predicting the Depth of Cut of the Waterjet in Soft Tissue**  
*Oral Presentation at ISMR Conference* Apr. 2019
- **Waterjet Needle Steering: Design, Modeling, & Path Planning**  
*Oral Presentation at BioRob Conference* Nov. 2020
- **Resultant Radius of Curvature of Stylet-and-Tube Steerable Needles**  
*Oral Presentation at IROS Conference* Oct. 2020
- **Waterjet-assisted Needle Steering to be Used for Medical Applications**  
*Invited Speaker for MME Seminar Series, WSU, Tri-Cities* Nov. 2019
- **Waterjet Steerable Needles**  
*Poster Presentation at Academic showcase and research Expo, WSU* Mar. 2019
- **Towards water-jet steerable needles**  
*Oral Presentation at BioRob Conference* Aug. 2018

## TEACHING EXPERIENCE

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### Saint Louis University

*Modern Robotics I: Arm-type Manipulators (MENG 5930, 4930)* Fall 2023

- Fundamentals of robotic arms motion (such as tools to express robot position and orientation as well as velocities and forces), forward and inverse kinematics, velocity kinematics and statics, dynamics, motion planning, and control based on screw theory & experiential learning through working on a ROS-based Robotic Arm

*Mechatronics Systems Design (MENG 2400)* Spring 2024

- Synergistic integration of mechanical engineering, electrical engineering, and computer science to design systems that can sense, act, and think.

### Washington State University

*Graduate TA for Mechatronics* Spring 2018, 2019

- Nominated for the best Teaching Award by successfully mentoring more than 160 students for two semesters for the Mechatronics course to develop a Pac-Man Robot, System Automation projects using PLCs, and a Scavenger Race Robot
- Students observed better job offers after taking this class.

- Received lots of praise from students and advisors for my performance to mentor more than 160 students

## STUDENT MENTORING

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### Mecharithmetic Lab at Saint Louis University SLU

July 2023 – Now

#### PhDs:

- Guangping Liu
- Kamyab Yazdipaz
- Tipu Sultan
- **Committee member for:** Daniel Montes Tolon (co-advised with Srikanth Gururajan), Maya Dunlap (co-advised with Jenna Gorlewicz), Bryan MacGavin (co-advised with Jenna Gorlewicz), Xingbang Chen (co-advised with Theodosios Alexander)

#### Undergraduate Students:

- Pascal Sikorski, Kaleb Yu, Lucy Billadeau, Leo Schrader, Naveena Mutharasan

### M3 Robotics Lab at Washington State University WSU

July 2016 – Aug. 2020

- Successfully mentored undergraduate students involved in the fracture-directed steerable needles project

## SERVICE (ACADEMIC, DEPARTMENTAL, COMMUNITY & OUTREACH)

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### Reviewing:

- **Journals:** IEEE Robotics and Automation Letters (RA-L), IEEE Access, IEEE Transactions on Robotics (T-RO), Medical & Biological Engineering & Computing MBEC, Transactions of the Institute of Measurement and Control TIMC, IEEE Transactions on Robotics, Computers and Electrical Engineering COMPELECENG, Frontiers in Robotics & AI
- **Conferences:** (IROS, BioRob, ICRA, etc.)

### Judging:

- Judge for Society of Women Engineer SWE's WE Local Awards (the Rising Star 2018, 2019), Poster and Rapid Fire Competitions (WE18, WE19, WE20), Mission Awards (2018), Emerging Leader Award (2020)

### Outreach:

- Worked with middle school students to familiarize them with the engineering design process through reading articles and building by volunteering as an eMentor for IEEE TryEngineering Together Outreach Program (Sep. 2019 - May 2020)
- Gave feedback on science projects to 4th and 5th Grade students by volunteering to be a Guest Scientist, Franklin Elementary School, 2019
- Mentored several undergraduate and graduate students through GradSWE mentoring program (2018 - 2020)

### Charity:

- Sponsored the educational costs of three kids through the Child Foundation (2019 - Now)

## PROFESSIONAL MEMBERSHIPS

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- American Society of Mechanical Engineers (ASME)
- IEEE, IEEE Robotics and Automation Society, IEEE Engineering in Medicine and Biology Society, IEEE Women in Engineering
- Society of Women Engineers, SWE

## LANGUAGES

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- English (Fluent)
- Persian (Second Language)
- Azerbaijani (Mother Tongue)
- Turkish (Fluent)
- Arabic (Fluent)