MARZIEH M. ARDESTANI, Ph.D., ACTAR
SENIOR CONSULTANT

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Dr. Ardestani is a Senior Consultant at ESi, bringing a wealth of expertise in mechanical engineering, electrical engineering, and biomedical engineering. She holds a Ph.D. in Mechanical Engineering, a master's degree in electrical engineering, and a bachelor's degree in biomedical engineering. Dr. Ardestani is also a certified accident reconstructionist (ACTAR #4142) and a certified BOSCH CDR technician and analyst.

In her role at ESi, Dr. Ardestani specializes in vehicle accident reconstruction, including passenger vehicles, commercial tractor-trailers, and pedestrian accidents. Her extensive knowledge encompasses various aspects of injury biomechanics and causation, with a focus on occupational and sports injuries, as well as medical device analysis. Her technical skills are further demonstrated through her ability to investigate complex scenarios such as rear-end collisions, side swipes, intersection accidents, and staged accidents involving commercial vehicles.

Dr. Ardestani's expertise extends to analyzing alleged defects in airbags and seatbelts, brake system failures, vehicle loss of control, and driver distraction. She is proficient in retrieving and analyzing data from airbag control modules and engine control modules, and she employs techniques such as time-distance analysis, damage profile analysis, and crash simulations to provide thorough root-cause analyses and determine fault in vehicle accidents.

Before joining ESi, Dr. Ardestani served as an Assistant Professor, where her research concentrated on traumatic brain injury, spinal cord and lower extremity joint injuries, human motion analysis, and mechanisms of slip/trip and fall accidents. Her academic background and research experience complement her professional work, enhancing her ability to handle complex cases involving medical devices, implants, and medical imaging technologies such as MRI and X-ray machines.

Dr. Ardestani has published extensively in peer-reviewed journals and has presented at numerous conferences, with more than 20 documented works in her field. Her interdisciplinary education and broad range of experience position her as a leading expert in accident reconstruction and injury analysis, ensuring meticulous and accurate assessments of intricate accident cases.

Areas of Specialization

Automotive
Accident Reconstruction
Biomechanics
Injury Analysis
Injury Consistency/Causation
Marine Accident
Medical Devices
Slip, trip and fall
Occupational Injuries and Worker Compensation
Computer Modeling

Education

Ph.D., Mechanical Engineering. Xi'an Jiaotong University. 2015
M.S., Control System Engineering. Isfahan University of Technology. 2011
B.S., Biomedical Engineering. Isfahan University. 2009

Licenses/Certifications

Accreditation Commission for Accident reconstruction .... ACTAR #4142

Positions Held

Engineering Systems Inc., Clackamas, Portland

Senior Consultant, 2024 – Present

Insight Forensic Engineering LLC, Orlando, Florida

Principal Consultant, 2022 – 2024

J.S. Held LLC, Orlando, Florida

Senior Project Manager, 2021 – 2022

Rimkus Consulting Group, New Orleans, Louisiana

Senior Consultant, 2020 – 2021

Indiana University, Indianapolis, Indiana

Assistant Research Professor, 2017 – 2020

RUSH University Medical Center, Chicago, Illinois

Post-doctoral research fellow, 2016 – 2017

University of Oregon, Eugene, Oregon

Post-doctoral research fellow, 2015 – 2016

Continuing Education

Bosch© CDR Tool Technician Training, IPTM, 2020

At-Scene Traffic Crash/Traffic Homicide Investigation, IPTM, July 2020

Advanced Traffic Crash Investigation, IPTM, November 2020

Traffic Crash Reconstruction, IPTM, December 2020

Human Factor, Crash Safety Research Center, December 2021

Commercial Vehicle Crash Investigation, IPTM, August 2021

EDR Analyst, IPTM, August 2022

Publications

"Human lower extremity joint moment prediction: A wavelet neural network approach", **Ardestani, M.M**., Zhang, X., Wang, L., Lian, Q., Liu, Y., He, J., Li, D. and Jin, Z., Journal of Expert Systems with Applications, 41(9), pp. 4422-4433 (2014).

"Feed forward artificial neural network to predict contact force at medial knee joint: Application to gait modification." **Ardestani, M.M**., Chen, Z., Wang, L., Lian, Q., Liu, Y., He, J., Li, D. and Jin, Z., Journal of Neurocomputing, 41(9), pp. 4422-4433 (2014).

"Prediction of in vivo joint mechanics of an artificial knee implant using rigid multi-body dynamics with elastic contacts." Chen, Z., Zhang, X., **Ardestani, M.M**., Wang, L., Liu, Y., Lian, Q., He, J., Li, D. and Jin, Z., Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine, 228(6), pp.564-575 (2014)

"Gait Modification and Optimization using Neural Network-Genetic Algorithm Approach: Application to Knee Rehabilitation." **Ardestani, M.M**., Moazen, M. and Jin, Z., Journal of Expert System with Application, 41(16), pp.7466– 7477 (2014).

"A Neural Network Approach for Determining Subject Specific Gait Modification to Reduce Total Knee Force." **Ardestani, M.M**., Chen, Z., Wang, L., Lian, Q., Liu, Y., He, J., Li, D. and Jin, Z., Journal of Medical Engineering and Physics,36(10), pp.1253-1265 (2014).

"Sensitivity analysis of human lower extremity joint moments due to changes in joint kinematics." **Ardestani, M.M**., Moazen, M. and Jin, Z., Journal of Medical Engineering & Physics, 37(2), pp.165-174 (2015)

"A real-time topography of maximum contact pressure distribution at medial tibiofemoral knee implant during gait: Application to knee rehabilitation." **Ardestani, M.M**., Moazen, M., Chen, Z., Zhang, J. and Jin, Z., Journal of Neuro computing. 154, pp.174-188 (2015)

"Posterior Stabilized Versus Cruciate Retaining Total Knee Arthroplasty Designs: Reliability and Sensitivity", **Ardestani, M.M**., Moazen, M., Maniei, E. and Jin, Z., Journal of Medical Engineering and Physics, 37(4), pp.350-360 (2015).

"Contribution of Geometric Design Parameters to Knee Implant Performance: Conflicting Impact of Conformity on Kinematics and Contact Mechanics.", Ardestani**, M.M**., Moazen, M. and Jin, Z., The Knee, 22(3), pp.217-224 (2015).

"How Human Gait Responds to Muscle Impairment in Total Knee Arthroplasty Patients: Muscular Compensations and Articular Perturbations", **Ardestani, M.M**. and Moazen, M., Journal of Biomechanics, 49(9), pp.1620-1633 (2016).

"Can a Linear Combination of Gait Principal Component Vectors Identify Hip OA Stages?" **Ardestani, M.M**. and Wimmer, M.A., Journal of Biomechanics; 49(10), pp.2023-2030 (2016).

"From normal to fast walking: impact of cadence and stride length on lower extremity joint moments." **Ardestani, M.M**., Ferrigno, C., Moazen, M. and Wimmer, M.A., Journal of Gait & posture, 46, pp.118-125 (2016).

"Prediction of polyethylene wear rates from gait biomechanics and implant positioning in total hip replacement" **Ardestani, M.M**., Edwards, P.P.A. and Wimmer, M.A., Journal of Clinical Orthopedics and Related Research, 475(8), pp.2027-2042 (2017).

"TKA patients with unsatisfying knee function shows changes in neuromotor synergy pattern but not joint biomechanics", Ardestani**, M.M**., Malloy, P., Nam, D., Rosenberg, A.G. and Wimmer, M.A., Journal of Electromyography and Kinesiology, 37, pp.90-100. (2017)

"Kinematic and Neuromuscular Adaptations in Incomplete Spinal Cord Injury after High-versus Low Intensity Locomotor Training", **Ardestani, M.M**., Henderson, C.E., Salehi, S.H., Mahtani, G.B., Schmit, B.D. and Hornby, T.G., Journal of Neurotrauma, 36(12), pp. 2036-2044 (2019).

"Compensation or Recovery? Altered Kinetics and Neuromuscular Synergies Following High-Intensity Stepping Training Poststroke", **Ardestani, M.M**., Kinnaird, C.R., Henderson, C.E. and Hornby, T.G., Journal of Neurorehabilitation and Neural Repair, 33(1), pp.47-58 (2019).

"Computational analysis of knee joint stability following total knee arthroplasty", **Ardestani, M.M**., ZhenXian, C., Noori-Dokht, H., Moazen, M. and Jin, Z., Journal of Biomechanics, 86, pp.17- 26 (2019).

"Improved walking function in laboratory does not guarantee increased community walking in stroke survivors: potential role of gait biomechanics", Ardestani**, M.M**., Henderson, C.E. and Hornby, T.G. Journal of Biomechanics, 91, pp.151-159 (2019).

"Contributions of Stepping Intensity and Variability to Mobility in Individuals Poststroke: A Randomized Clinical Trial", Hornby, T.G., Henderson, C.E., Plawecki, A., Lucas, E., Lotter, J., Holthus, M.,

Brazg, G., Fahey, M., Woodward, J., **Ardestani, M.M.**, and Roth, E.J., Stroke, 50(9), pp.2492-2499. (2019).

"Effect of Investigator Observation on Gait Parameters in Individuals with Stroke", **Ardestani M.M.**, Hornby TG, Journal of Biomechanics, 100, p.109602 (2020).

"Locomotor kinematics and kinetics following high-intensity stepping training in variable contexts post-stroke". **Ardestani M.M**, et al, Journal of Neurorehabilitation and Neural Repair, 34(7), pp.652-660 (2020).

"Task-specific vs impairment-based training on locomotor performance in individuals with chronic spinal cord injury: a randomized cross-over study", Hornby TG, **Ardestani M.M.**, Neurorehabilitation and Neural Repair, 34(7), pp.627-639 (2020).

Academic Conference Presentations

"Artificial Neural Network Classifier of Human motion, Based on Kinetic Parameters", **Ardestani M.M**, 2nd International Conference on Control and Automation, Shiraz, Iran. Dec 2011, DOI: 10.1109/ICCIAutom.2011.6356699, IEEE

"Walking pattern classification in children with cerebral palsy: A wavelet network approach", **Ardestani M.M.,** 16th CSI International Symposium on Artificial Intelligence and Signal Processing. Shiraz University, Iran. May 2012, DOI: 10.1109/AISP.2012.6313752, IEEE

"Muscle Activity Prediction Using Wavelet Neural Network", **Ardestani M.M,** International conference on wavelet analysis and pattern recognition, Tianjin, China, July 2013.

""Novel Hybrid of Time-Delay Neural Network and Wavelets to Predict Rich Frequency Patterns: Application to Gait Biomechanics, **Ardestani M.M**., International conference on Artificial Intelligence and Software Engineering, Phuket, Thailand, January 2014.

"Do Neuromuscular Synergies Modify Knee Functionality in Patients with Total Knee Arthroplasty?" **Ardestani M.M**., Rosenberg A.G., Wimmer M.A., Orthopedic Research Society Meeting. San Diego, March 2017.

"Bode margin of knee kinematic waveforms are related to knee function score in patients with total knee arthroplasty", **Ardestani M.M**., Rosenberg A.G., Wimmer M.A., Orthopedic Research Society meeting, San Diego, March 2017.

"Neurorehabilitation: A Game Changer in Rehabilitation of Stiff Total Knee Replacement: Orthopedic Research Society meeting", **Ardestani, M.M**., New Orleans, March 2018.

"Patellofemoral Alignment: What We Have Underestimated in Tibiofemoral Wear Scars", **Ardestani, M.M** Orthopedic Research Society meeting, New Orleans, March 2018.

"Medializing the Center of Pressure to Offload the Knee and Decelerate Osteoarthritis: Fact or Fiction", **Ardestani, M.M,** Orthopedic Research Society meeting, Austin-February 2019.

"Contributions of Stepping Intensity and Variability to Mobility in Individuals Post-Stroke: A Randomized Clinical Trial", Henderson, C.E., Plawecki, A., Lucas, E.G., Lotter, J.K., Holthus, M.E., Brazg, G., Fahey, M.M., Woodward, J.L., **Ardestani, M.M**., Roth, E. and Hornby, T.G., 2020 Combined Sections Meeting (CSM), APTA, February 2020.

"Potential Role of Task-Specific Training on Locomotor Recovery Following Incomplete Spinal Cord Injury", Lotter JK, Henderson CE, Plawecki A, Holthus ME, Lucas EG, **Ardestani M.M**, Hornby TG, 2020 Combined Sections Meeting (CSM) APTA, February 2020.

"Relationships between Changes in Daily Stepping and Clinical Measures Following Locomotor Training", Plawecki A, Henderson CE, Lotter JK, Holthus ME, Lucas EG, Ardestani MM, Hornby TG, 2020 Combined Sections Meeting (CSM), APTA, February 2020.