

Curriculum Vitae
Arash Mahboobin
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INTERESTS

Computational and experimental human movement biomechanics, bio-signal processing, and engineering education. Specific areas of biomechanics and bio-signal processing research include developing muscle-actuated forward dynamic simulations of gait (normal and pathological), analysis and modeling of human postural control, and time-varying signals and systems. Engineering education research includes curriculum and laboratory development of biomechanics and bio-signal processing concepts.

EDUCATION

- Ph.D., University of Pittsburgh, 2007 (Electrical Engineering)
Dissertation: *Computational and Robotic Models of Human Postural Control*
- M.S., University of Illinois at Urbana-Champaign, 2002 (General Engineering)
Thesis: *Analysis and Validation of a Human Postural Control Model*
- B.S., Azad University, 1998 (Biomedical Engineering)

PROFESSIONAL EXPERIENCE

- 2018-present: Undergraduate Coordinator
Department of Bioengineering, University of Pittsburgh
- 2017-present: Assistant Professor
Department of Bioengineering, University of Pittsburgh
- 2014-2017: Research Assistant Professor (primary focus: *teaching*)
Department of Bioengineering, University of Pittsburgh
- 2012-2014: Research Assistant Professor (primary focus: *research*)
Department of Bioengineering, University of Pittsburgh
- 2012–present: Senior Scientist
Pittsburgh Biomechanics, LLC
- 2010–2012: Visiting Research Assistant Professor
Department of Bioengineering, University of Pittsburgh

- 2010–2013: Pepper Junior Scholar
Claude D. Pepper Older Americans Independence Center, University of Pittsburgh
- 2008–2010: Postdoctoral Research Associate
Department of Bioengineering, University of Pittsburgh
- 2002–2007: Research Assistant
Department of Electrical Engineering, University of Pittsburgh
- 2000–2002: Research Assistant
Department of General Engineering, University of Illinois at Urbana-Champaign
- 2000–2001: Teaching Assistant
College of Business, University of Illinois at Urbana-Champaign

Visiting appointments

- 2013 (February-April): Visiting Scholar
Computational Biomechanics Laboratory, University of Florida

TEACHING ACTIVITIES

Courses

- BIOENG 1002 (Faculty mentor)
Undergraduate Intramural Internship (Fall 2012, 2014)
- BIOENG 1085 (Instructor)
Introduction to Bioengineering Seminar (Fall 2016–present)
- BIOENG 1086 (Faculty Administrator)
Bioengineering Seminar for Minors (Fall 2017–present)
- BIOENG 1095 (Faculty Administrator)
Special Projects (Fall 2017–present)
- BIOENG 1096 (Faculty Administrator)
Undergraduate Teaching Experience (Fall 2017–present)
- BIOENG 1150 (Co-Instructor; Instructor / Administrator)
Bioengineering Methods & Applications (Spring 2014; Spring 2015–2019)
- BIOENG 1241 (Instructor)
Societal, Political and Ethical Issues in Biotechnology (Spring 2018, 2019)
- BIOENG 1255 (Co-Instructor; Laboratory developer)
Dynamic Systems: A Physiological Perspective (Spring 2014, 2016, Fall 2017, 2018)
- BIOENG 1320 (Co-Instructor)
Biological Signals and Systems (Fall 2011, 2013)
- BIOENG 1320 Laboratory (Instructor)

Biological Signals and Systems Laboratory (Fall 2014–2018)

- BIOENG 1580 (Co-Instructor; Guest lecturer)
Biomedical Applications of Signal Processing (Fall 2009, 2010; Spring 2017, 2018)
- BIOENG 1631 (Guest Lecturer)
Biomechanics 2: Introduction to Biodynamics and Biosolid Mechanics (Fall 2009–2018)
- BIOENG 1632 (Lecturer; Co-Instructor)
Biomechanics 3: Biodynamics of Movement (Spring 2010–2012; Spring 2013–2019)
- BIOENG 2035 (Lecturer; Co-Instructor)
Biomechanical Modeling of Movement, Posture, & Gait (Fall 2006; Spring 2011)
- BIOENG 2061 (Lecturer)
Ergonomics and Occupational Biomechanics (Fall 2008)
- BIOENG/ECE 2695 (Assistant Instructor)
Special Topics in Control–Human Postural Control (Spring 2006)
- BIOENG 2632 (Lecturer; Co-Instructor)
Biomechanics 3: Biodynamics of Movement (Spring 2010–2012; Spring 2013–2019)
- BIOENG 2721 (Lecturer; Co-Instructor)
Human Movement Biomechanics (Spring 2010; Fall 2012)
- BIOENG/ECE 3528 (Co-Instructor)
Time-Frequency Signal Analysis (Fall 2008, Spring 2010)
- ECE 0031 (Instructor)
Linear Circuits and Systems I (Fall 2015)
- ECE 2523 (Instructor)
Digital Signal Processing (Spring 2016)
- ENGR 0011 (Instructor) - Freshman engineering program
Introduction to Engineering Analysis I (Fall 2014–2016)
- ENGR 0012 (Instructor) - Freshman engineering program
Introduction to Engineering Analysis II (Spring 2015–2017)
- ENGR 2900 (Guest Lecturer)
Graduate Fellowships & Proposal-Writing Workshop (Fall 2016)
- HPA 1044 (Guest Lecturer) - Health & Physical Activity
Biomechanics (Spring 2015)

Software development using MATLAB and Simulink

- OpenSim-MATLAB Musculoskeletal Modeling & Simulation Toolbox
- Signals and Systems Toolbox (BIOENG 1320)
- Biomedical Applications of Signal Processing Toolbox (BIOENG 1580)

- Time-Frequency Analysis Toolbox (BIOENG/ECE 3528)
- Human Postural Control Toolbox (BIOENG/ECE 2695)

Workshops

- Selected participant in *2018 Jarman Laboratory Film Workshop*, University of Pittsburgh, May 11–14, 2018
- Selected participant in *2016 National Effective Teaching Institute (NETI), NETI-1A (Basic NETI)*, San Diego, California, January 6-8, 2016
- Introduction to Teaching, University of Pittsburgh, August 23–25, 2010
- Selected participant in the *14th Annual Science, Technology, Engineering, and Mathematics Education Scholars (STEMES) Program: Connecting the Dots: Aligning Course Objectives, Assessments, and Activities to Enhance Learning in STEM Courses*, Michigan State University, May 18–20, 2010

GRANTS

External

- National Institutes of Health - R03
Role in project: **Co-Investigator**
Project title: *Effects of visual fields on standing balance*
Project duration: 08/01/2013–07/31/2015
Dollar amount: \$153,312
- National Institute for Occupational Safety and Health - R01
Role in project: **Co-Investigator.**
Project title: *Modeling shoe-floor interface properties to predict slips and falls*
Project duration: 07/01/10–06/30/13
Dollar amount: \$685,394
- National Institute for Occupational Safety and Health - R01
Role in project: **Postdoctoral Research Associate**
Project title: *Biomechanics of Slips in Older Adults*
Project duration: 08/01/07–07/31/10
Dollar amount: \$800,000

Internal

- University of Pittsburgh Provost's Personalized Education Grant Program (*under review*)
Role in project: **Principal Investigator**
Project title: *Reinforcing Course Connections – Educational experiences that simultaneously deliver new knowledge and revisit previously learned concepts*
Project duration: TBD

Dollar amount: \$15,000

- Pittsburgh Claude D. Pepper Older Americans Independence Center (University center funded by National Institutes of Health/National Institute of Aging)

Role in project: **Principal Investigator**

Project title: *Lower Extremity Muscle Contributions to Rapid Voluntary Stepping in the Elderly*

Project duration: 09/01/11–08/31/12

Dollar amount: \$10,000

- Pittsburgh Claude D. Pepper Older Americans Independence Center (University center funded by National Institutes of Health/National Institute of Aging)

Role in project: **Research Assistant**

Project title: *Modeling Sensory Integration and Attention in Balance of Elderly Subjects*

Project duration: 06/1/05–05/31/06

Dollar amount: \$36,960

PROFESSIONAL ACTIVITIES

Grant reviewer

- National Science Foundation, panelist, 2014, 2016
- National Science Foundation, ad hoc review, Research Initiation Awards—Historically Black Colleges and Universities Undergraduate Program, Division of Human Resource Development, 2015
- Physicians Services Incorporated Foundation (not-for-profit medical research organization within the province of Ontario, Canada)

Journal reviewer

- Journal of Biomechanical Engineering
- PLOS ONE
- Journal of Biomechanics
- Gait & Posture
- Brain Research Bulletin
- Behavioural Brain Research
- Computer Methods in Biomechanics and Biomedical Engineering
- Journal of NeuroEngineering and Rehabilitation
- Journal of Mechanics in Medicine and Biology

Conference reviewer

- Biomedical Engineering Society
- Gait and Movement Analysis Society
- IEEE Engineering in Medicine and Biology
- IEEE-RAS International Conference on Humanoid Robots

- American Society of Biomechanics

Other

- Annual first-year engineering conference chair (2015, 2016, 2017)
- Executive program committee member, 2013 American Society of Biomechanics Conference

Affiliations

- American Society of Biomechanics (ASB)
- Institute of Electronic and Electrical Engineers (IEEE)
- American Society for Engineering Education (ASEE)
- Biomedical Engineering Society (BMES)

HONORS

The William A. Chittenden Award (Outstanding M.S. Graduate Award), University of Illinois at Urbana-Champaign, 2003

STUDENT ADVISING AND MENTORING

- Undergraduate advisor (2015-present)
- National Science Foundation Graduate Research Fellowship Program, 2017
Role: Mentor
Advisees
 Adam Smoulder, B.S. - *Awarded (2018)*
 Henry Phalen, B.S. - *Awarded (2018)*
 Emily Kiefer, B.S.
 Kiara Lee, B.S.
- National Science Foundation Graduate Research Fellowship Program workshop (ENGR 2900), 2016
Role: Mentor
Advisees
 Michelle Pressly, B.S.
 Santino Graziani, B.S.
 Robert Gregg, B.S.
- National Science Foundation Graduate Research Fellowship Program workshop (Internal: Department of Bioengineering), 2014, 2015
Role: Mentor
2015 Advisees
 Yashar Assi, B.S.
 Liza Bruk, B.S.

Kevin King, B.S.
Joseph Kozak, B.S.
Saundria Moed, B.S.
Michael Taylor, B.S.

2014 Advisees

Jonathan Calvert, B.S.
Yashar Assi, B.S.

Gerald Ferrer, B.S. - *Awarded (2015)*

Erika Pilner, B.S. (University of Wisconsin-Milwaukee) - *Awarded (2015)*

Carly Sombric, B.S. - *Awarded (2015)*

Natalie Austin, B.S. - *Awarded (2015)*

- April Chambers, Ph.D., April 2011
Dissertation: *The Impact of Slip Exposure on Gait*
Role: Member of Committee
- Kevin Toosi, M.D., Ph.D., December 2011
Dissertation: *Wrist Biomechanics and Ultrasonographic Measures of the Median Nerve During Computer Keyboarding*
Role: Member of Committee
- Justin M. Haney, M.S., April 2014
Thesis: *Using Near Infrared Spectroscopy in the Evaluation of Standing Fatigue*
Role: Member of Committee
- Raymond Van Ham, B.S., April 2014
Role: Mentor (*Concentration: Computational Biomechanics*)
- Stephanie Quatchak, B.S., April 2015
Role: Mentor (*Concentration: Computational Biomechanics*)
- Shoko Horibata, visiting student, B.S. (Tokyo Metropolitan University)
Role: Co-Mentor on independent study, *Kinematics changes due to anterior cruciate ligament deficiency—A gait simulation approach*, October-November 2013
- Jennica Roche, Professional M.S., August–December 2011
Role: Co-Mentor on independent study, *Quantifying Local Stability of Locomotion Through Lyapunov Exponents*
- Caitlin M. O’Connell, Ph.D. student, August 2013-present
Role: Co-Advisor
- Ryan Le Grand, B.S. student, July-August 2014
Role: Tutoring on human postural control
- Jonathan A. Gustafson, Ph.D. student
Role: Tutoring on modeling and simulation using OpenSim

- Bradley C. Campbell, Ph.D. student
Role: Tutoring on modeling and simulation using OpenSim
- David Walker, Ph.D. student (University of Florida), February-April 2013
Role: Tutoring on modeling and simulation using OpenSim
- Rachel Jackson, Ph.D. student
Role: Tutoring on modeling and simulation using OpenSim
- Allison Luther, M.S., August 2011-April 2013
Role: Tutoring on modeling and simulation using OpenSim
- Paige E. Kendell, B.S., April 2015
Role: Tutoring on modeling and simulation using OpenSim
- Nicole T. McClain, M.S., April 2015
Role: Co-Mentor on human postural control (vibrotactile feedback design), August 2013-April 2015
- Grace E. Owens, B.S., April 2014
Role: Tutoring on electromyography (EMG) signal processing
- Joan R. Guyer, B.S., April 2015
Role: Tutoring on electromyography (EMG) signal processing

PUBLICATIONS

Refereed journal articles

1. **A. Mahboobin** and R. M. Clark (2018). How to architecture open-ended problem-solvers? Student reflections on scaffolding experiences in an open-ended problem-solving biosignals laboratory. *Journal of STEM Education: Innovations and Research* (Submitted)
2. R. M. Clark and **A. Mahboobin** (2018). Scaffolding to support problem-solving performance in a bioengineering lab — A case study. *IEEE Transactions on Education*, 61(2): 109–118
3. C. O’Connell, **A. Mahboobin**, Scott Drexler, Mark Redfern, Amy Nau, and R. Cham (2017). Effects of acute peripheral/central visual field loss on standing balance. *Experimental Brain Research*, 235(11): 3261–3270
4. C. O’Connell, A. J. Chambers, **A. Mahboobin**, and R. Cham (2016). Effects of slip severity on muscle activation of the trailing leg during an unexpected slip. *Journal of Electromyography and Kinesiology*, 28, 61–66
5. **A. Mahboobin**, R. Cham, S. J. Piazza (2010). The impact of a systematic reduction in shoe-floor friction on heel contact walking kinematics—A gait simulation approach. *Journal of Biomechanics*, 43, 1532–1539

6. **A. Mahboobin**, P. J. Loughlin, C. G. Atkeson, M. S. Redfern (2009). A mechanism for sensory re-weighting in postural control. *Medical & Biological Engineering & Computing*, 47, pp. 921–929
7. **A. Mahboobin**, P. J. Loughlin, M. S. Redfern, S. O. Anderson, C. G. Atkeson, J. K. Hodgins (2008). Sensory adaptation in human balance control: Lessons for bio-mimetic robotic bipeds. *Neural Networks*, 21(4), 621–627
8. **A. Mahboobin**, P. Loughlin, M. Redfern (2007). A model-based approach to attention and sensory integration in postural control of older adults. *Neuroscience Letters*, 429, 147–151
9. **A. Mahboobin**, P. Loughlin, M. Redfern, P. Sparto (2005). Sensory re-weighting in human postural control during moving-scene perturbations. *Experimental Brain Research*, 167, 260–267

Unpublished technical notes

1. **A. Mahboobin** (2011). Improved simulation of heel contact during normal walking: An extensive sensitivity analysis. *Human Movement and Balance Laboratory, University of Pittsburgh, Pittsburgh*

Conference proceedings

1. E. M. Pliner, A. A. Dukes, **A. Mahboobin**, and K. E. Beschorner (2019). Effects of interest-tailored biomechanics lectures on student engagement. *Midwest Regional American Society of Biomechanics Meeting*, Dayton, OH, February 28-March 1
2. R. Clark and **A. Mahboobin** (2018). Student reflections on experiences gained from an open-ended problem-solving bio-signals laboratory. *125th Annual Conference of American Society of Engineering Education*, Salt Lake City, UT, June 24-27
3. **A. Mahboobin** and R. Clark (2018). Scaffolding to support problem-solving performance in a bioengineering lab — A case study. *Assessment and Teaching Conference*, Pittsburgh, PA, January 26
4. **A. Mahboobin** and R. Clark (2017). Build as you go: An approach to completing laboratory reports. *124th Annual Conference of American Society of Engineering Education*, Columbus, OH, June 25-28
5. C. O’Connell, **A. Mahboobin**, A. Nau, and S. Drexler (2016). Effects of acute visual field occlusion on standing balance. *American Society of Biomechanics*, Raleigh, North Carolina, August 2–5
6. R. Clark and **A. Mahboobin** (2016). Scaffolding engineering students to be the problem solvers we want them to be. *123rd Annual Conference of American Society of Engineering Education*, New Orleans, LA, June 26-29

7. C. O'Connell, A. Chambers, **A. Mahboobin**, and R. Cham (2015). Role of multi-sensory integration relevant for balance in slip recovery. *American Society of Biomechanics*, Columbus, Ohio, August 5–8 (Poster presentation)
8. R. Le Grand, C. O'Connell, A. Chambers, **A. Mahboobin**, and R. Cham (2014). Effects of visual fields on standing balance. *Science 2014*, University of Pittsburgh, Pittsburgh, PA, October 1-3
9. S. Horibata, **A. Mahboobin**, R. E. Debski, and H. Fujie (2014). Muscle force alterations due to ACL-deficient gait—A simulation approach. *7th World Congress of Biomechanics, in conjunction with American Society of Biomechanics*, Boston, Massachusetts, July 6-11 (Poster presentation)
10. C. O'Connell, R. Cham, **A. Mahboobin**, and A. Chambers (2014). Muscle activation of trailing leg during slip. *7th World Congress of Biomechanics, in conjunction with American Society of Biomechanics*, Boston, Massachusetts, July 6-11 (Poster presentation)
11. S. Horibata, **A. Mahboobin**, R. Debski, and H. Fujie (2014). Kinematics changes due to anterior cruciate ligament deficiency—A gait simulation approach. *The Japanese Society of Mechanical Engineers*, Kanto, Japan, March 14-15
12. **A. Mahboobin** (2013). An automated iterative method for adjusting virtual model markers in an OpenSim model. *American Society of Biomechanics*, Omaha, Nebraska, September 4–7 (Poster presentation)
13. R. Cham, **A. Mahboobin**, M. S. Redfern, and A. C. Nau (2013). Impact of central and peripheral vision loss on standing balance. *Journal of Biomechanics Award Semi-finalist. American Society of Biomechanics*, Omaha, Nebraska, September 4–7 (Podium presentation)
14. R. Van Ham and **A. Mahboobin** (2013). Insight into the role of lower extremity net joint moment contributions to rapid voluntary stepping in the elderly. *American Society of Biomechanics*, Omaha, Nebraska, September 4–7 (Thematic poster presentation)
15. R. Van Ham and **A. Mahboobin** (2013). Kinematics of step initiation in young and older adults. *7th Annual Research Day on Aging, The Aging Institute of University of Pittsburgh Medical Center* (Poster presentation)
16. R. Van Ham and **A. Mahboobin** (2012). Kinematics of step initiation in young and older adults. *Biomedical Engineering Society Annual Meeting*, Atlanta, Georgia, October 24–27 (Poster presentation)
17. P. Loughlin, **A. Mahboobin**, J. Furman, P. Sparto (2012). Patient-customized vibrotactile feedback for postural control. *Joint World Congress of International Society for Posture & Gait and Gait & Mental Function*, Trondheim, Norway, June 24–28 (Podium presentation)

18. P. Loughlin, **A. Mahboobin**, J. Furman (2011). Designing vibrotactile balance feedback for desired body sway reductions. *33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Boston, Massachusetts, August 30–September 3 (Podium presentation)
19. A. Chambers, R. Cham, **A. Mahboobin** (2011). Insights into the role of proactive strategies in postural responses to slips using gait simulations. *Simulia Computational Biomechanics Award Finalist. American Society of Biomechanics*, Long Beach, California, August 10–13 (Poster presentation)
20. **A. Mahboobin**, M. Cenciarini, M. Redfern, and P. Loughlin (2011). Model-based investigation of ankle stiffness control versus active feedback control during quiet standing. *Proceedings of the ASME 2011 Summer Bioengineering Conference*, Farmington, Pennsylvania, June 22–25 (Poster presentation)
21. **A. Mahboobin**, R. Cham, S. J. Piazza (2011). Improved simulation of heel contact during normal walking. *Proceedings of the ASME 2011 Summer Bioengineering Conference*, Farmington, Pennsylvania, June 22–25 (Podium presentation)
22. **A. Mahboobin**, M. Redfern, P. Loughlin (2011). A model-based approach to attention and sensory integration in postural control of older adults. *5th Annual Research Day, The Aging Institute of University of Pittsburgh Medical Center (UPMC)* (Poster presentation)
23. A. Chambers, R. Cham, **A. Mahboobin** (2011). Insights into the role of proactive strategies in postural responses to slips using gait simulations. *5th Annual Research Day, The Aging Institute of University of Pittsburgh Medical Center (UPMC)* (Poster presentation)
24. **A. Mahboobin**, M. Cenciarini, M. Redfern, and P. Loughlin (2010). Ankle stiffness control during quiet standing versus active sensory feedback control with delay. *Biomedical Engineering Society Annual Meeting*, Austin, Texas, October 6–9 (Poster presentation)
25. **A. Mahboobin**, R. Cham, and S. J. Piazza (2010). Determinants of slip-related balance recoveries – A gait simulation approach. *Gait & Clinical Movement Analysis Society*, Miami, Florida, May 12–16
26. **A. Mahboobin**, R. Cham, and S. J. Piazza (2010). Use of walking simulations to assess the frictional requirements of slip resistant gait. *International Conference on Falls Prevention & Protection*, Morgantown, West Virginia, May 19–20 (Podium presentation)
27. **A. Mahboobin**, R. Cham, and S. J. Piazza (2009). Influence of foot-floor friction coefficient on the passive response to slip during walking. *American Society of Biomechanics*, Pennsylvania State University, August 26–29 (Podium presentation)

28. **A. Mahboobin**, S. Piazza and R. Cham (2009). Impact of reducing the foot-floor friction coefficient on the passive kinematics of walking. *International Society for Posture & Gait*, Bologna, Italy, 19th International Conference, June 21–25 (Poster presentation)
29. **A. Mahboobin**, P. Loughlin, and M. Redfern (2007). Modeling attentional influence on postural control in young and older adults. *International Society for Posture & Gait*, Burlington, Vermont, 18th International Conference, July 14–18 (Poster presentation)
30. **A. Mahboobin**, P. Loughlin and M. Redfern (2006). Modeling attention and sensory integration in postural control of older adults. *American Society of Biomechanics Meeting*, Sept 6–9, Blacksburg, VA (Poster presentation)
31. **A. Mahboobin**, P. Loughlin and M. Redfern (2006). A model-based approach to attention and sensory integration in postural control of older adults. *Proceedings of the 28th IEEE Engineering in Medicine and Biology Society Conference*, August 30–September 3, NYC (Poster presentation)
32. **A. Mahboobin**, P. Loughlin, M. Redfern and P. Sparto (2004). Sensory re-weighting in human postural control during moving-scene perturbations. *Abstracts of the 27th Annual Midwinter Meeting of the Association for Research in Otolaryngology*, Daytona Beach, FL (Poster presentation)
33. **A. Mahboobin**, C. Beck, M. Moeinzadeh, P. Loughlin (2002). Analysis and validation of a human postural control model. *IEEE Proceedings of the American Control Conference*, Alaska, May 8–10 (Podium presentation)