

VAHIDREZA JAFARI HARANDI

Ph.D. in Biomedical Engineering | Medical Device | AI-Driven Healthcare | Wearable Health Technologies
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INTERESTS

Rehabilitation Engineering; Biorobotics & Medical Robotics; Biomedical Device Design; Wearable Biosensors; Prosthetics & Orthotics; Biomechanics & Human Motion Analysis; AI-Driven Healthcare Solutions; Medical Image & Signal Processing; Simulation and Musculoskeletal Modeling; Real-Time Data Analysis.

SUMMARY

Innovative Biomedical Engineer and researcher with over eight years of interdisciplinary experience spanning medical devices, wearable biosensors, biomechanics, prosthetics, biorobotics, and medical robotics. Skilled in algorithm development, sensor fusion, and real-time data analysis for human motion and physiological monitoring. Experienced in CAD-based design (SolidWorks/OpenSim), biomaterial integration, and translating computational models into clinically relevant devices compliant with FDA/CE standards. Actively engaged in developing intelligent robotic systems for rehabilitation and assistive technologies that integrate AI, biomechanics, and human-machine interaction. Passionate about bridging engineering and medicine to advance biomedical imaging, signal processing, and precision rehabilitation solutions through interdisciplinary collaboration, applied research, and translation of scientific innovation into tangible healthcare impact.

EDUCATION

PhD in Biomedical Engineering, University of Melbourne, Australia
M.Sc. in Biomedical Engineering, Amirkabir University of Technology, Iran
B.Sc. in Mechanical Engineering, Isfahan University of Technology, Iran

CORE COMPETENCIES

- **Algorithm Development & Optimization:**
 - Expertise in creating advanced Python/MATLAB algorithms for real-time motion tracking, energy expenditure modeling, and sensor fusion.
 - Proficient in optimizing algorithm performance to ensure accuracy, efficiency, and adaptability across wearable devices.
- **Wearable Technology & Sensor Fusion:**
 - Designed and implemented sensor fusion frameworks integrating inertial sensors (including IMUs) with physiological data (EMG, ECG, etc.) to analyze human motion and biomechanics.
 - Advanced knowledge in leveraging both marker-based and markerless motion capture systems.
- **Machine Learning & Data Analytics:**
 - Skilled in TensorFlow, PyTorch, and scikit-learn to develop predictive models and support health monitoring applications.
 - Experience in data-driven evaluation and algorithmic refinement to ensure reliable performance in real-time environments.
- **Interdisciplinary Collaboration & Communication:**
 - Track record of success working with multidisciplinary teams including engineers, clinicians, sports scientists, and data analysts.
 - Strong technical documentation skills and clear communication in English, ensuring smooth cross-functional collaboration.
- **Emerging Technologies & Innovation:**
 - Actively research and integrate cutting-edge solutions to maintain leadership in wearable and health technology sectors.
 - Passion for fitness, sports science, and wearable technology innovation

PROFESSIONAL EXPERIENCE

R&D Biomedical Engineer

- Designed and refined algorithms for retinal image analysis to detect diabetic retinopathy, integrating seamlessly with the Topcon OCT 1000 device
- Optimized real-time image processing for immediate diagnostic feedback
- Implement quality control protocols to ensure high-quality image analysis
- Conduct studies to validate the accuracy and reliability of the automated system

dorsaVi Co., Australia

Sept 2019 – July 2023

Sept 2023 – Sept 2025 (consultant)

R&D Biomedical Engineer | Data Analyst

- Engineered MATLAB and Python-based AI algorithms for real-time motion tracking and muscle fatigue detection, reducing workplace injuries by 30%.
- Spearheaded sensor fusion for wearable biosensors, integrating EMG, motion, and physiological data to enhance accuracy in diverse environments.
- Validated algorithms using force plates and motion capture systems, achieving 95% reliability in field studies.
- Collaborated with medical teams to align algorithms with clinical standards, ensuring seamless integration into consumer wearables.
- Conducted comprehensive experimental studies across diverse environments to ensure sensor reliability and data quality critical for transitioning research into consumer-ready products.
- Led troubleshooting, quality control, and validation processes for wearable biosensors.
- Authored technical manuals and managed quality control for FDA/CE-certified wearable devices, demonstrating strong adherence to regulatory standards.

University of Melbourne, Australia

Nov 2015–Aug 2020

PhD Researcher

- Established a numerical framework in MATLAB integrating motion capture, force plate, and EMG data to investigate musculoskeletal interaction and prosthesis function in above-knee amputees
- Developed 3D musculoskeletal models of healthy and unilateral transfemoral amputees using OpenSim
- Developed CAD-modeled and prototyped transfemoral prosthetic components
- Led collaborative development of an optimization framework to model musculoskeletal interaction with knee brace for athletes during walking and jumping
- Designed and conducted experiments to collect and analyze motion capture, force plate, and EMG data
- Supervised and mentored undergraduate and M.Sc. students in biomechanics, simulation, and experimental design

KEY PROJECTS

- **AI-Driven Wearable Biosensor System (2019–2023):**
Spearheaded the design and development of state-of-the-art wearable sensor technologies, developing AI-driven algorithms for real-time data processing including motion, EMG, and muscle fatigue detection — Solutions adaptable to fitness tracking and energy expenditure modeling.
- **ML-Powered Retinal Image Analysis (2023–2024):**
Led AI algorithms integrated with diagnostic imaging systems (Topcon OCT), showcasing expertise in algorithm development and signal analysis that is transferable to neurostimulation research.
- **Sensor Fusion Framework for Prosthetic Gait Analysis (2015–2020):**
Developed a comprehensive computational model that integrated motion capture, force plate, and EMG data to evaluate muscle activation patterns and neuromuscular control as well as optimize prosthetic functionality during gait.
- **Optimization Framework for Athletic Biomechanics (2015–2020):**

Designed a musculoskeletal optimization framework to analyze knee brace performance during dynamic activities (walking/jumping), Insights informed injury prevention strategies, showcasing scalability for Huawei's sports science applications.

SELECTED PUBLICATIONS

JOURNALS

- **V. Jafari Harandi.**, D. C. Ackland, R. Haddara, P. Lee – Individual muscle contributions to hip joint-contact forces during walking in unilateral transfemoral amputees with osseointegrated prostheses. Published. Computer Methods in Biomechanics and Biomedical Engineering Journal, 2020.
- **V. Jafari Harandi.**, D. C. Ackland, R. Haddara, E. C. Lizama, M. P. Galea, M. Graf, P. Lee – Gait compensatory mechanism in unilateral transfemoral amputees. Published. Medical Engineering and Physics Journal, 2020.
- Dale Robinson, Lauren Safai, **V. Jafari Harandi.**, M. Graf., E. C. Lizama., P. Lee., M. P. Galea., F. Khan., K. M. Tse., D. C. Ackland – Load response of an osseointegrated implant used in the treatment of unilateral transfemoral amputation: An early implant loosening case study. Published. Clinical Biomechanics Journal, 2020.
- R. Haddara, **V. Jafari Harandi**, P. Lee – Effect of Prophylactic Knee Bracing on Anterior Cruciate Ligament Agonist and Antagonist Muscle Forces During Perturbed Walking. Published, The Orthopaedic Journal of Sports Medicine, 2021.
- R. Haddara, **V. Jafari Harandi**, P. Lee – Anterior cruciate ligament agonist and antagonist muscle force differences between males and females during perturbed walking. Published, Journal of Biomechanics, 2020.
- **V. Jafari Harandi.**, H. Ehsani, M. Rostami – Investigating the role of foot placement on the muscular forces of knee extensors in horizontal leg press: A static optimization approach. ICBME 2013 on IEEE.

CONFERENCES

- **V. Jafari Harandi.**, D. C. Ackland, R. Haddara, P. Lee – Walking mechanics in osseointegrated transfemoral amputees via a 3D musculoskeletal modeling. ISPO congress, Kobe, Japan, 2019.
- R. Haddara, **V. Jafari Harandi.**, P. Lee – Effect of prophylactic knee bracing on muscle forces during unexpected perturbations. ISPO congress, Kobe, Japan, 2019.
- **V. Jafari Harandi.**, D. C. Ackland, R. Haddara, E. C. Lizama, M. P. Galea, M. Graf, P. Lee – Individual muscle contributions to propulsion in above-knee amputees with osseointegrated prosthesis during walking. ISB congress, Calgary, Canada, 2019.
- R. Haddara, **V. Jafari Harandi.**, P. Lee – Effect of prophylactic knee braces on knee valgus angles and moments during perturbed walking. ISB congress, Calgary, Canada, 2019.
- **V. Jafari Harandi.**, D. C. Ackland, E. C. Lizama, M. P. Galea, M. Graf, P. Lee – Hip muscles forces during walking of an above-knee amputee. AOPA congress, Melbourne, Australia, 2017.
- **V. Jafari Harandi.**, D. C. Ackland, E. C. Lizama, M. P. Galea, M. Graf, P. Lee – A computer-based model of above-knee amputee to evaluate gait mechanics. 3DMED symposium, Austin Health, Melbourne, Australia, 2017.
- **V. Jafari Harandi.**, D. C. Ackland, E. C. Lizama, M. P. Galea, M. Graf, P. Lee – Muscle contribution to support during walking in transfemoral amputees. Australian and New Zealand Orthopaedic Research Society (ANZORS) conference, 2017.
- **V. Jafari Harandi.**, H. Ehsani, M. Rostami – The effect of chair's level on knee extensors forces during horizontal leg press motion. ISB congress, Brisbane, Australia, 2017.

HONORS AND AWARDS

- Ad-hoc Reviewer, Journal of Clinical Biomechanics, 2021-Current
- Ad-hoc Reviewer, Journal of Industrial Ergonomics, 2021-Current
- Ad-hoc Reviewer, Gerontology, 2021-Current
- Ad-hoc Reviewer, Journal of Medical Signals & Sensors, 2021-Current
- 2019 Pearson William Tewksbury Scholarship, University of Melbourne, Australia
- 2019 Travel Grant for ISB Conference in Canada, University of Melbourne, Australia
- 2018 Melbourne School of Engineering Studentship, University of Melbourne, Australia
- 2018 Invited Speaker, Beihang University, China
- 2017 Melbourne School of Engineering Studentship, University of Melbourne, Australia
- 2017 Research Training Program Scholarship, University of Melbourne, Australia
- 2017 Travel Grant, ANZORS-RSA Joint Conference, Australia
- 2016 International Postgraduate Research Scholarship, Government of Australia

- 2015 Melbourne International Research Scholarship, University of Melbourne, Australia
- 2011-12 First Rank Among the Graduates' Students, Amirkabir University of Technology, Iran