Hossein Sharifi, PhD, MS

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Summary

Computational Scientist with a PhD in Mechanical Engineering and over seven years of experience in multiphysics finite element modeling (ANSYS, Abaqus, FEniCS) for biomedical applications. Expert in Python and MATLAB for algorithm development, delivering innovative solutions for safety and regulatory compliance. Proven leader in R&D teams, driving impactful design decisions.

Highlights

- **Multiphysics FEM Expertise**: PhD in Mechanical Engineering with 7+ years of experience in static and dynamic FEA simulations (electromagnetic, electromechanical, structural) using ANSYS, Abaqus, and LS-DYNA for biomedical (e.g. heart) and engineering applications.
- **SIMULIA R&D Intern**: 15-month internship with Dassault Systèmes' SIMULIA R&D team on the *Living Heart Project*, developing advanced Abaqus-based FE simulations for biomedical applications.
- **Algorithm and Digital Twin Development**: Skilled in programming multiphysics FEM algorithms, digital twin in Python, formulating governing partial differential equations for electromagnetic and structural applications.
- **Proficient Programmer**: Expert in Python for software development, data analysis, and machine learning.
- **R&D Leadership**: Led innovative computational modeling projects, driving solutions through cross-functional collaboration over 3+ years.
- **Technical Communication**: Authored peer-reviewed publications and federal grant proposals and presented findings to diverse stakeholders.

Technical Skills

FEA Tools: Abaqus, ANSYS, LS-DYNA, FEniCS, Isight, STAAD Pro, SAP2000, CSI Bridge

Programming: Python (NumPy, SciPy, PyTorch, etc.), MATLAB, C++, HTML, JavaScript

CAD: SolidWorks

Operating Systems: Linux, Windows, HPC cluster environments

Experience

Genetesis, Inc. **Mason, OH**
Computational Scientist *Aug 2023–Present*

- Developed multiscale FEA models using FEniCS to simulate cardiac electrophysiology and reproduce magnetocardiogram (MCG) measurements.
- Created patient-specific 3D heart meshes by co-registering MRI and MCG data, enabling inverse modeling for localization of premature ventricular contractions and arrhythmias.
- Designed a novel algorithm to reconstruct the heart's anatomical shape from MCG signals, validated against clinical data.
- Led development of an inverse modeling algorithm for MCGs, fostering cross-functional collaboration with R&D and design teams to evaluate new product lines.
- Conducted static and dynamic FEM simulations on HPC systems and wrote Python scripts for post-processing, visualization, and weekly R&D reporting.

Ligence Heart Company **Remote**
Contract Consultant Scientist *Jan 2025–Apr 2025*

- Developed Python-based software tools for strain analysis pipelines, integrating deep learning algorithms to segment structures from imaging data.
- Advised R&D team on implementing strain analysis and deep learning-based segmentation from imaging datasets, optimizing workflow accuracy.
- Developed a data visualization tool for reporting cardiac strain data (bullseye plot) as a part of finalized software product.

Dassault Systèmes **Providence, RI**
Biomechanical Engineer Intern *May 2022–Jul 2023*

- Simulated MitraClip deployment for edge-to-edge mitral valve repair in the ENRICHMENT project, collaborating with clinical advisors to validate device performance, informing FDA regulatory strategies and contributing to the published playbook.
- Conducted large-scale FEA and CFD simulations of mitral valve dynamics using Abaqus, generating key insights for device safety and supporting in silico clinical trial (ISCT) credibility for the ENRICHMENT project.
- Developed surrogate machine learning models to create virtual patient cohorts, enabling scalable ISCT simulations and accelerating medical device evaluation timelines.
- Utilized SolidWorks for CAD integration, optimizing mitral valve device designs and ensuring compatibility with delivery system interfaces.
- Presented simulation outcomes to principal investigators and external researchers, fostering engagement with the leadership communities.

University of Kentucky **Lexington, KY**
Graduate Research Assistant *Aug 2018–May 2023*

- Developed multiscale FEA algorithms in Python using FEniCS to simulate the electromechanical function of the heart, optimizing constitutive models.
- Collected cardiac MRI (CMRI) data from hundreds of mice, generating animal-specific 3D heart meshes via segmentation techniques for accurate FEA simulations.
- Contributed to development of a multiscale FEA model of a single left ventricle using LS-DYNA.
- Simulated left ventricular function by developing a 0D lumped-parameter model for the `PyMyoVent` pipeline.
- Quantified myocardial strain in mouse hearts by collecting and analyzing MRI data, collaborating with a multidisciplinary team from the Department of Physiology.
- Presented research findings at national conferences, engaging with engineering and scientific communities.

Education

University of Kentucky **Lexington, KY**
PhD in Mechanical Engineering *2018–2023*
GPA: 3.94/4.0; Dissertation: *Multiscale Modeling of Cardiac Growth and Baroreflex Control*

University of Kentucky **Lexington, KY**
MS in Civil Engineering *2016–2018*
GPA: 4.0/4.0; Thesis: *Finite Element Evaluation of 2-Cell RC Box Culverts*

Shiraz University **Shiraz, Iran**
BS in Civil & Environmental Engineering *2010–2014*

Certifications

2022: Introduction to Computer Vision and Image Processing

2022: Introduction to Deep Learning & Neural Networks with Kera

2022: Machine Learning with Python

2020: Applied Plotting, Charting & Data Representation

2020: Introduction to Data Science in Python

2015: Introduction to Programming with MATLAB

Publications (Selected)

2024: Mehri, M., **Sharifi, H.**, et al. *Multiscale fiber remodeling in the infarcted left ventricle using a stress-based reorientation law*. *Acta Biomaterialia*, 189:337–350. DOI: 10.1016/j.actbio.2024.09.049

2024: **Sharifi, H.**, Mehri, M., et al. *Multiscale finite element modeling of left ventricular growth in simulations of valve disease*. *Ann Biomed Eng*. DOI: 10.1007/s10439-024-03497-x

2024: **Sharifi, H.**, Lee, L., et al. *A multiscale finite element model of left ventricular mechanics incorporating baroreflex regulation*. *Comput Biol Med*. DOI: 10.1016/j.compbiomed.2023.107690

2022: **Sharifi, H.**, Mann, C. K., et al. *A multiscale model of the cardiovascular system that regulates arterial pressure via closed-loop baroreflex control*. *Biomech Model Mechanobiol*. DOI: 10.1007/s10237-022-01628-8

2021: **Sharifi, H.**, Mann, C. K., et al. *Multiscale simulations of left ventricular growth and remodeling*. *Biophys Rev*, 13:729–746. DOI: 10.1007/s12551-021-00826-5

Note: Full list available at Google Scholar.