The Faculty of Medicine of Harvard University
Curriculum Vitae

Date Prepared:	**August 5, 2024**
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Education:

08/2004	Bachelor	Aerospace Engineering	Amirkabir University of Technology (Tehran Polytechnic), Iran
01/2007	Master	Aerospace Engineering	Sharif University of Technology, Iran
10/2013	Doctorate	Mechanical Engineering, Thesis Advisors: Dimos Poulikakos & Vartan Kurtcuoglu	Swiss Federal Institute of Technology, ETH Zurich (Hemodynamics and drug delivery in stented arteries)

Postdoctoral Training:

10/2014 – 02/2016	Postdoctoral Fellow	Computational physiology and cardiovascular biomechanics Mentor: Elazer R. Edelman	Institute for Medical Engineering and Science, Health Sciences and Technology Program, Massachusetts Institute of Technology (MIT)
03/2016 – 09/2019	Postdoctoral Associate	Bioinformatics, computational cardiology, drug delivery Mentor: Elazer R. Edelman	Institute for Medical Engineering and Science, HST Program, MIT

Faculty Academic Appointments:

10/2022 –	Assistant Professor	Department of Surgery	Harvard Medical School
07/2021 –	Member of the Faculty	Department of Surgery	Harvard Medical School
10/2019 – 12/2020	Research Scientist	Institute for Medical Engineering and Science, HST Program	MIT

Appointments at Hospitals/Affiliated Institutions:

12/2020-	Lead Investigator	Department of Surgery, Division of Thoracic and Cardiac Surgery	Brigham and Women's Hospital

Major Administrative Leadership Positions:

Local

2003– 2004	Chair, Student Syndicate	Aerospace Engineering Department, Tehran Polytechnic
2019 – 2021	Head, Bioinformatics group	Biomedical Engineering Center (BMEC), MIT
2019 2021	Co-Head, Mechanical Circulatory Support (MCS) group	BMEC, MIT

Committee Service:

Local

2002 – 2004	Member, Students Syndicate, AE Department	Tehran Polytechnic, Iran
	2002 – 2004	Member
2018 – 2020	Thesis Dissertation Committee for Visiting Master Students of BMEC	Massachusetts Institute of Technology
	2018 -	Member
2022 –	Cardiac Surgery Research Oversight Committee	BWH
	2022 -	Co-chair
2023 –	IEEE Boston Section, Professional Development & Education Committee	Co-Chair
2024 –	Biomedical Engineering Society, Diversity Committee	Member

Professional Societies:

2004-2007	Iranian Society of Mechanical Engineers (ISME)	
	2004 – 2007	Student Member
2004-2007	Iranian Aerospace Society	
	2004 – 2007	Student Member
2007-	Iran's National Elites Foundation	
	2007 -	Member
2012-2015	Swiss Engineering Society	
	2012 – 2015	Member
2018-2019	American Physiological Society (APS)	
	2018 – 2019	Member
2021 –	American Heart Association (AHA)	
	2021 -	Member
2021 –	American Physical Society (APS)	
	2021 -	Member
2021 –	Institute of Electrical and Electronics Engineers (IEEE)	
	2021 -	Member

2021 –	European Society of Biomechanics (ESB)	
	2021 -	Member
2021 –	Biomedical Engineering Society (BMES)	
	2021 -	Professional Member

Grant Review Activities:

2023	Modeling and Analysis of Biological Systems (MABS) Study Section	NIH Invited Reviewer
2017	Applied and Engineering Sciences	Netherlands Organization for Scientific Research (NWO) Invited Reviewer
2020,2023	Standalone Projects Program	Austrian Science Fund (FWF) Invited Reviewer
2021, 2022	Research Projects Program	French National Institute of Health and Medical Research (INSERM) Invited Reviewer

Editorial Activities:

Editorial Board

Associate Editor of Cardiovascular Imaging & Heart Valve Disease, Frontiers in Cardiovascular Medicine
Review Editor of Computational Materials Science

Ad hoc Reviewer

Alexandria Engineering Journal
Annals of Biomedical Engineering
Applied Sciences
Archives of Computational Methods in Engineering
Biomechanics & Modeling in Mechanobiology
BioMedical Engineering OnLine
Cardiovascular Engineering & Technology (CVET)
Computational and Structural Biotechnology Journal
Computer Methods and Programs in Biomedicine
Computer Methods in Biomechanics and Biomedical Engineering
Experimental & Therapeutic Medicine
Energy
IEEE Journal of Biomedical and Health Informatics
IEEE Transactions on Medical Imaging
International Journal of Numerical Methods in Biomedical Engineering
Journal of Biomechanical Engineering
Journal of Biomechanics
Journal of the Mechanical Behavior of Biomedical Materials
Journal of Clinical Medicine
Journal of the Royal Society Interface
Medicina

PlosOne
Processes
Reviews in Cardiovascular Medicine
Royal Society Open Science
Scientific Reports (Nature)

Honors and Prizes:

2003	Best Student Award	AE Department, Tehran Polytechnic, Iran	Academics
2006	Top Student Award	Sharif University of Technology, Iran	Academics
2007	Awarded thesis	National Nanotechnology Initiative Council (INIC), Iran	Research
2009	McGill Engineering Doctoral Awards (MEDA)	McGill University	Academics
2013	Research Spotlight	ETH Globe, ETH Zurich and ETH Zurich Alumni Magazine	Research
2013	Featured Research	Selected research of ETH Online, ETH Zurich, Switzerland	Research
2014	Mobility Award	Swiss National Science Foundation, Switzerland	Research
2017	Ambizione Finalist	Swiss National Science Foundation, Switzerland	Research
2019	Finalist	MIT $100K Entrepreneurship Competition, MIT	Research & Entrepreneurship
2021	SPOT Award	MIT Institute for Medical Engineering and Science	Administrative & Community Services
2022	Pillars of Excellence Award	Mass General Brigham	Optimizing Collaboration
2023	IGNITE Award	Connors center	Research
2023	ZOLL Award	Zoll Foundation	Research
2024	Katelyn M. Caruso Chair of Research	Brain Aneurysm Foundation	Research
2024	Rapid AI Chair of Research	Brain Aneurysm Foundation	Research
2024	Mentorship Award	BWH	Community Services

Report of Funded and Unfunded Projects

Past

2014 – 2016 A combined computational & experimental attempt for mechanistic understanding of the interaction between vascular manipulation, local drug delivery and tissue repair.
Swiss National Science Foundation
PI ($97,000)
Goal: To study in depth the effect of procedural factors of coronary intervention in adverse clinical events

2015 Endovascular Devices and Vascular Repair (supplement)

NIH – NIGMS. 5R01GM049039-20 (PI: Elazer Edelman)
Co-Applicant
Supplemental fund to buy state-of-the-art optical coherence tomography set-up

2015-2017 In vitro test of thrombogenicity in self-expanding stents
Industrial grant by Stentys Inc. (PI: Kumaran Kolandaivelu)
Co-Investigator
Goal: Explore the risk of malapposition of self-expanding nitinol stent as a predictor of thrombus formation using engineering phantoms built by additive manufacturing

2016 – 2020 Endovascular Devices and Vascular Repair
NIH – NIGMS. 5R01GM049039-24 (PI: Elazer Edelman)
Project Leader (Co-applicant)
This project seeks to determine the disparity between animal models and clinical human cases and how one could maintain the mechanical environment rather than the geometrical features to better replicate the interventional complexities.

2020 Three-dimensional Transient Modeling of Pharmacokinetics for the Firehawk Sirolimus-eluting Coronary Stents
Shanghai MicroPort Medical (Group) Co., Ltd. (Co-PI: Rami Tzafriri)
Co-PI ($45,000)
This project in reply to an industrial funding computationally studied the drug delivery from an emerging endovascular implant

2017 – 2021 InSilc: In-silico trials for drug-eluting BVS design, development and evaluation
European Union, European Commission H2020 (PI: Dimitris Fotiadis)
Co-Investigator & Task Co-Leader
This project seeks to develop a computational platform for assessing the efficacy and safety of bioresorbable endovascular implants, and we developed the drug delivery module for this computational tool

2021 – 2023 Co-registration of intravascular data from optical coherence tomography with minimally invasive images to characterize the atherosclerotic lesions
HeartFlow Inc. (PI: Elazer Edelman)
Co-Investigator
Goal: The goal is to benefit from extensive information of the intravascular imaging data to validate the calcium burden estimation of CT images.

2021-2022 Improved Delivery System for Drug-Coated Balloon Therapy
NIH 1R43HL160298-01(PI: Rydberg)
Consultant ($15,000)
Goal: to develop a novel pulsatile angioplasty balloon inflation system to improve the efficacy of drug-coated balloon angioplasty.

Current

2022-2025 Personalized Lesion Modification Optimizes Atherosclerosis Intervention
NIH-NHLBI- R01 (PI: Elazer Edelman)
Co-Investigator
Goal: Uncovering, for the first time, the acting mechanisms of lesion modification techniques, quantifying how modification alters vascular micro-morphology (calcium, lipid, fibrous content), micro-mechanics (compliance, stress), and local drug distribution (uptake, retention), after intervention.

2023-2024 Leveraging AI Tools for Prediction of Cardiac Remodeling to Enhance Diagnosis and Therapy in Women with Severe Aortic Stenosis
Connors BWH-MGB Collaborative IGNITE Award
PI
Goal: To leverage advanced machine learning tools to address disparity in diagnosing and treating aortic stenosis in women

2023-2025 Clinical predictors of thrombosis in extracorporeal membrane oxygenators used for acute critical care
Zoll Foundation: Resuscitation and Acute Critical Care
PI
Goal: To leverage advanced machine learning tools to address thrombosis in extracorporeal membrane oxygenation setup and predict adverse events

Projects Submitted for Funding

Submitted 07/2024 Automated Engineering Tools to study Coronary Artery Disease

NSF Career Award
PI
Goal: To leverage micromechanical metrics and computational algorithms to gain a deeper understanding of plaque stability and create a personalized medicine approach to study coronary artery disease

Predicting aortic dissection in Marfan patients using shape analysis and mechanical stressors
Marfan Foundation Career Award
PI
Goal: Using novel machine learning approaches, we leverage anatomical shape to predict the dissection occurrence and surgery results, and conduct computational models to extract functional metrics

Submitted 06/2024 Generating Synthetic Cardiovascular Anatomy to Augment In-Silico Clinical Trials

NSF
Co-I
Goal: To unveil a groundbreaking method, harnessing generative AI to sculpt virtual anatomies for precise studies into the device-anatomy interplay

Submitted 10/2023	AI-guided tools for enhanced aortic stenosis therapy NIH R01 PI Goal: To leverage machine learning to stratify the risk and plan for therapy in AS patients
Submitted 11/2023	Mechanistic risk stratification in coronary artery disease leveraging automated AI tools AHA Career Award PI Goal: to create a personalized medicine tool that can predict the real-time risk of rapid plaque progression and destabilization.
Submitted 11/2023	Real-time estimation of patient-specific structural and shear stress in diseased coronaries to predict clinical events AHA's Second Century Early Faculty Independence Award PI Goal: To develop an engineering platform that facilitates characterization of micro morphology and micromechanics in diseased coronary arteries
Submitted 12/2023	Leveraging Sexual Dimorphism to Predict Cardiac Remodeling and Enhance Treatment in Women with Severe Aortic Stenosis NIH R21 PI Goal: To present a comprehensive approach to analyzing cardiac remodeling using advanced machine learning techniques
Submitted 01/2024	Mending Broken Hearts: Metabolomic Optimization of Ex Vivo Perfused Hearts Before Transplantation Collaborative Sciences Award Co-PI Goal: To present a comprehensive approach to study ex vivo heart perfusion
Submitted 01/2024	Utilizing Deep Learning in the Diagnosis of Aortic Stenosis Severity for Strategic Therapy Planning PhRMA Foundation Translational Medicine Career Award PI Goal: To leverage machine learning to stratify the risk and plan for therapy in AS patients

Training Grants and Mentored Trainee Grants

2016 – 2017	Hemodynamics of paravalvular leaks after Transcatheter aortic valve replacement American Heart Association Co-Investigator (PI: Zahra K. Motamed)

Goal: Computationally predict the clinical outcomes of angioplasty in patients with mild/moderate coarctation.

2019 – 2020 Mechanical characterization of multi-material atherosclerotic lesions using inverse modeling techniques
Zeno Karl Schindler Foundation
Co-Mentor (PI: Bharath Narayanan)
Goal: To extract the structural behavior of lesion heterogeneous coronary lesions using inverse finite element models

2019 – 2020 Understanding TAVR Device Expansion as it Relates to Morphology of the Bicuspid Aortic Valve: A Simulation Study
Harvard Medical School, Scholars in Medicine
Co-Mentor (PI: Jonathan Kusner)
Goal: Distinguish between different categories of bicuspid aortic valve patients as it relates to their outcome post TAVR highlighting the distinct effect of geometrical morphology and consequent structural stress state.

2020 Computational fluid dynamics of the adult aorta during use of extracorporeal membrane oxygenation and left ventricular assist.
Zeno Karl Schindler foundation
Co-Mentor (PI: Brooke Zampell)
Goal: To numerically explore how the combination of ECMO and Impella alter physiological flow and perfusion in patient-specific aorta models.

2020 – 2021 Processing angiography and intravascular imaging of atherosclerotic arteries using machine learning techniques.
EPFL Women In Science & Humanities Foundation
Co-Mentor (PI: Yanan Niu)
Goal: Build machine learning platform for image processing to extract geometrical features of heterogeneous diseased coronary arteries.

2022 Leveraging Shape Analysis and Machine Learning to Identify Hemodynamic Features of Aortopathy
Zeno Karl Schindler foundation
Mentor (PI: Emma Roussel)
Goal: To use statistical shape analysis and neural network modeling to predict Aortopathy from morphology of vasculature with higher accuracy.

2022 Patient-specific Study of Calcium Morphology and Distribution to Predict Clinical Outcomes in Atherosclerotic Arteries
Zeno Karl Schindler Foundation
Mentor (PI: Ross Straughan)

Goal: To build a computational platform to correlate the adverse outcomes for interventions in highly calcified lesions to the calcium morphology.

2022 Computational study of hemodynamics in bicuspid valves after transcatheter aortic valve replacement
Heyning-Roelli Foundation
Mentor (PI: Leonardo Rossato)
Goal: To build a computational platform to study blood flow in bicuspid valves after TAVR procedure.

2023 Patient-specific Study of Calcium Distribution to Predict Clinical Outcomes in stenosed heart valves
Zeno Karl Schindler Foundation
Mentor (PI: Sandra Haltmeier)
Goal: To build an automated platform to correlate the adverse outcomes for TAVR interventions to the calcium distribution.

2023 Seeing through blood: An experimental setup to enhance visual access for cardiac surgery
Heyning-Roelli Foundation and ETH SEMP scholarship
Mentor (PI: Manuel Mekkattu)
Goal: To build a prototype for visual access through blood vessels and chambers

2024 – Leveraging deep learning algorithms for risk stratification and therapy planning in patients with aortic stenosis
AHA Postdoctoral Fellowship
Mentor (PI: Amir Rouhollahi)
Goal: To build a computational platform to study clinical events after TAVR procedure

Unfunded Current Projects

2020 – Computational modeling of fluid-structure interaction in bicuspid aortic valve
PI
Goal: Study hemodynamics and structural environment of bicuspid aortic valves and risk stratification for aortic stenosis and ascending aorta aneurysm based on their morphology and function.

2020 – Computational modeling of hemodynamics in mechanical assist devices
PI
Goal: Explore aberrant hemodynamic metrics and turbulent blood flow patterns in life support systems and assist devices.

2020 – Local drug pharmacokinetics and pharmacodynamics in stented coronary arteries
Co-PI
Goal: Build an in silico platform to model drug delivery and responses in various vascular beds

2022 –	Reduced-order modeling of lung injury PI Goal: To leverage 0-D models to characterize the lung injury for patients with acute respiratory distress syndrome (ARDS)	

Report of Local Teaching and Training

Teaching of Students in Courses:

Spring 2006	Advanced Mathematics	Department of Aerospace Engineering, Sharif University of Technology
Fall 2011 & Fall 2012	Energy Conversion and Transport in Biological Systems, Co-lecturer	Department of mechanical Engineering, ETH Zurich
Fall 2016	Computational Methods in Cardiovascular Research	Institute for Medical Engineering and Science, MIT, 1 session of 1.5h

Research Supervisory and Training Responsibilities:

2010 – 2013	Supervision of graduate students (average of 1 student per year)	ETH Zurich, 10-12 hours per week per student
2010 – 2013	Supervision of undergraduate students (average of 1 student per year)	ETH Zurich, 8-10 hours per week per student
2015 – 2021	Supervision of undergraduate students (average of 1-2 students per year)	Massachusetts Institute of Technology, 8-10 hours per week per student
2015 – 2021	Supervision of graduate students (average of 2-3 students per year)	Massachusetts Institute of Technology, 10-12 hours per week per student
2017 – 2021	Supervision of medical students (average of 1 student per year)	Massachusetts Institute of Technology, 4-8 hours per week per student
2017 – 2021	Supervision of PhD candidates (average of 1-2 candidates per year)	Massachusetts Institute of Technology, 8-10 hours per week per fellow
2020 – 2021	Supervision of post-doctoral research fellows (average of 1-2 fellows per year)	Massachusetts Institute of Technology, 4-6 hours per week per fellow
2020 –	Supervision of post-doctoral research fellows (average of 3-4 fellows per year)	Brigham and Women's Hospital, 8-10 hours per week per fellow
2021 –	Supervision of graduate students (average of 6-8 students per year)	Brigham and Women's Hospital 6-8 hours per week per student
2021 –	Supervision of undergraduate students (average of 1-2 students per year)	Brigham and Women's Hospital 4-8 hours per week per student

2021 –	Supervision of medical students (average of 1 student per year)	Brigham and Women's Hospital, 10-12 hours per week per student

Mentored Trainees and Faculty:

2010 – 2011 Fernando Pacheco, Graduate student, ETH Zurich, Switzerland
Career stage: Master's student, Imperial College, UK (6-month Master Thesis work at ETH Zurich). Mentoring role: primary research and career mentor. Accomplishments: co-authored a journal paper and a poster publication; graduation with a master's degree, Imperial College, UK followed by an industrial career at Stryker.

2010 – 2011 Shyam Natarajan, Graduate student, ETH Zurich, Switzerland
Career stage: Master student (3-month semester thesis at ETH Zurich). Mentoring role: Thesis co-supervisor. Accomplishments: Admitted for PhD at ETH Zurich.

2012 – 2013 Gian Schadli, Undergraduate student, ETH Zurich, Switzerland
Career stage: Bachelor student (6-month bachelor thesis at ETH Zurich). Mentoring role: Thesis supervisor. Accomplishments: Admitted for Master/PhD at ETH Zurich.

2015 – 2016 Amin Ebrahimi, Graduate student, Ferdowsi University
Career stage: Master student, Ferdowsi University. Mentoring role: primary research and career mentor. Accomplishments: Published a journal paper and admitted for PhD at TU Delft at Netherlands.

2015 – 2016 Franz Hackbarth, Undergraduate student, University of Hartford
Career stage: Research internship (6 months at MIT & BWH). Mentoring role: Co-mentor. Accomplishments: contributed to an industry-funded project with Stentys and followed his career in industry after graduation.

2015 – 2017 Elaine Ma, Undergraduate Student, Wellesley College
Career stage: Research internship at MIT (part-time 2 semesters and one summer). Mentoring role: co-mentor. Accomplishments: graduated with BS degree.

2015 – 2016 Anjali Mirsa, Undergraduate student, MIT
Career stage: Research intern. Mentoring role: co-mentor. Accomplishments: awarded the Mitchell Scholarship to pursue a master's in public health at University College Cork in Ireland, and currently MD Candidate at Harvard Medical School.

2016 Suk Joon Lee, MD Candidate at Harvard Medical School
Career stage: Research fellow. Mentoring role: co-mentor. Accomplishments: co-authored a journal paper and now MD-PHD student at Harvard.

2016 Iva Monique T Gramatikov, Undergraduate student, MIT

Career Stage: undergraduate research assistant at MIT. Mentoring role: co-mentor. Accomplishments: Research Assistant at Koch Institute, MIT.

2016 David Dellal, Undergraduate student, MIT

Career Stage: undergraduate research assistant at MIT. Mentoring role: co-mentor. Accomplishments: NSF Graduate Fellow at Yale University.

2016 – 2017 Junedh Amrute, Undergraduate student, Caltech

Career Stage: Summer research fellow, MIT. Mentoring role: co-mentor. Accomplishments: Multiple published journal papers and abstracts as well as oral presentations, admitted as MD-PhD Student at Washington University in St Louis School of Medicine.

2017 – 2019 Masoud Vahedi, Graduate student, University of Semnan

Career Stage: Remote research assistant. Mentoring role: primary research and career mentor. Accomplishments: co-authored multiple publications including a journal paper and an abstract with oral presentations of supervised research, Admitted for PhD to U Calgary.

2017 – 2019 Pei-Jiang Wang, PhD, Boston University

Career Stage: PhD candidate, MIT. Mentoring role: co-mentor. Accomplishments: multiple published journal papers and abstracts, followed by professional career at Boston Scientifics.

2017 – Max Olender, PhD, MIT

Career Stage: PhD candidate, MIT. Mentoring role: co-mentor. Accomplishments: several journal and conference papers, multiple abstract and pending patents, Graduated with PhD from MIT, currently awarded Congressional Fellow.

2018 – 2020 Mehdi Ramezanpour, Graduate student, Tarbiat Modarres University

Career Stage: remote research assistant, MIT. Mentoring role: primary research and career mentor. Accomplishments: Published two first-author journal papers, an oral presentation, a submitted paper, admitted to University of Pittsburg for PhD.

2019 Ana Rusetski, Graduate student, EPFL Switzerland

Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-supervisor. Accomplishments: Funded fellowship for master's thesis at MIT, graduated with master's, and followed her career at Amgen Inc.

2019 Eitan Galper, Undergraduate student, University of Maryland

Career Stage: Summer internship at MIT. Mentoring role: Supervisor. Accomplishments: Published a journal paper, Admitted to the University of Maryland.

2019 – 2020 Bharath Narayanan, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-supervisor. Accomplishments: Funded fellowship for master's thesis at MIT, multiple abstracts published, published a journal paper and filed pending patents, graduated with master's, and currently PhD student at EPFL.

2019 – 2020 Elissa C Ito, Undergraduate student, MIT
Career Stage: undergraduate research assistant at MIT. Mentoring role: co-mentor. Accomplishments: Successfully contributed to an industry-funded project.

2019 – 2020 Jon Kusner, MD, Harvard Medical School
Career Stage: MD/Resident fellow, MIT. Mentoring role: co-mentor. Accomplishments: multiple abstract and journal papers published; joined Duke University for residency.

2019 – 2020 Farhan Khodaee, Graduate student, University of Denver
Career Stage: Graduate research assistant, MIT. Mentoring role: primary research and career mentor. Accomplishments: multiple published journal papers and abstracts as well as oral presentations, admitted to MIT Mechanical Engineering program for PhD.

2019 – 2020 Monika Colombo, PhD/Research fellow, Politecnico di Milano
Career Stage: Visiting PhD candidate, MIT. Mentoring role: co-mentor. Accomplishments: Funded fellowship for 1-year visit at MIT, submitted a journal paper, graduated with PhD, Postdoctoral position at ETH Zurich.

2020 – 2021 Brooke Zampell, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-supervisor. Accomplishments: Funded fellowship for master's thesis at MIT, multiple submitted abstracts and journal papers, graduated with master's from EPFL, joined industry.

2020 – 2021 Yanan Niu, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-supervisor. Accomplishments: Funded fellowship for master's thesis at MIT, graduated the master's program of EPFL, and currently a PhD student at the same institution.

2020 – 2021 Abhishek Karmakar, Graduate student, Indian Institute of Technology
Career Stage: remote research assistant, MIT. Mentoring role: Mentor. Accomplishments: Published a paper followed by an oral presentation, admitted to the Cornel University for PhD.

2020 – Karim Kadry, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: primary research and career mentor. Accomplishments: Published several journal papers, graduated the master's program of EPFL and joined MIT for PhD under my co-supervision.

2021 – 2022 Jessica Williams, PhD/Postdoctoral fellow, Brigham and Women's Hospital
Career Stage: postdoctoral fellow. Mentoring role: co-mentor. Accomplishments: multiple grant submissions; Winner of the Rock the Mic Pitch Session at Discover Brigham 2020; Joined Boston Scientific.

2021 – Hamed Moradi, MS/Research Engineer, Sharif University of Technology
Career Stage: Remote Research assistant. Mentoring role: primary research and career mentor. Accomplishments: contributing to an industry-funded project on computational cardiology; Multiple abstracts and papers published; started PhD at TU Eindhoven.

2021 – 2022 James Willi, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis supervisor. Accomplishments: Funded fellowship for master's thesis at BWH, multiple submitted abstracts and a drafted journal paper.

2021 – Amir Rouhollahi, PhD, Postdoctoral fellow, Brigham and Women's Hospital
Career Stage: postdoctoral fellow. Mentoring role: Mentor. Accomplishments: AHA fellowship; Several papers published.

2021 – 2023 Mohammad Mostafa Asheghan, PhD, Postdoctoral fellow, Brigham and Women's Hospital
Career Stage: postdoctoral fellow. Mentoring role: Mentor. Accomplishments: multiple grant submissions; Awarded the 2021 BRI Research Excellence Award, Joined WPI as a Faculty Member.

2022 Emma Roussel, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor. Accomplishments: Funded fellowship for master's thesis at BWH, joined industry.

2022 Ross Straughan, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH (prospective). Mentoring role: Thesis Supervisor. Accomplishments: Funded fellowship for master's thesis at BWH, multiple journal papers published, started PhD at ETH.

2022 Leonardo Nunes Rossato, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor. Accomplishments: Funded fellowship for master's thesis at BWH, a book chapter published, joined industry.

2022 Rabina Awal, PhD student, University of Louisiana at Lafayette
Career Stage: Intern at BWH. Mentoring role: Internship Supervisor.
Accomplishments: Finished PhD and joined industry.

2022 – Jonas Sogbadji, PhD student, MIT
Career Stage: Master thesis at IMES. Mentoring role: Thesis co-Supervisor.
Accomplishments: Finished master's and started PhD at MIT under my co-supervision.

2022 – Yiqing Liu, Postdoctoral Fellow, MIT
Career Stage: Postdoc at IMES, MIT. Mentoring role: co-Supervisor.
Accomplishments: Multiple publications.

2023 Matthias Gilles Zeller, Graduate Student, EPFL Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis co-Supervisor.
Accomplishments: Defended the thesis and joined industry.

2023 Sandra Haltmeier, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.
Accomplishments: Funded fellowship for master's thesis at BWH, multiple published abstracts and journal papers. Started PhD at ETH

2023 Manuel Mekkattu, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.
Accomplishments: Funded fellowship for master's thesis at BWH, Received 2023 Research Excellence award from BWH, started PhD at ETH.

2023 Rick Saner, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.
Accomplishments: Defended the thesis and joined industry.

2023 Kehan Pan, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.
Accomplishments: Defended the thesis and joined industry.

2023 – 2024 Anny Wang, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.

2023 – Mert Ertugrul, Graduate student, ETH Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-Supervisor.

2023 – Mariia Eremina, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-Supervisor.

2023 So Hee Ahn, Graduate student, MIT
Career Stage: Master's Thesis at IMES, MIT. Mentoring role: Thesis co-Supervisor.
Accomplishments: Defended the thesis and joined Medical School.

2023 – Shreya Gupta, Graduate student, MIT

Career Stage: Master's research at IMES, MIT. Mentoring role: co-Supervisor.

2023 – 2024 Rakhym Annabayev, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.

2023 – 2024 Raimon Casamitjana Roig, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.

2023 – Elias Bou Farhat, MD, Postdoctoral fellow, Brigham and Women's Hospital
Career Stage: Fellow at BWH. Mentoring role: career mentor & project supervisor
Accomplishments: multiple grant submissions; Awarded the 2023 BRI Research Excellence Award, multiple publications.

2024 – Chang Yan, Graduate student, ETH Switzerland
Career Stage: Master's thesis at BWH. Mentoring role: Thesis Supervisor.

2024 – Naravich Chutisilp, Graduate student, EPFL Switzerland
Career Stage: Master's thesis at MIT. Mentoring role: Thesis co-Supervisor.

2024 – Neeka Khosraviani, Undergraduate student, UMass Amherst
Career Stage: Intern at BWH. Mentoring role: Supervisor.

2024 – Ganti Mahapatruni Harshvardhan, Intern, Boston University
Career Stage: Intern & Engineering Staff at BWH. Mentoring role: Supervisor.
Ajay Yatheendhar Manicka <ajay_m@mit.edu>

2024 – Ajay Yatheendhar Manicka, PhD student, MIT
Career Stage: PhD student at MIT. Mentoring role: co-Supervisor

Local Invited Presentations:

No presentations below were sponsored by 3rd parties/outside entities

2014 Hemodynamics of stented coronary arteries
Institute for Medical Engineering and Science, MIT

2015 Biofluid Dynamics, Computational Perspective
Institute for Medical Engineering and Science, MIT

2016 Systemic biocompatibility of endovascular implants, New perspective
Harvard-MIT Biomedical Engineering Center, MIT

2020 Computational tools to design assist devices
Harvard-MIT Biomedical Engineering Center, MIT

2020	In silico tools to optimize drug delivery in emerging endovascular implants Harvard-MIT Biomedical Engineering Center, MIT
2020	Computational tools to study life support systems Cardiovascular Life Sciences Work in Progress Seminar, Brigham and Women's Hospital
2021	A Computational Patient-Specific Model of Impella Support for Cardiogenic Shock Discover Brigham 2021, Brigham and Women's Hospital

Report of Regional, National and International Invited Teaching and Presentations

No presentations below were sponsored by 3rd parties/outside entities

Regional

2018	Evaluating the future role of polymer stents: New research & advanced designs to improve patient care Medical Tubing, Woburn, MA
2019	Computational Physiology in Medical Device Arena: The New Concept of Mechanical Biocompatibility Worcester Polytechnic Institute, Worcester, MA
2019	Computational physiology and mechanical biocompatibility in the era of theranostics and digital medicine Massachusetts General Hospital (MGH), Boston, MA
2020	Mechanical biocompatibility in the era of digital medicine Northeastern University, Boston, MA
2022	Risk of Cardiac Ischemia in respiratory failure patients using upper body venoarterial extracorporeal membrane oxygenation: A computational study Lung Research Center Symposium, Brigham and Women's Hospital, Boston, MA
2023	Hemodynamics Of Impella Support: A Computational Patient-specific Model Of Therapy For Cardiogenic Shock Abiomed Inc. (remote), Boston, MA
2023	Leveraging Machine Learning and Computational Models to Address Challenges in Cardiovascular and Cardiac Surgery Research Center for Interdisciplinary Sciences (CICS), Boston, MA

National

2018 Flow modulator restores physiological perfusion in vital organs in type-B Aortic dissection.

U.S. National Congress for Theoretical Application of Mechanics
Northwestern University, Chicago, IL

2019 Computational physiology and mechanical biocompatibility in the era of digital medicine
University of Toledo, Toledo, OH

2019 Mechanical biocompatibility assessment using computational physiology
Syracuse University, Syracuse, NY

2019 Mechanical biocompatibility in the era of digital medicine
University of Pittsburg, Pittsburg, PA

2020 Leveraging computational tools to address mechanical biocompatibility: A new perspective in personalized digital medicine
Stevens Institute of Technology, New Jersey, NJ

2020 Computational physiology and bioinformatics to serve personalized digital medicine
Virginia Tech, Blacksburg, VA

2020 Reduced Risk of Spinal Cord Ischemia With Multilayer Flow Modulators In Type-B Aortic Dissection Patients
The American Society for Artificial Internal Organs 66th Annual Conference
Virtual

2021 Computational Prediction of Drug-eluting Stent Performance in Patient-specific Arteries - A Virtual Reality"
2nd Biomedical Engineering & Instrumentation Summit
Boston, MA

2021 Effect of Upper body venoarterial extracorporeal membrane oxygenation on end-organ oxygen delivery in respiratory failure patients: a computational study
74th Annual Meeting of the APS Division of Fluid Dynamics
Phoenix, AZ

2022 My Journey in Computational Cardiology and Atherosclerosis: An Aerospace Engineer Working at Hospital
Boston IEEE EMBS Invited Talk Serries
Virtual

International

2013 Optimal wall shear metrics for the prediction of plaque location

8th International Symposium on Biomechanics in Vascular Biology and Cardiovascular Disease, Rotterdam, The Netherlands

2014 A Model of Tumor Growth Coupling a Cellular Biomodel with Biomechanical Simulations
Research Workshop on In Silico Oncology and Cancer Investigation, Athens, Greece

2016 Patient-specific computational study of drug deposition in porcine coronary arteries with overlapping stents.
International Bio-Fluid Symposium, Pasadena, CA

2018 Effect of Raphe Extent on the Functionality of Bicuspid Aortic Valves/Oral Presentation
World Congress of Biomechanics, Dublin, Ireland

2018 Computational module for drug delivery in bioresorbable vascular scaffolds
European Research Commission, Luxembourg

2018 Modeling drug delivery in a sirolimous-eluting stent: investigation of physico-chemical properties of coating, drug, and arterial tissue
Workshop for Modelling and Experiments in Drug Delivery Systems, University of Glasgow, UK.

2019 Computational Physiology, Biofluidics, and Medical Device Design/optimization
University of Twente, Netherlands

2019 In-silico module to model transient three-dimensional drug delivery in subject-specific geometries of stented arteries: physics-based simulation of controlled release and tissue retention
Workshop, International Conference on Computational Bioengineering, Belgrade, Serbia

2020 Transient subject-specific drug delivery in stented arteries: physics-based simulation of controlled release and retention
9th International Bio-Fluid Mechanics and Vascular Mechano-Biology Symposium
Tucson, Arizona

2021 Computational tools to enhance mechanical biocompatibility in bioresorbable vascular scaffolds/Invited Webinar
Yazd Stem Cell and Regenerative Medicine Institute, Iran

2022 Challenges for AI in medicine

	Second edition of the Symposium "AI and Medicine: Promises and Limits", National Academy of Medicine, Paris, France
2022	Drug discovery Second edition of the Symposium "AI and Medicine: Promises and Limits", National Academy of Medicine, Paris, France
2023	Computational Models and Machine Learning Suites to Enhance Therapy Planning and Surgical Outcomes University of Basel, Switzerland
2023	Patterns of Calcium in Aortic Stenosis and Impact on TAVR TCT
2024	Real-Time Quantification of Patient-specific Wall Stress in Diseased Coronary Arteries Biomechanics in Vascular Biology and Cardiovascular Disease Rotterdam, Netherlands

Report of Technological and Other Scientific Innovations

Quantitative and Direct Visualization of Vascular State and Micro-Morphology from Intravascular Image Data	Disclosed Invention, M.I.T. Case No. 22697, filed in 2020 Description: A haptic stimulator includes a multilayer sheet with either a piezoelectric or electroactive polymer layer adapted to mechanically deform upon application of a voltage to the polymer, the multilayer sheet secured to a substrate, and a source of electrical stimulation coupled to drive the electrodes on the polymer layer with an AC signal to vibrate the polymer layer. In particular embodiments, the polymer contains polyvinylidene fluoride.
A Method Leveraging Morphology for Non-Destructive In Situ Mechanical Characterization of Heterogeneous Biological Tissue	Pending patent, 2021 Description: At Edelman lab, my colleagues and I created a computational tool to extract the lesion micro morphology from intravascular images using deep learning techniques. Inverse methods are then used applying optimization techniques to two imaging pull backs with intravascular pressure measurements to estimate the material properties of different diseased tissue components.
Deep Learning Approaches to Classify Atherosclerotic Tissue	Software Code Disclosure, M.I.T. Case No. 23593, filed in 2021 Description: A software has been developed which is capable to quantify constituents of atherosclerotic lesions using deep learning techniques. This platform allows delineation of micromorphology in atherosclerotic vasculature prior and post intervention, and thus assesses the performance of procedure.

Corneal Epithelium Imaging Setup to record a new biomarker to sub-clinically detect Keratoconus	Provisional Patent filed Description: oxygen consumption mapping within the epithelium and stroma as an effectual and accurate measure of diagnosis of Keratoconus at the earliest stage. We proposed corneal epithelium reflectography by UVA1 multispectral scanner and image processing
Automated, simulation-ready digital twin generation from intravascular images of coronary arteries	BWH Disclosure filed Description: We have developed a tool which automatically generates structural simulation files and digital twins from segmented intravascular images
System and method for mechanical characterization of heterogeneous tissue	US Patent App. 18/277,128 Description: Inverse methods are used in imaging data to estimate the material properties of different diseased tissue components.

Report of Education of Patients and Service to the Community

No presentations below were sponsored by 3rd parties/outside entities

Activities

2013	Science for The Community Interview with Science page of local newspaper, Swiss Federal Institute of Technology (ETH Zurich)
2018 – 2019	Meet the Faculty, Harvard Medical School This is an annual event providing the community of MD students with the latest research at laboratories associated with Health, Science, and Technology Program of Harvard Medical School.
2019	Miami-MIT Program This is an introduction of BMEC, MIT research to extend the impact of education/research and innovation activities at Miami, Visit the Mayor event, Cambridge, MA
2019	MIT Stephen A. Schwarzman College of Computer Inauguration Computational Cardiology Research presenter, Cambridge, MA.
2021	Discover Brigham, Brigham and Women's Hospital

This is an annual event presenting the research activity of Brigham Research Institute to the community; 3 posters accepted; 1 poster awarded with Excellence award; 1 poster selected for roundtable session

2022 Discover Brigham, Brigham and Women's Hospital
This is an annual event presenting the research activity of Brigham Research Institute to the community; 4 posters presented

2023 Discover Brigham, Brigham and Women's Hospital
This is an annual event presenting the research activity of Brigham Research Institute to the community; 4 posters presented

2024 Harvard Research Day, HMS
This is an annual event presenting the research activity of HMS to the community; 1 Talk and 2 posters presented

Report of Scholarship

ORCID ID: orcid.org/0000-0002-4210-3177

Peer-Reviewed Scholarship in print or other media:

Research Investigations

1. **Rikhtegar F,** Knight JA, Olgac U, Saur SC, Poulikakos D, Marshall W, Cattin PC, Alkadhi H, Kurtcuoglu V. Choosing the optimal wall shear parameter for the prediction of plaque location: A patient-specific computational study in human left coronary arteries, *Atherosclerosis* 2012; 221:432-437, PMID: 22317967.

2. **Rikhtegar F,** Pacheco F, Wyss C, Stock KS, Ge H, Choo RJ, Ferrari A, Poulikakos D, Müller R, Kurtcuoglu V. Compound Ex Vivo and In Silico Method for Hemodynamic Analysis of Stented Arteries, *PLoS One* 2013; 8(3):e58147. PMID: 23516442.

3. Holme MN, Schulz G, Deyhle H, Weitkamp T, Beckmann F, Lobrinus JA, **Rikhtegar F**, Kurtcuoglu V, Saxer T, Müller B. Complementary X-ray tomography techniques: Histology-validated three-dimensional imaging of soft and hard human tissues, *Nature Protocols* 2014; 9:1401-1415. PMID: 24853926.

4. **Rikhtegar F**, Wyss C, Stock KS, Poulikakos D, Müller R, Kurtcuoglu V. Hemodynamics in coronary arteries with overlapping stents, Journal of Biomechanics 2014; 47(2):505-511. PMID: 24275438.

5. Naglik C, **Rikhtegar F**, Klug C. Buoyancy of some Palaeozoic ammonoids and their hydrostatic properties based on empirical 3D-models, *Lethaia* 2015; 49 (1):3-12.

6. Gokgol C, Diehm N, **Rikhtegar Nezami F**, Büchler P. Nitinol Stent Oversizing in Patients Undergoing Popliteal Artery Revascularization: A Finite Element Study, *Annals of biomedical engineering* 2015; 43 (12):2868-2880. PMID: 26101031.

7. Keshavarz-Motamed Z, Randles A, **Rikhtegar Nezami F**, Partida RA, Nakamura K, Staziaki PV, Ben-Assa E, Ghoshhajra B, Bhatt AB, Edelman ER. Mild Coarctation of the Aorta: To Touch or Not to Touch the Patient? Looking at Left Ventricular Function and Hemodynamics, *Circulation* 2016; 132: A18045-A18045. PMID: 22335567.

8. Ebrahimi A, **Rikhtegar F**, Sabaghan A, Roohi E, Heat transfer and entropy generation in a microchannel with longitudinal vortex generators using nanofluids, Energy 2016; 101: 190-201.

9. **Rikhtegar F**, Edelman ER, Olgac U, Poulikakos D, Kurtcuoglu V. Drug deposition in coronary arteries with overlapping drug-eluting stents. *Journal of controlled release* 2016; 238:1-9. PMID: 27432751.

10. Athanasiou LS, **Rikhtegar F**, Galon MZ, Lopes AC, Lemos PA, Edelman ER. Optimized automated segmentation and 3D reconstruction using intracoronary optical coherence tomography. *IEEE Journal of Biomedical and Health Informatics* 2018; 22(4). PMID: 29969405. (Featured on Cover)

11. Amrute JM, Athanasiou LS, **Rikhtegar F**, de la Torre Hernandez JM, Camarero TG, Edelman ER. Polymeric endovascular strut and lumen detection algorithm for intracoronary optical coherence tomography images. *Journal of Biomedical Optics (JBO)* 2018; 23(3). PMID: 29560624

12. **Rikhtegar F**, Athanasiou LS, Amrute JM, Edelman ER. Multilayer flow modulator enhances vital organ perfusion in type B Aortic dissection patients, *American Journal of Physiology-Heart and Circulatory Physiology* 2018; 315(5):H1182-H1193. PMID:30095992

13. Athanasiou LS, **Rikhtegar F**, Edelman ER. Position Paper Computational Cardiology. *IEEE Journal of Biomedical and Health Informatics* 2018; 23(1): 4-1. PMID: 30346296. (Featured on Cover)

14. Wang PJ*, **Rikhtegar F***, Gorji MB, Berti F, Petrini L, Wierzbicki T, Migliavacca F, Edelman ER. Effect of working environment and procedural strategies on mechanical performance of bioresorbable vascular scaffolds. *Acta Biomaterialia* 2018; 82:34-43. PMID: 30342288. (*Equal Contribution)

15. Pordanjani AH, Vahedi SM, **Rikhtegar F**, Wongwises S. Optimization and sensitivity analysis of magneto-hydrodynamic natural convection nanofluid flow inside a square enclosure using response surface methodology. *Journal of Thermal Analysis and Calorimetry* 2019; 135 (2), 1031-1045.

16. Athanasiou LS*, **Rikhtegar F***, Edelman ER. Hemodynamic consequences of a multilayer flow modulator in Aortic Dissection. *Medical & Biological Engineering & Computing* 2019; Vol. 57, Issue 9, pp 1861–1874. PMID: 31209712. (*Equal Contribution)

17. Ramezanpour M, Maerefat M, Mokhtari-Dizaji M, Roshanali F, **Rikhtegar F**. Numerical investigation of the effects of bed shape on the end-to-side CABG hemodynamics. *Journal of Mechanics in Medicine and Biology* 2019; Vol. 19, No. 4.

18. Olender ML, Athanasiou LS, de la Torre Hernandez JM, Ben Assa E, **Rikhtegar F**, Edelman ER. A Mechanical Approach to Smooth Surface Fitting to Determine Vessel Walls in Optical Coherence Tomography Images. *IEEE Transactions on Medical Imaging* 2019; Vol. 38, No. 6. PMID: 30507499.

19. Ramezanpour M*, **Rikhtegar F***, Kabinejadian F, Ramezanpour N, Maerefat M, Holzapfel GA, Bull, JL. Role of Vessel Microstructure in the Longevity of End-to-side Grafts. *Journal of Biomechanical Engineering-ASME* 2020; 142 (2), PMID: 31141598. (*Equal Contribition)

20. Keshavarz-Motamed Z, Khodaei SV, **Rikhtegar F**, Amrute J, Lee SJ, Brown J, Ben-Assa E, Camarero TG, Calvo JR, Sellers S, Blanke P, Leipsic J, Hernandez JM, Edelman ER. Mixed valvular disease following transcatheter aortic valve replacement: quantification and systematic differentiation using clinical measurements and image-based patient-specific in silico modeling. *J of American Heart Association* 2020; 9 (5), e015063. PMID: 32106747.

21. **Rikhtegar F**, Khodaee F, Edelman ER, Keller SR. A Computational Fluid Dynamics Study of the Extracorporeal Membrane Oxygenation-Failing Heart Circulation. *American Society for Artificial Internal Organs Journal* 2021; 7 (3), 276-283. PMID: 33627601. (Featured on Cover)

22. Wang PJ, Berti F, Antonini L, **Rikhtegar F**, Petrini L, Migliavacca F, Edelman ER. Multimodal loading environment predicts bioresorbable vascular scaffolds' durability, *Annals of Biomed Eng* 2021; published Online. PMID: 33123828.

23. Kusner J, Luraghi G, Khodaee F, Rodriguez Matas JF, Migliavacca F, Edelman ER, **Nezami FR**. Understanding TAVR Device Expansion as it Relates to Morphology of the Bicuspid Aortic Valve: A Simulation Study, *PLoS One* 2021; 16 (5), e0251579. PMID: 33999969.

24. Olender ML, de la Torre Hernández JM, Athanasiou LS, **Nezami FR**, Edelman ER. Artificial Intelligence to Generate Medical Images: Augmenting the Cardiologist's Visual Clinical Workflow, *European Heart Journal - Digital Health* 2021 September; 2(3): 539-544.

25. Kadry K, Olender ML, Marlevi D, Edelman ER, **Nezami FR**. A platform for high-fidelity patient-specific structural modelling of atherosclerotic arteries: from intravascular imaging to three-dimensional stress distributions, *Journal of Royal Society Interface 2021;18(182).* PMID: 34583562.

26. Conway C*, **Nezami FR***, Rogers C, Groothuis A, Squire A, Edelman ER. Acute Stent-Induced Endothelial Denudation: Biomechanical Predictors of Vascular Injury, *Frontiers in Cardiovascular Medicine* 2021; 8:733605. PMID: 34722666 (*Equal Contribution)

27. Narayanan B, Olender ML, Marlevi D, Edelman ER, **Nezami FR**. An Inverse Method for Mechanical Characterization of Heterogeneous Diseased Arteries using Intravascular Imaging, *Nature Scientific Reports* 2021. PMID: 34795350

28. **Nezami FR**, Ramezanpour, M, Khodaee F, Goffer E, Edelman ER, Keller SP. Simulation of Fluid-Structure Interaction in Extracorporeal Membrane Oxygenation Circulatory Support Systems, *Journal of Cardiovascular Translational Research* 2022; 15 (2), 249-257. PMID: 34128180.

29. Khodaee F, **Nezami FR**, Zampell BA, Galper E, Edelman ER, Keller SR. Effect of anatomical variation on extracorporeal membrane oxygenation circulatory support: A computational study. *Computers in Biology and Medicine* 2022; 141:105178. PMID: 34995875.

30. Olender ML, Niu Y, Marlevi D, Edelman ER, **Nezami FR**. Impact and implications of mixed plaque class in automated characterization of complex atherosclerotic lesions. *Computerized Medical Imaging and Graphics* 2022; 97:102051. PMID: 35272217.

31. Williams JG, Marlevi D, Bruse JL, **Nezami FR**, Moradi H, Fortunato RN, Maiti S, Billaud M, Edelman ER, Gleason TG. Aortic Dissection is Determined by Specific Shape and Hemodynamic Interactions. *Annals of Biomedical Engineering* 2022 Aug 9. PMID: 35943618.

32. Karmakar A, Olender ML, Marlevi D, Shlofmitz E, Shlofmitz RA, Edelman ER, **Nezami FR**. Framework for lumen-based nonrigid tomographic coregistration of intravascular images. *J Med Imaging* 2022; 9(4):044006. PMID: 36043032.

33. Moradi H, Al-Hourani A, Concilia G, Khoshmanesh F, **Nezami FR**, Needham S, Baratchi S, Khoshmanesh K. Recent developments in modeling, imaging, and monitoring of cardiovascular diseases using machine learning. Biophysical Reviews. 2023 Jan; 10:1-5. PMID: 36909958

34. Asheghan M, Javadikasgari H, Attary T, Rouhollahi A, Straughan R, Willi JN, Awal R, Sabe A, de la Cruz KI, **Nezami FR**. Predicting One-Year Left Ventricular Mass Index Regression Following Transcatheter Aortic Valve Replacement in Patients with Severe Aortic Stenosis: A New Era is Coming, *Frontiers in Cardiovascular Medicine* 2023; 10:1130152.

35. Salazar-Martín AG, Kalluri S, Villanueva MA, Hughes TK, Wadsworth MH, Dao TT, Balcells M, **Nezami FR**, Shalek AK, Edelman ER. Single-Cell RNA Sequencing Reveals That Adaptation of Human Aortic Endothelial Cells to Antiproliferative Therapies Is Modulated by Flow-Induced Shear Stress, Arteriosclerosis, Thrombosis, and Vascular Biology. 2023; 43:2265–2281.

36. Rouhollahi A, Willi JN, Haltmeier S, Mehrtash A, Straughan R, Javadikasgari H, Brown J, Itoh A, de la Cruz KI, Aikawa E, Edelman ER, **Nezami FR**. CardioVision: A fully automated deep learning package for medical image segmentation and reconstruction generating digital twins for patients with aortic stenosis. Computerized Medical Imaging and Graphics. 2023; 109:102289.
37. Straughan R, Kadry K, Parikh SA, Edelman ER, **Nezami FR**. Fully automated construction of three-dimensional finite element simulations from Optical Coherence Tomography. Comput Biol Med. 2023; 165:107341.
38. Liu Y, **Nezami FR**, Edelman ER. A transformer-based pyramid network for coronary calcified plaque segmentation in intravascular optical coherence tomography images. Computerized Med Imaging Graph. 2024 Apr;113:102347.

Other peer-reviewed scholarship

Case Reports

1. Keshavarz-Motamed Z, **Rikhtegar Nezami F**, Partida RA, Nakamura K, Staziaki PV, Ben-Assa E, Ghoshhajra B, Bhatt AB, Edelman ER. Elimination of trans-coarctation pressure gradients has no impact on left ventricular function or aortic shear stress post intervention in patients with mild coarctation of the aorta. *Journal of the American College of Cardiology (JACC): Cardiovascular Intervention* 2016; 9(18): 1953-1965, 2016. PMID: 27659574.

Reviews, Correspondence

1. Olender ML, **Nezami FR**, de la Torre Hernández JM, Athanasiou LS, Edelman ER. Translational challenges for synthetic imaging in cardiology, *European Heart Journal - Digital Health* 2021.

2. Kolandaivelu K, **Rikhtegar F**. The Systems Biocompatibility of Coronary Stents, *Interventional Cardiology Clinics* 2016; 5(3):295-306. PMID: 28582028.

Non-peer reviewed scholarship in print or other media:

Proceedings of Meetings or other non-peer reviewed scholarship

1. **Rikhtegar Nezami F**, Kolokotroni E, Stamatakos G, Büchler P. A Model of Tumor Growth Coupling a Cellular Biomodel with Biomechanical Simulations. IEEE *Proceedings of the 6th Int Adv Research Workshop on In Silico Oncology and Cancer Investigation* 2014.
2. Amrute JM, Athanasiou L, **Rikhtegar F**, de la Torre Hernandez JM, Camarero TG, Edelman ER. Automated Segmentation of Bioresorbable Vascular Scaffold Struts in Intracoronary Optical Coherence Tomography Images. *Proceeding of IEEE International Conference on Bioinformatics and Bioengineering (BIBE)* 2017; pp. 297-302. PMID: 30147989.
3. Athanasiou LS, **Rikhtegar F**, Galon MZ, Lopes AC, Lemos PA, Edelman ER. Fully automated lumen segmentation of intracoronary optical coherence tomography images. *Proc. SPIE Medical Imaging* 2017; P10133:101332. PMID: 30147989.

4. Karanasiou G, Tsompou P, Tachos N, Antonini L, Petrini L, Pennati G, Gijsen F, **Rikhtegar Nezami F**, Tzafiri R, Vaughan T, Martin F, Fotiadis DI. Design and implementation of in silico clinical trial for Bioresorbable Vascular Scaffolds, *42nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, July 2020, Montreal, Canada PMID: 33018557.
5. Karmakar A, Olender ML, **Rikhtegar Nezami F**, Marlevi D, Shlofmitz E, Shlofmitz RA, Edelman ER. Detailed Investigation of Lumen-Based Tomographic Co-Registration, *IEEE International Conference on Bioinformatics and Biomedicine (BIBM)* 2020; pp. 1038-1042.
6. Tzafriri R, **Rikhtegar F**, Edelman ER. Computational Prediction of Drug-Eluting Stent Performance in Patient-Specific Arteries: A Virtual Reality. *JACC: Cardiovascular Interventions* 2020; 13 (4), S43-S44. PMID: 30814251.
7. Karanasiou G, Tsompou P, Tachos N, Karanasiou GE, Sakellarios A, Kyriakidis S, Antonini L, Pennati G, Petrini L, Gijsen F, **Rikhtegar Nezami F**, Tzafiri R, Martin F, Fotiadis DI, An in silico trials platform for the evaluation of effect of the arterial anatomy configuration on stent implantation, *43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)* 2021, pp. 4213-4217.
8. Niu Y, Olender ML, Marlevi D, **Nezami FR**, Edelman ER. Improving Automated Tissue Characterization in Optical Coherence Tomography by Melding Attenuation Compensation with Deep Learning, *IEEE International Conference on Biomedical and Health Informatics (BHI'21)* 2021.
9. Narayanan B, Olender ML, **Nezami FR**, Edelman ER, Marlevi D. In Vitro Validation of a Novel Image-Based Inverse Method for Mechanical Characterization of Vessels, *IEEE International Conference on Biomedical and Health Informatics (BHI'21)* 2021.
10. Moradi H, Edelman ER, Keller SP, **Nezami FR**. Oxygen Delivery in Upper Body Venoarterial Extracorporeal Membrane Oxygenation: A Computational Model. ASAIO Journal: June 2022 - Volume 68 - Issue Supplement 2 - p 49.
11. Kadry K, Karmakar A, Schuh A, Petersen K, Schaap M, Marlevi D, Taylor C, Edelman ER, **Nezami FR**. Morphology-based non-rigid registration of coronary computed tomography and intravascular images through virtual catheter path optimization. ArXiv, 2022.
12. Kadry K, Gupta S A, **Nezami FR**, Edelman ER. Probing the Limits and Capabilities of Diffusion Models for the Anatomic Editing of Digital Twins, arXiv:2401.00247, 2023.
13. Rouhollahi A, Haltmeier S, Javadikasgari H, Bou Farhat E, de la Cruz K, Aikawa E, and **Nezami FR**. TCT-390 AI-Guided Assessment of Calcium Burden for Enhanced Risk Stratification and Outcome Prediction in Severe Aortic Stenosis Patients Undergoing Transcatheter Aortic Valve Replacement. J Am Coll Cardiol. 2023 Oct, 82 B155.
14. Straughan R, Kadry K, Edelman ER, **Nezami FR**. Arteriosclerosis, Automated Platform for Large Scale Structural Simulations of Atherosclerotic Lesions Thrombosis, and Vascular Biology. 2023;43:A622.
15. Liu Y, **Nezami FR**, Edelman ER. A Framework for Automated Quantification of Calcified Coronary Artery from Intravascular Optical Coherence Tomography Images, 2023 IEEE EMBS International Conference on Biomedical and Health Informatics (BHI), Pittsburgh, PA, USA, 2023, pp. 1-4.

16. Straughan R, Kadry K, Parikh SA, Edelman ER, **Nezami FR.** Fully Automated Construction of Three-dimensional Finite Element Simulations from Optical Coherence Tomography. ArXiv [Preprint]. 2024 May 22:arXiv:2405.13643v1.
17. Kadry K, Gupta S, Sogbadji J, Schaap M, Petersen K, Mizukami T, Collet C, **Nezami FR**, Edelman ER. A Diffusion Model for Simulation Ready Coronary Anatomy with Morpho-skeletal Control., arXiv preprint arXiv:2407.15631.
18. Farahani A, Zarei-Hanzaki A, Abedi HR, Daryoush S, Delbari Ragheb Z, Mianabadi F, Shahparvar S, Akrami M, Mostafavi E, Khanbareh H, **Nezami FR**. Silk-based biopolymers promise extensive biomedical applications in tissue engineering, drug delivery, and BioMEMS.. Journal of Polymers and the Environment 31 (11), 4559-4582.

Book Chapters:

1. **Rikhtegar Nezami F**, Athanasiou L, Edelman ER. Endovascular Drug Delivery and Drug Elution Systems, Biomechanics of Coronary Atherosclerotic Plaque, From Model to Patient, Part 5, Elsevier, Vol. 4, Ed. 1, ISBN: 978-0-12-817195-0, 2020. Editor: J. Ohayon (Book chapter).
2. Edelman ER, Athanasiou L, **Rikhtegar F**. Endothelial cells and hemodynamics. McDonald's Blood Flow in Arteries, CRC Press (Taylor & Francis), p.125-135, 2022.
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4. Edelman ER, **Rikhtegar Nezami F**. Anatomy of the heart and circulation, McDonald's Blood Flow in Arteries**,** CRC Press (Taylor & Francis), p.17-23, 2022
5. Rossato LN, Kusner J, **Nezami FR**. Modeling Hemodynamics of Rotary Blood Pumps and Predicting the Potential Risks. Applied Complex Flow: Applications of Complex Flows and CFD, Singapore: Springer Nature Singapore, pp. 1-19, 2023.

Thesis:

Rikhtegar Nezami F, Hemodynamics and Mass Transport in Stented Coronary Arteries. Doctoral Thesis, Department of Mechanical Engineering, ETH Zurich, Oct 2013
URL: https://doi.org/10.3929/ethz-a-010118593

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings:

1. Darbandi M, **Rikhtegar Nezami F**. Finite volume simulation of micro and Nano gas flows using second-order boundary condition. International Conference on Computational Methods (ICCM), Hiroshima Japan, 4-6 April 2007. Oral Presentation
2. Darbandi M, **Rikhtegar F**, Schneider GE. Simulation of rarefied micro to Nano gas flows using improved slip flow models. 37th AIAA Fluid Dynamics Conference and Exhibit, Miami, FL, USA, 2007. Oral Presentation
3. Darbandi M, Vakilipour S, **Rikhtegar Nezami F**, Schneider GE, Finite volume simulation of gaseous micro flows using modified slip flow conditions, 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, USA, 2007. Oral Presentation

4. **Rikhtegar F**, Knight JK, Olgac U, Saur SC, Poulikakos D, Marshall, Cattin PC, Alkadhi H, Kurtcuoglu V. Optimal wall shear metrics for the prediction of plaque location, 8th Int. Symp on Biomech in Vasc Biology and Cardiovascular Disease, Rotterdam, 2013. Poster Presentation
5. **Rikhtegar F**, Pacheco F, Wyss C, Stock KS, Ge H, Choo RJ, Ferrari A, Poulikakos D, Mueller R, Kurtcuoglu V. From Real Heart to CFD. 8th Int Symp on Biomech in Vasc Biol & Cardiov Disease, Rotterdam, 2013. Poster Presentation
6. Buscema M, Holme MN, **Rikhtegar Nezami F**, Kurtcuoglu V, Weinberger A, Bugna S, Herzen J, F. Beckmann, Zumbuehl A, Saxer T, Mueller B. Determining the Shear Stress Threshold of Mechano-Sensitive Nano Containers for Targeted Vasodilatation. 4th Japan-Switzerland Workshop on Biomechanics (JSB). Nagoya, JAPAN, 2014. Oral Presentation
7. Keshavarz-Motamed Z, **Rikhtegar Nezami F**, Randles A, Partida RA, Nakamura K, Staziaki PV, Ben-Assa E, Ghoshhajra B, Bhatt AB, Edelman ER. Mild Coarctation of the Aorta: To Touch or Not to Touch the Patient? Looking at Left Ventricular Function and Hemodynamics. American Heart Association Scientific Sessions. November 07 - 11, Orlando, FL, USA, 2015. Oral Presentation
8. Keshavarz-Motamed Z, Randles A, **Rikhtegar Nezami F**, Partida RA, Nakamura K, Staziaki PV, Ben-Assa E, Ghoshhajra B, Bhatt AB, Edelman ER. Mild Coarctation of the Aorta: To Touch or Not to Touch the Patient? Looking at Left Ventricular Function and Hemodynamics, Bulletin of the American Physical Society, 60, 2015. Oral Presentation
9. **Rikhtegar F**, Kunio M, Lopes AC, Bailey L, Edelman ER. Endovascular stents to induce diffuse calcified lesion and maintain persistent malapposition in porcine coronary arteries. 11th International Symp on Biomechanics in Vascular Biology and Cardiovascular Disease. Emory University, May 2-3, Atlanta, GA, USA, 2016. Poster presentation
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17. Olender M, Athanasiou L, **Rikhtegar F**, Edelman ER. Computational Modeling in Cardiology: Image-derived and Intervention-driven insights. 2nd IEEE EMBS International Summer School on Computer Modeling in Medicine, June 9-14, 2019, Charleston, SC, USA. Oral Presentation (by Olender M)
18. **Rikhtegar F**, Khodaee F, Athanasiou LS, Edelman ER. Multilayer Flow Modulators Prevent Paraplegia in Type-B Aortic Dissection. 9th Int Bio-Fluid Mech and Vascular Mechano-Biology Symp, Feb 13-16, Tucson, AZ, 2020. Poster Presentation
19. Tzafriri AR, **Rikhtegar F**, Edelman ER. Computational Prediction of Drug-eluting Stent Performance in Patient-specific Arteries - A Virtual Reality", CRT2020, Feb 22-25, MD, 2020.
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21. **Rikhtegar Nezami F**, Athanasioua LS, O'Brien CC, Bailey L, Ma E, Lopes AC, Tzafriri R, Edelman ER. Endovascular implant malapposition persists in diffuse hard lesions but not in pristine coronary arteries. EuroPCR, May 2020, Paris, France. Cancelled due to Covid
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23. Khodaee F, Kaushik M, Brown J, **Rikhtegar F**, Edelman ER. Aortic Valve Calcification topography defines the Stenosis Severity. BEIS, July 20-22, Boston, 2021. Virtual Oral Presentation (By Khodaee F)
24. Tzafriri AR, Marlevi D, Budrewicz J, Bailey L, Markham P, Albaghdadi M, **Nezami FR**, Edelman ER. Atraumatic Endoluminal Microincisions Enhance Balloon-based Drug Delivery In Complex Porcine Restenotic Lesions. CRT 2021 Virtual, Feb 13 - April 24, 2021. Virtual Oral Presentation (By Tzafriri AR)
25. **Nezami FR**, Khodaee F, Qi Z, Corbett S, Keller SP, Edelman ER. Hemodynamics of Impella Support: A Computational Patient-specific Model Of Therapy For Cardiogenic Shock, 66th ASAIO Annual Conference. 2021. Virtual. Poster Presentation.
26. Khodaee F, **Nezami FR**, Zampell B, Corbett S, El Katerji A, Edelman ER, Keller SP. A Computational Model of The Hemodynamics of Ecpella Support, 66th ASAIO Annual Conference 2021. Virtual. Oral Presentation (By Khodaee F).
27. Ramezanpour M, Kusner J, Edelman ER, **Nezami FR**. Quantifying drivers of valve failure in bicuspid aortic valves: Raphe-dependent strain concentration. 74th Annual Meeting of the APS Division of Fluid Dynamics. 2021 November. Phoenix, Arizona. Oral Presentation (By Ramezanpour M).
28. Moradi H, Edelman ER, Keller SP, **Nezami FR**. Oxygen Delivery in Upper Body Venoarterial Extracorporeal Membrane Oxygenation: A Computational Model. 67th Annual Conference of the American Society of Artificial Internal Organs (ASAIO). 2022 June. Chicago, Illinois. Oral Presentation (By Keller SP).
29. Straughan R, Kadry K, Edelman ER, **Nezami FR**. Automated Platform For Large Scale Structural Simulations Of Atherosclerotic Lesions. Vascular Discovery Scientific Sessions (ATVB|PVD). American Heart Association. 2023 May. Boston, Massachusetts. Poster Presentation.

30. Moradi H, Edelman ER, Keller SP, **Nezami FR**. Computational modeling of oxygen transport to predict cardiac ischemia in lung failure patients treated with upper body venoarterial extracorporeal membrane oxygenation. Assisted Circulation Gordon Research Conference. 2023 May. Waterville Valley in Waterville Valley, New Hampshire. Poster Presentation.
31. Straughan R, Kadry K, Edelman ER, **Nezami FR**. A Framework to Create 3D Finite Element Models Fully-automatically from Optical Coherence Tomography. Biomechanics in Vascular Biology and Disease Gordon Research Conference. 2023 August. Mount Holyoke College in South Hadley, Massachusetts. Poster Presentation.

Narrative Report

Introduction: I am a Lead Investigator at Brigham and Women's Hospital (BWH) in the Department of Surgery, Division of Thoracic and Cardiac Surgery. I received my doctoral degree in Mechanical Engineering from Swiss Federal Institute of Technology (ETH Zurich) wherein I focused on developing a compound ex vivo and in silico method to study blood flow and drug delivery in stented coronary arteries. I later joined as a postdoctoral fellow to Harvard-MIT Biomedical Engineering Center at MIT where I was affiliated as a research scientist until December 2020. My research at MIT mainly focused on leveraging engineering tools and computational platforms to address challenges in cardiovascular research and clinical practices. My laboratory at BWH incorporates powerful computational tools that meld mechanics, translational medicine, and bioinformatics to examine the basis of critical cardiovascular diseases and propose novel therapies.

Area of expertise: My primary expertise is in using computational methods as well as both in vitro and ex/in vivo experiments to tackle challenges in cardiology and cardiac surgery. Integrating multiple disciplines of engineering, computer science, and biomaterials, my lab aims to achieve mechanistic understanding of several valvular and vascular diseases. Using elements of fluid dynamics, continuum mechanics, mass transport, and image processing, my team and I also assess the performance and optimize the design of assorted medical devices such as stents, prosthetic valves, endovascular implants, mechanical assist devices, and life support systems. Our provably reliable tools as well provide predictive means and diagnostic tools for clinicians and regulatory officials to update clinical therapy and surgical guidelines.

My initial graduate level research, on hemodynamics and drug delivery of stented arteries, has now expanded to span the wide spectrum of cardiovascular application including AI-guided surgery, life support systems, fusion imaging, and prosthetic devices such as valves, among others. With the privilege of daily collaboration with pioneer clinicians at BWH and unique access to a large cohort of clinical trials, my team and I develop data-driven tools based on data science and machine-learning routines to offer risk stratification and quantitative insight for enhanced clinical decision in cardiac surgery (related to e.g. aortic dissection, stenosis, aneurysm, etc.), cardiovascular intervention (angioplasty) and mechanical support devices. Developing rigorous tools for modeling, analysis, and synthesis of complex biological systems, my lab contributes to foster collaboration with clinical experts and industrial partners.

Teaching and Education: My research fuels my teaching. I am passionate about teaching and mentoring envisioning my role as a teacher to help students and trainees to become independent thinkers. Benefited from exposure to master teachers and, at their encouragement, with formal training in teaching, my teaching style is amalgam of personal evolution and incorporation of my lab's active line of research.

My desire to engage, challenge, and inspire young bright minds has not been limited to the classroom. I have had the privilege of co-supervising more than a dozen of PhD/MD students and postdocs, and more than twenty bachelor/master students - the majority of whom have been awarded fellowship funding and/or been reported in peer-reviewed scientific publications and assumed successful positions in academia and industry. Working closely with the chief of the Division of Thoracic and Cardiac Surgery at the Brigham and university leaders, I seek to fill the gap to engage local engineering and medical students in applied medical engineering research and incorporate hands-on experiences of frontier cardiovascular research to their academic syllabus mentoring them in my research lab.

Summary: As a recently established independent researcher, I seek to leverage my engineering expertise and network of professional researchers to advance clinically driven research at the interface of engineering and medicine, and teach and mentor the next generation of medical engineering scientists and insightful medical experts.