

Bioengineering

Research Map

Lee Makowski, Professor and Chair
l.makowski@northeastern.edu

Qianqian Fang, Associate Professor and Associate
Chair for Research and Graduate Studies
q.fang@northeastern.edu

Shiaoming Shi, Director of MS Programs
s.shi@northeastern.edu

Biomedical Devices and Bioimaging

Samuel Chung
Qianqian Fang
Tim Lannin
Helen Markewich
Mark Niedre
Esin Sozer
Tao Sun
Mohammad Abbas
Yaseen

Biomechanics, Biotransport, and Mechanobiology

Rouzbeh Amini
Chiara Bellini
Guohao Dai
Jessica Oakes
Harikrishnan Parameswaran
Jeffrey Ruberti
Sandra Shefelbine

Molecular, Cell, and Tissue Engineering

Anand Asthagiri
Ambika Bajpayee
Samuel Chung
Guohao Dai
Michael Jaeggli
Jiahe Li
Elizabeth Libby
Lee Makowski
Helen Markewich
Harikrishnan Parameswaran
Sara Rouhanifard
Jeffrey Ruberti
Shiaoming Shi

Systems, Synthetic, and Computational Bioengineering

Anand Asthagiri
Chiara Bellini
Miten Jain
Erel Levine
Herbert Levine
Elizabeth Libby
Mingyang Lu
Mona Minkara
Jessica Oakes
Nikolai Slavov
Eduardo Sontag
Raimond Winslow

Engineering Education

Aileen Huang-Saad

@nu_bioe

@nu_bioe

@NUBioE1



Anand Ashthagiri

Associate Professor of Bioengineering

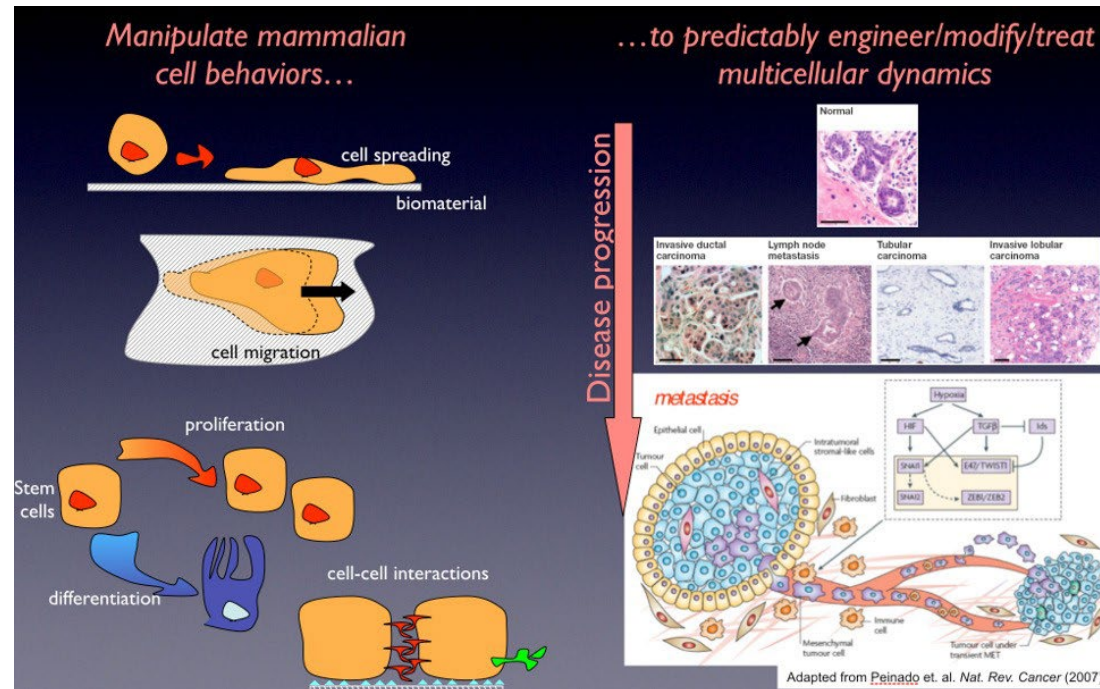
Affiliated Professor of Biology and Chemical Engineering

a.asthagiri@northeastern.edu

Research Area 3: Molecular, Cell and Tissue Engineering

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: cell and tissue engineering, quantitative principles of cancer cell biology and developmental biology



Lab Website: <http://www.cell-engineering.org>

Profile: <https://coe.northeastern.edu/people/asthagiri-anand/>

Teaching: BIOE3380 Biomolecular dynamics and control, BIOE5420 Cellular Engineering



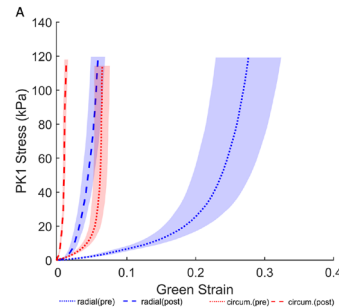
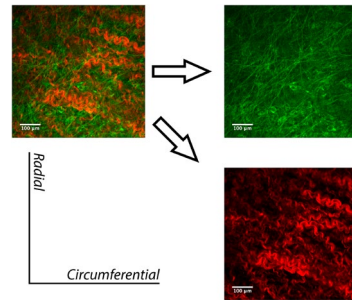
Rouzbeh Amini

Associate Professor of Bioengineering, Mechanical and Industrial Engineering

r.amini@northeastern.edu

Research Area 2: Biomechanics, Biotransport and Mechanobiology

Structural and Mechanical Characterization



Multi-scale Modeling

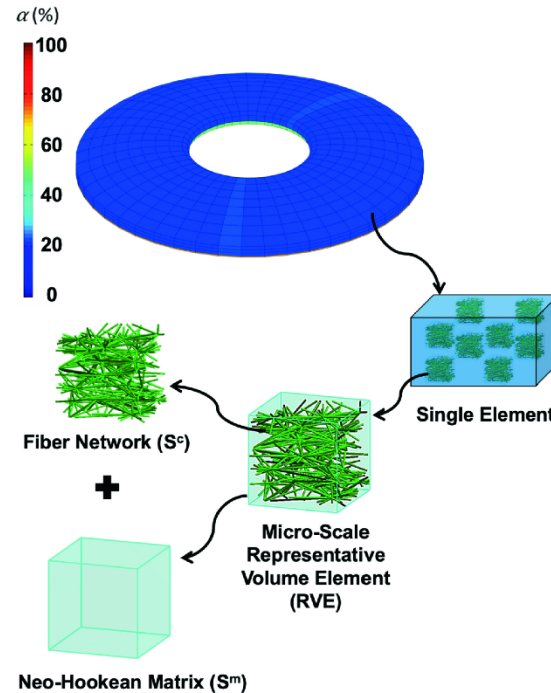
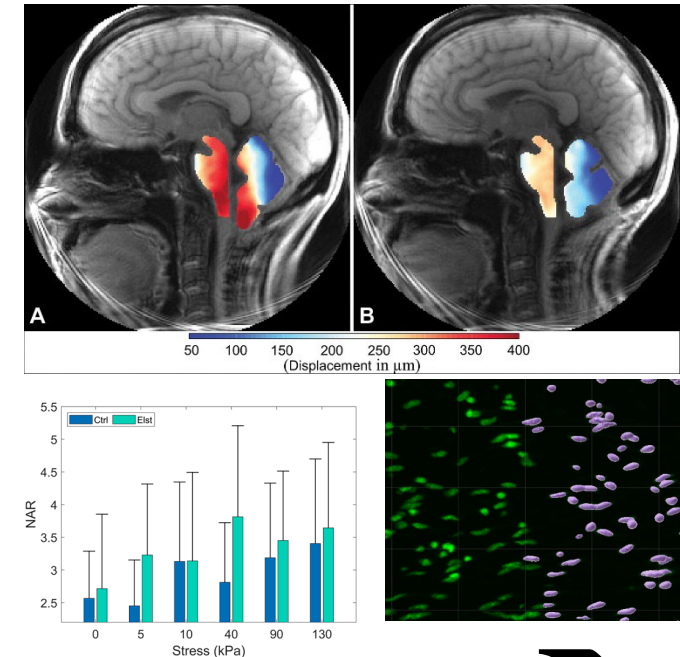


Image-based Biomechanics and Mechanobiology



Lab website: <https://ramini.coe.northeastern.edu/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/amini-rouzbeh/>



Ambika Bajpayee

Associate Professor of Bioengineering

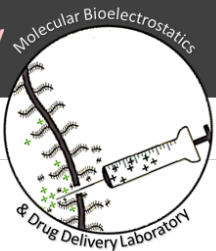
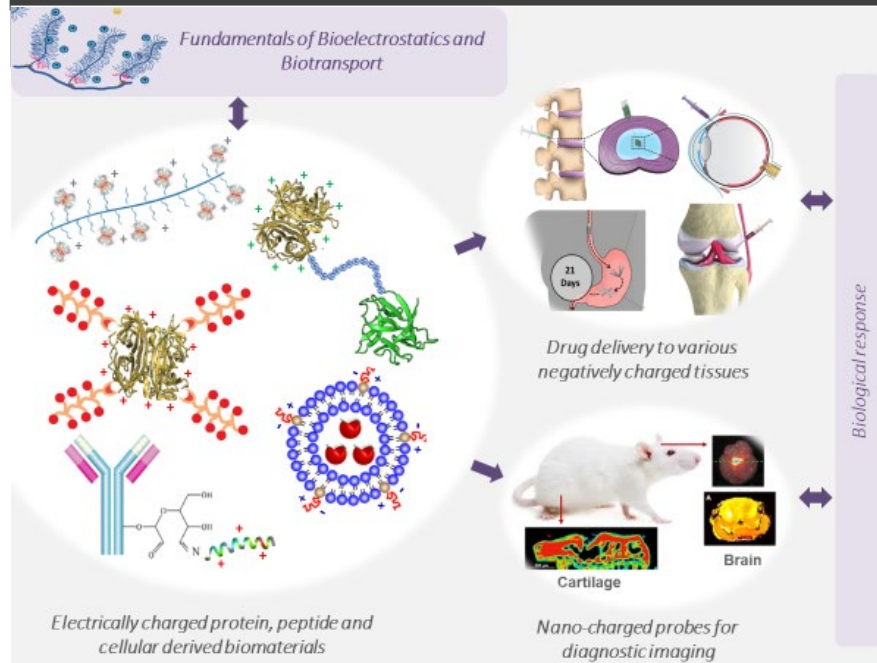
Molecular Bioelectrostatics & Drug Delivery Lab

a.bajpayee@neu.edu

Research Area 3: Molecular, Cell, and Tissue Engineering

Research Interests: Targeted delivery of drugs and imaging probes; bio-electrostatics; bio-transport modeling; mechanisms underlying trauma and age induced osteoarthritis

Molecular Bioelectrostatics and Drug Delivery Lab | Northeastern University



Lab website: <https://web.northeastern.edu/bajpayeelab/>

Teaching: BIOE 5650 Multiscale Biomechanics; 2350 Biomechanics; 5651 Fields Forces and Flows



Chiara Bellini

Associate Professor of Bioengineering

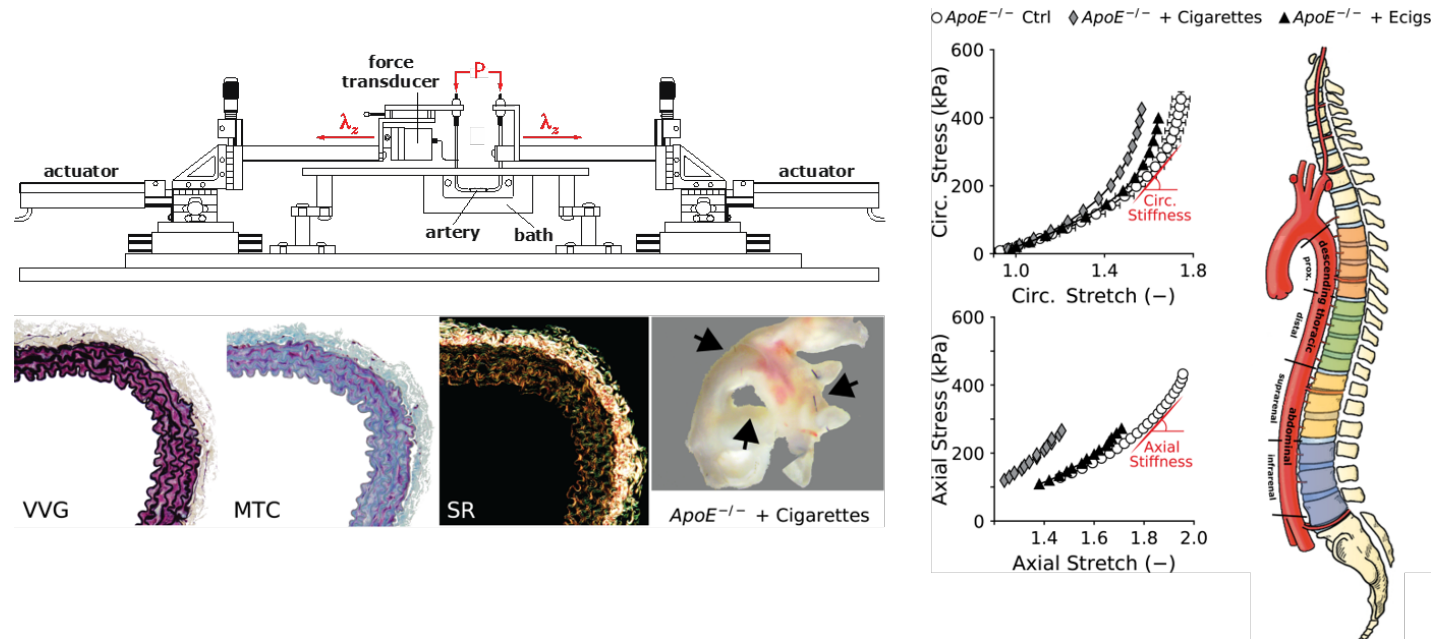
Affiliated Faculty, Mechanical and Industrial Engineering

c.bellini@northeastern.edu

Research Area 2: Biomechanics, Biotransport and MechanoBiology

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Cardiovascular mechanics; cell-mediated growth & remodeling of tissues and organs; thoracic aortic aneurysms; arterial stiffness; vascular/skeletal systems interaction; effect of chronic aerosol inhalation on cardiovascular function



Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/bellini-chiara/>

Teaching: BIOE 2350 Biomechanics



Samuel Chung

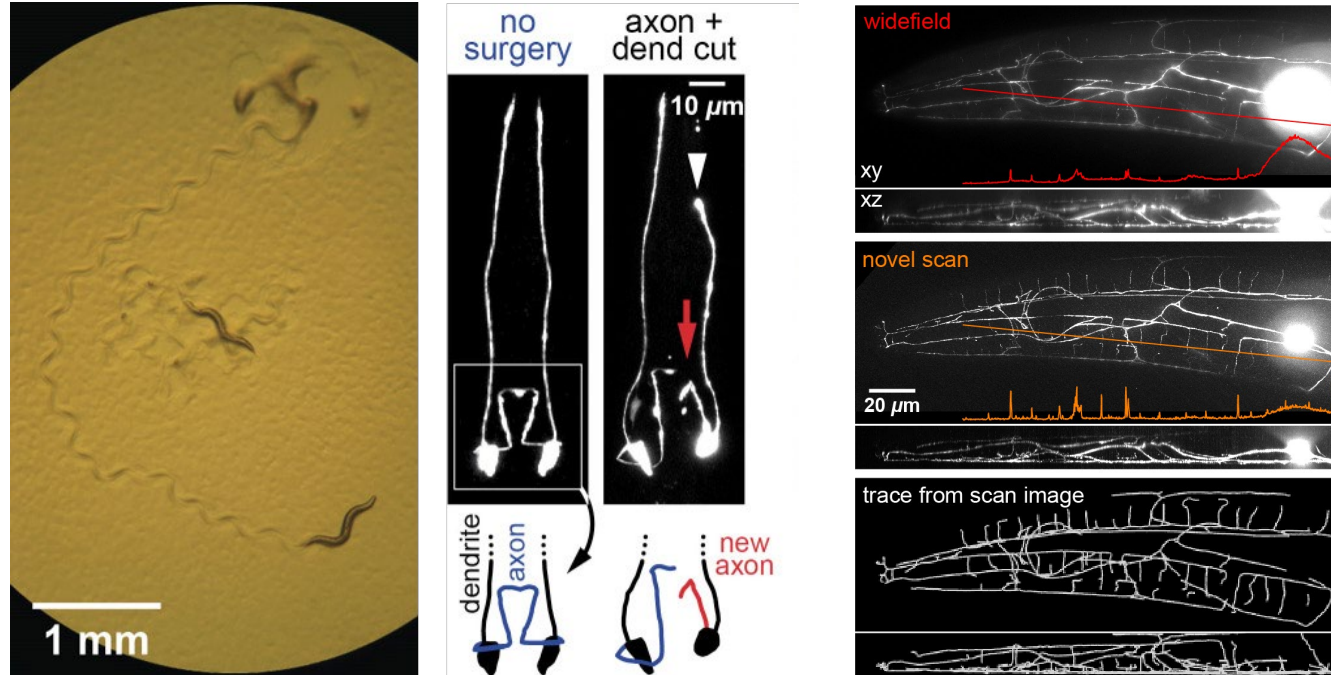
Assistant Professor of Bioengineering

s.chung@northeastern.edu

Research Area 1: Biomedical Devices and Bioimaging

Research Area 3: Molecular, Cell, and Tissue Engineering

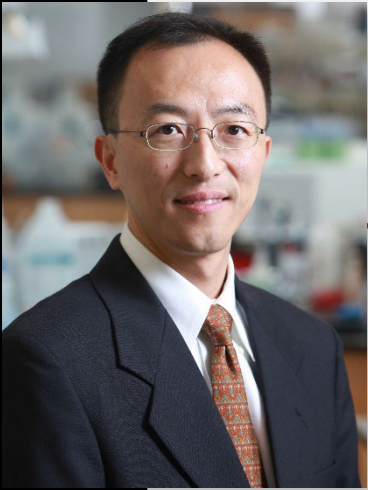
Research Interests: microscopy automation; subcellular laser surgery; axon regeneration



Web page: <https://sites.google.com/view/wormneurolab/>

Profile: <https://coe.northeastern.edu/people/chung-samuel/>

Teaching: BIOE 2355 Quantitative Physiology; BIOE 5648 Biomedical Optics



Guohao Dai

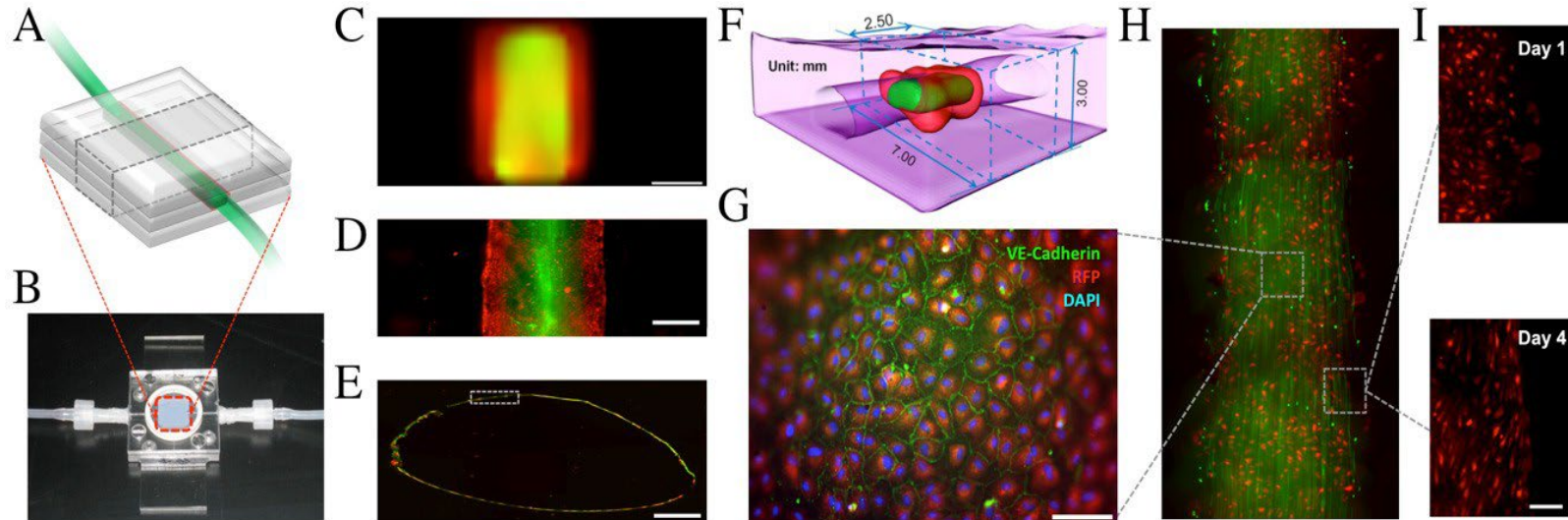
Associate Professor of Bioengineering

g.dai@northeastern.edu

Research Area 2: Biomechanics, Biotransport and Mechanobiology

Research Area 3: Molecular, Cell, and Tissue Engineering

Research Interests: Vascular Tissue Engineering, Stem Cell Engineering, 3D Bioprinting



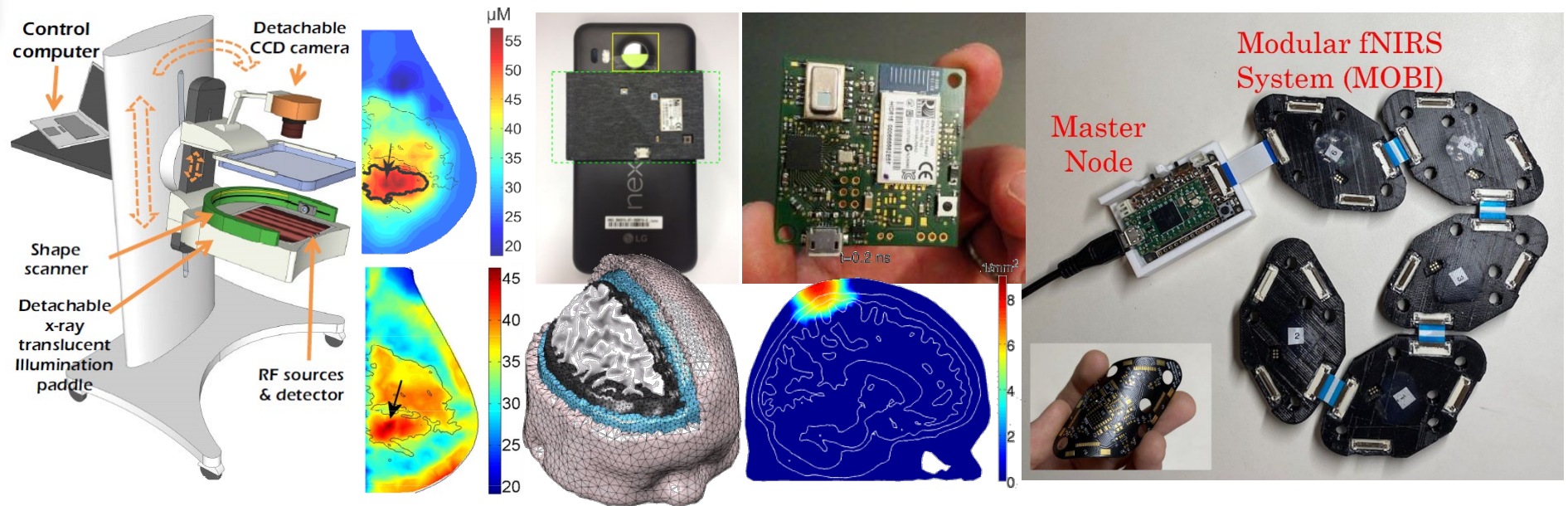
Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/dai-guohao/>

Teaching: Physiological Fluid Mechanics



Associate Professor of Bioengineering



Profile: <https://coe.northeastern.edu/people/fang-qianqian/>





Aileen Huang-Saad

Associate Professor of Bioengineering

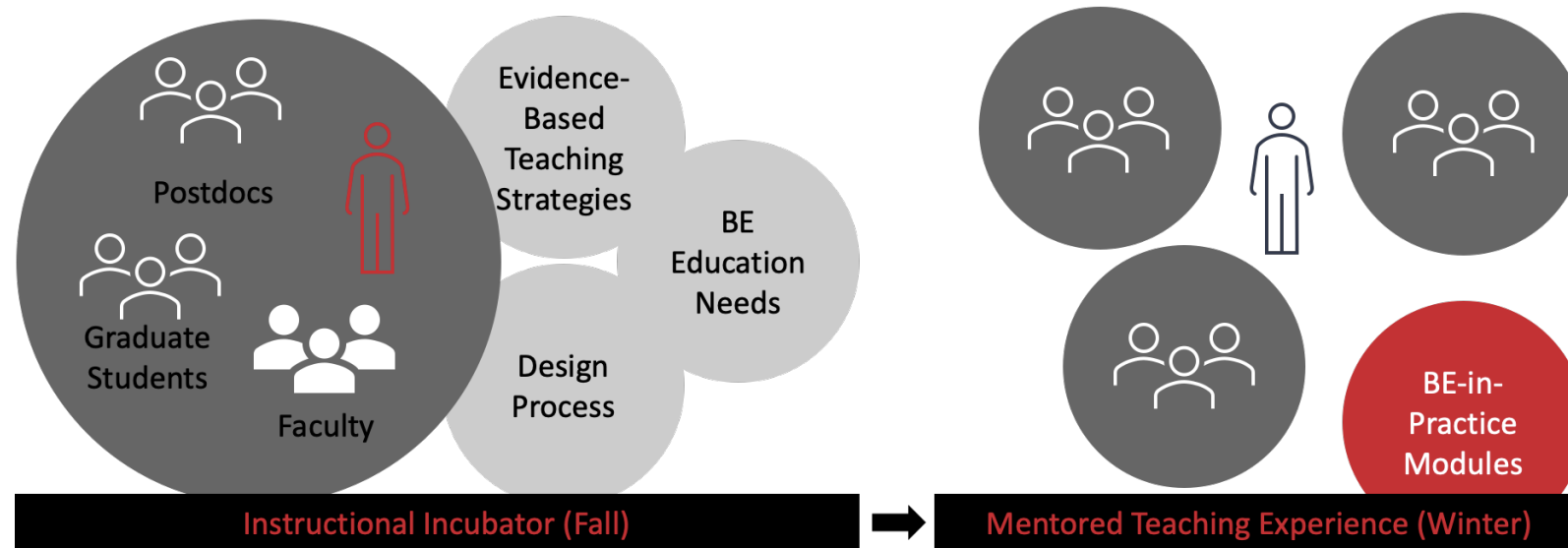
Director of Life Science and Engineering Programs

a.huang-saad@northeastern.edu

Research Area: Engineering Education

Research Interests: Entrepreneurship education microenvironments and their impact on the engagement of diverse populations, the influence of I-Corps on university ecosystems, and transforming BME education through instructional design

The Instructional Incubator was developed to increase student-centered, responsive teaching.



Lab: <https://teel.sites.northeastern.edu/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/huang-saad-aileen/>



Miten Jain

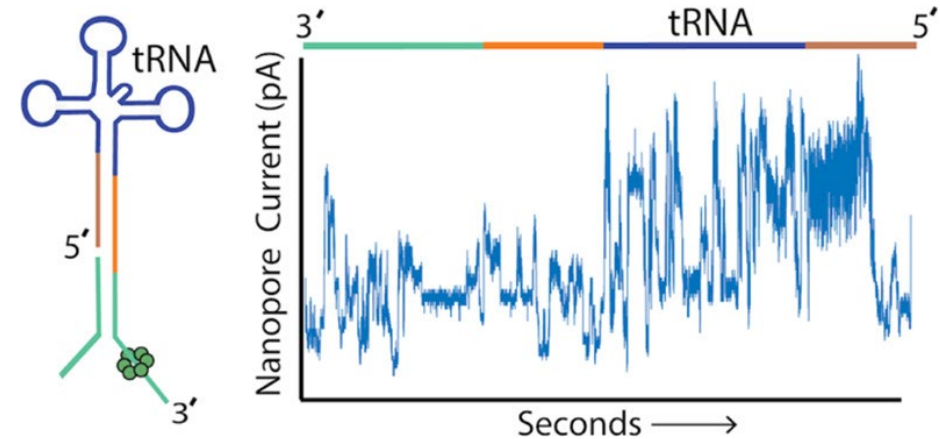
Assistant Professor

Affiliated Faculty, Bioengineering

mi.jain@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Genome organization and function; long read sequencing of DNA, RNA, and proteins; Nanopore technology; biological methods and deep learning for resolving complex repeats and nucleotide modifications; applying genomics to the clinic; developing therapeutic applications.



Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/jain-miten/>



Erel Levine

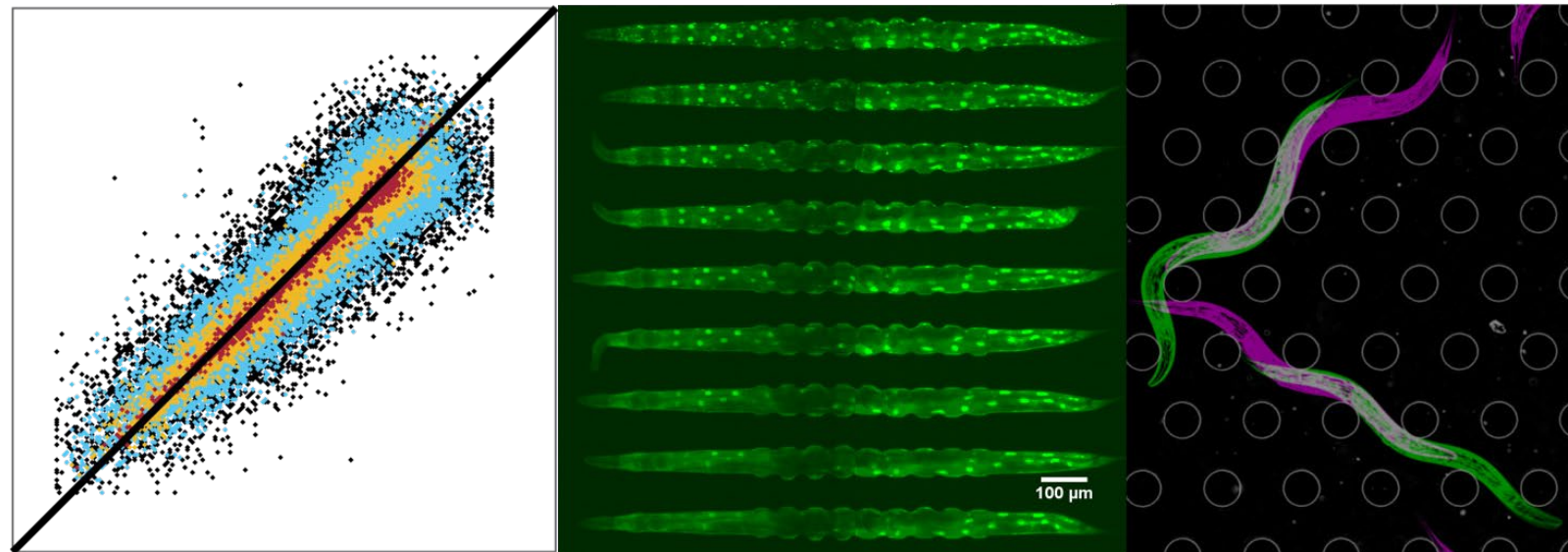
Associate Professor

Affiliated Faculty, Chemical engineering

e.levine@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Gut-brain interactions and its effects on health, stress response, and behavior; Statistical and machine learning approaches to biological data; Synthetic biology in multi-cellular organisms



Lab: <https://web.northeastern.edu/sysbioeng/>

Profile: <https://coe.northeastern.edu/people/levine-erel/>

Teaching: Mathematical methods in bioengineering, quantitative and physical biology



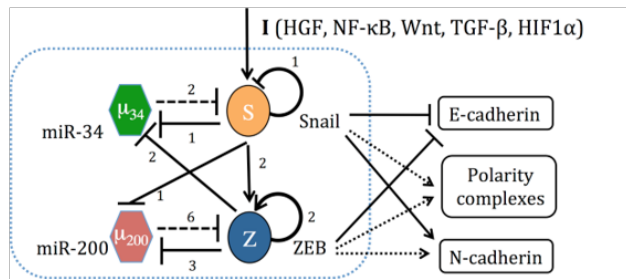
Herbert Levine

University Distinguished Professor of Bioengineering and Physics

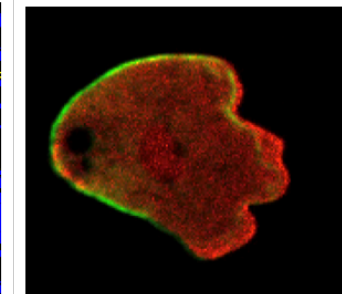
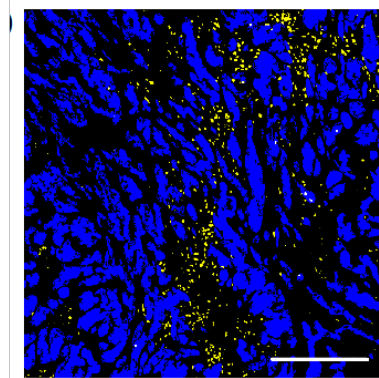
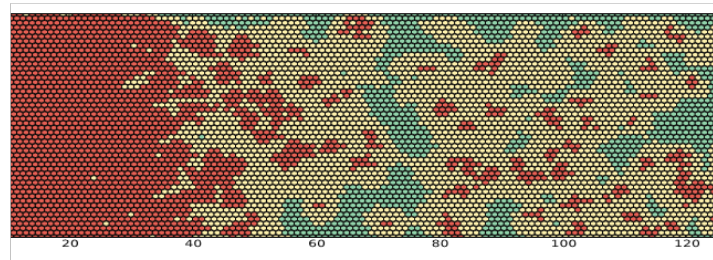
h.levine@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Theoretical approaches to the functional behavior of living systems. Cell signaling and cell motility. Cancer metastasis and the cancer-immune interaction. Drug resistance and epigenetics.



Basic circuit underlying epithelial plasticity



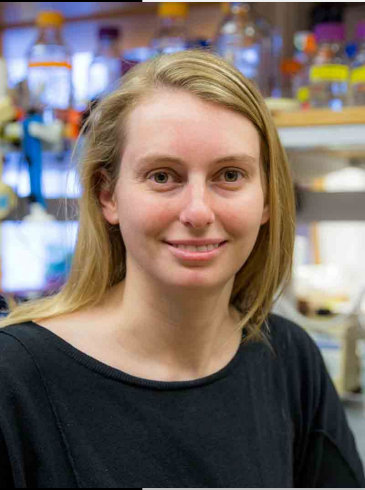
Chemotaxing cell showing actin (red). myosin (green)

T-cells (yellow) failing to invade tumor (experiment)
Spatial patterning of phenotypes (theory)

Publications: [Google Scholar](https://scholar.google.com/citations?user=h.levine)

Profile: <https://coe.northeastern.edu/people/levine-herbert/>

Teaching: Biomechanics, cell motility, graduate and undergraduate physics



Elizabeth Libby

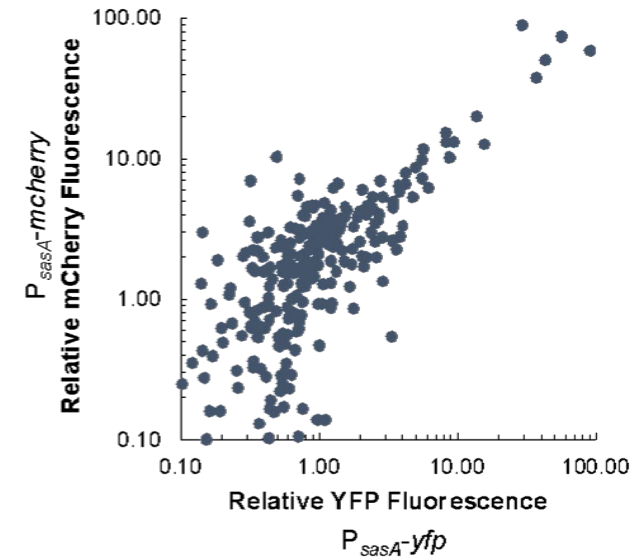
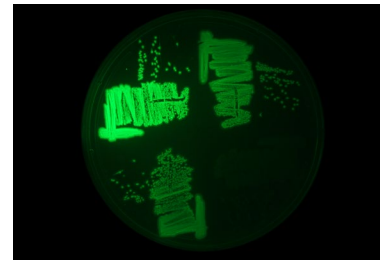
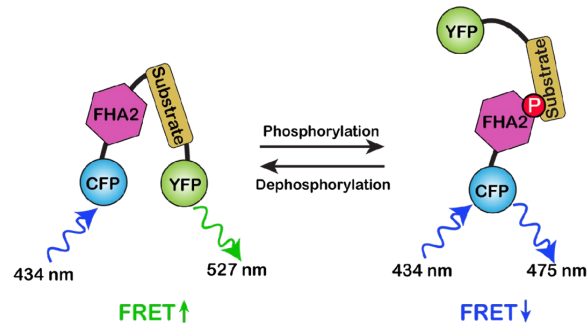
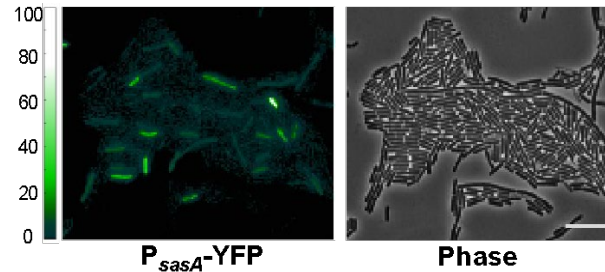
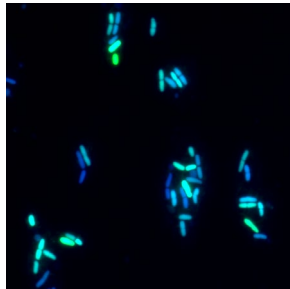
Assistant Professor of Bioengineering

e.libby@northeastern.edu

Research Area 3: Molecular, Cell and Tissue Engineering

Research Area 4: Systems, Synthetic and Computational Bioengineering

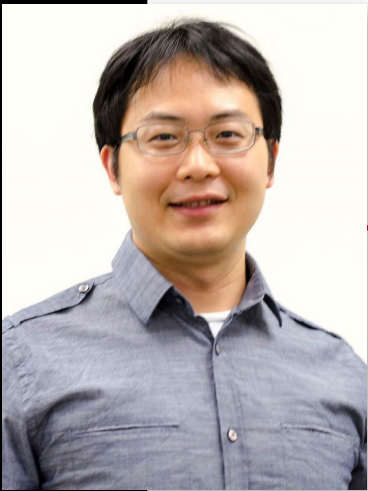
Research Interests: Synthetic biology, microbiology, biosensor development



Publications: [Google Scholar](#)

Lab: <https://libbylab.sites.northeastern.edu/>

Profile: <https://coe.northeastern.edu/people/libby-elizabeth/>



Mingyang Lu

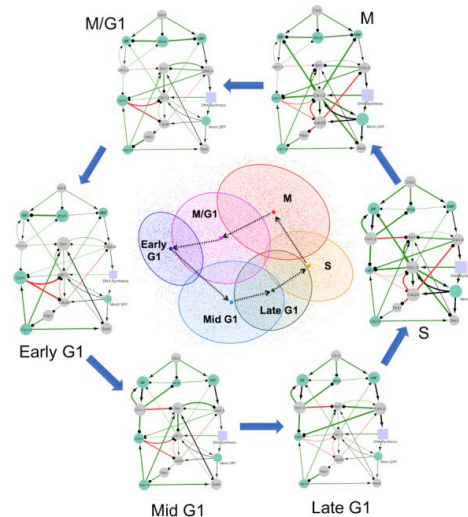
Assistant Professor of Bioengineering

m.lu@northeastern.edu

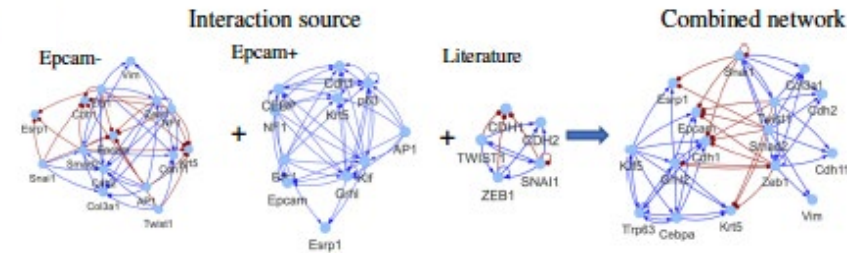
Research Area 4: Computational and Systems Biology

Research Interests: Computational systems biology, an integration of mathematical modeling and bioinformatics for studying gene regulatory networks, single cell genomics, epithelial-mesenchymal transition, coarse-graining, reverse engineering, machine learning, stochasticity and heterogeneity in gene expression

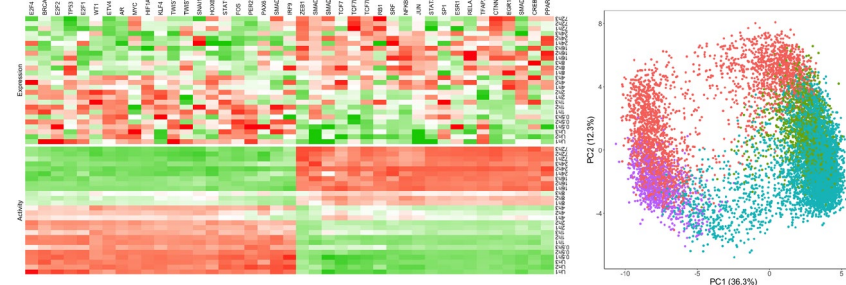
Modeling cellular state transitions



Gene network construction



Genomic data integration





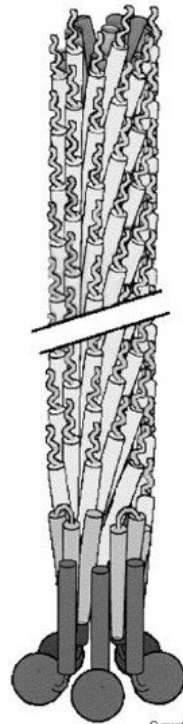
Lee Makowski

Professor and Chair of Bioengineering

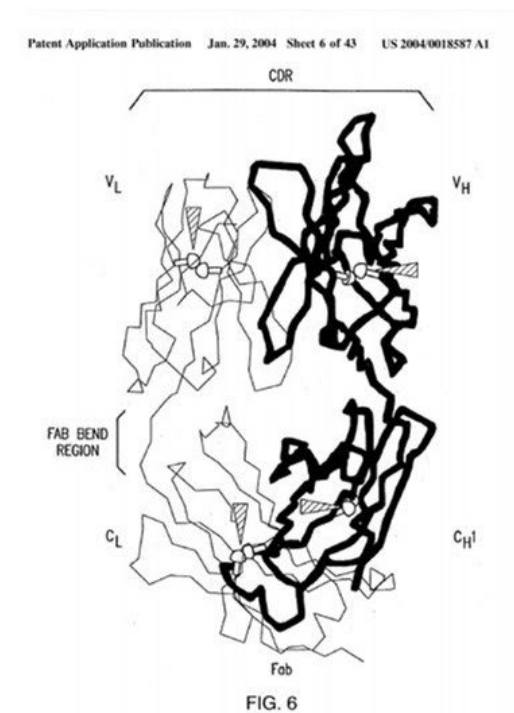
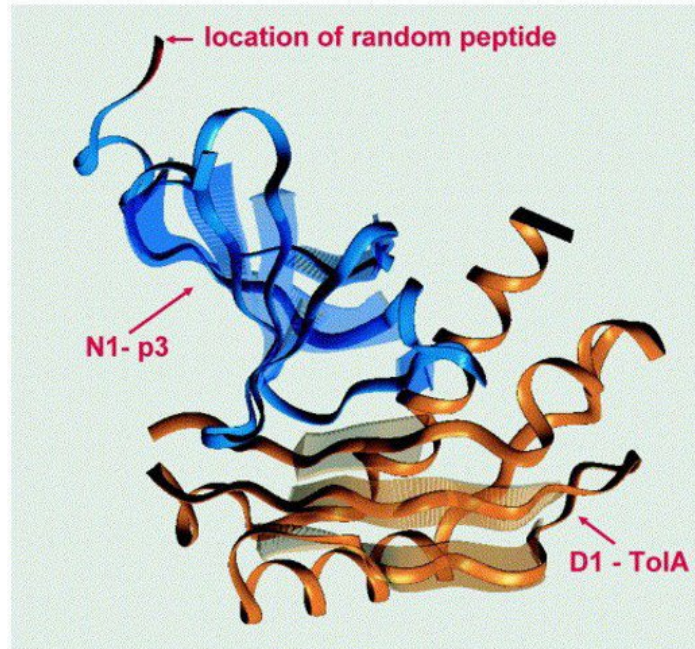
l.makowski@northeastern.edu

Research Area 3: Molecular, Cell and Tissue Engineering

Research Interests: Image and signal processing as applied to biophysical data designed to answer fundamental questions about the molecular basis of living systems.



Current Opinion in Biotechnology



Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/makowski-lee/>

Teaching: Principles of Bioengineering, Molecular Bioengineering



Mona Minkara

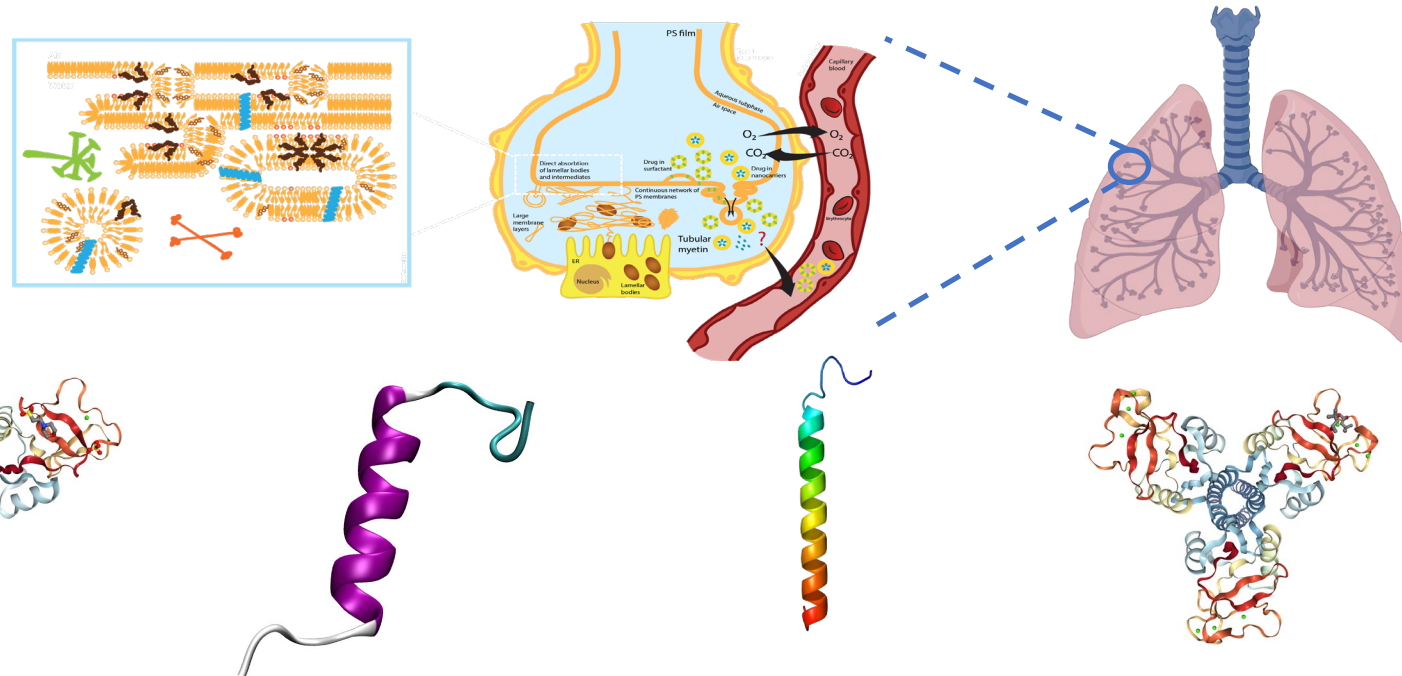
Assistant Professor of Bioengineering

Affiliated Faculty, Chemistry and Chemical Biology

m.minkara@northeastern.edu

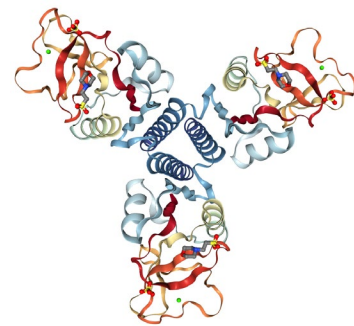
Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Using computational methods including Monte Carlo methods, molecular dynamics simulations, and molecular docking calculations to obtain a fundamental understanding of molecular interactions that occur at biological interfaces, such as the pulmonary surfactant system in the lungs.

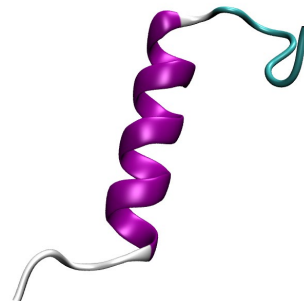


The pulmonary surfactant system is vital for healthy breathing and acts as the first line of defense against airborne pathogens.

Created with
BioRender.com



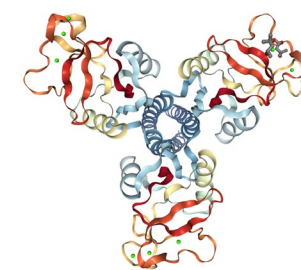
SP-A(PDB: 1R13)



SP-B (PDB: 1DFW)



SP-C (PDB: 2YAD)



SP-D (PDB: 4M18)

Lab website: <http://www.minkaracombinelab.com>
Profile: <https://coe.northeastern.edu/people/minkara-mona/>



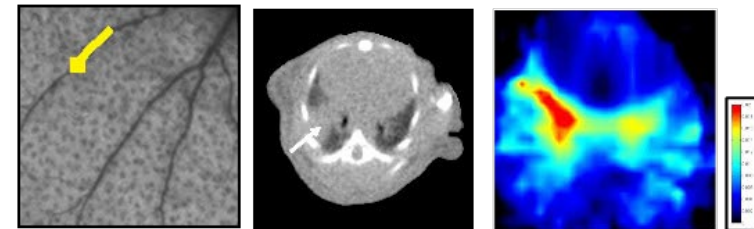
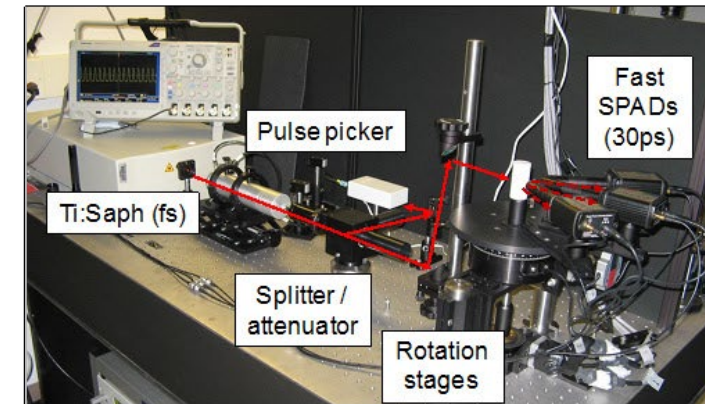
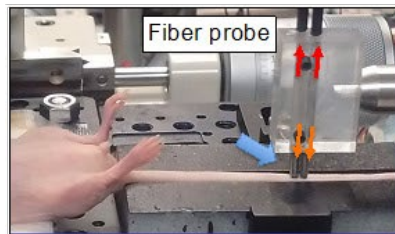
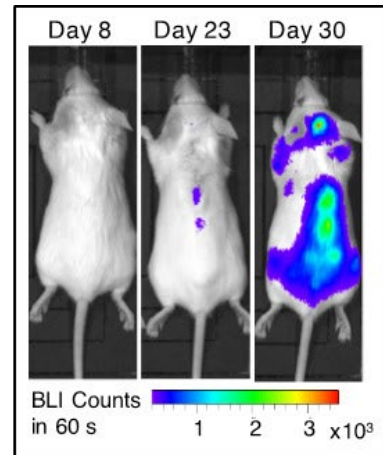
Mark Niedre

Professor of Bioengineering

m.niedre@northeastern.edu

Research Area 1: Biomedical Devices and Bioimaging

Research Interests: Biomedical optics; fluorescence imaging; cancer metastasis; rare cell detection and tracking in the body; ultrafast light-tissue interactions; image reconstruction and signal processing



Lab: <https://sites.google.com/site/niedrelab/home>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/niedre-mark/>

Teaching: BIOE 3210 Bioelectricity, BIOE 5235 Biomedical Imaging



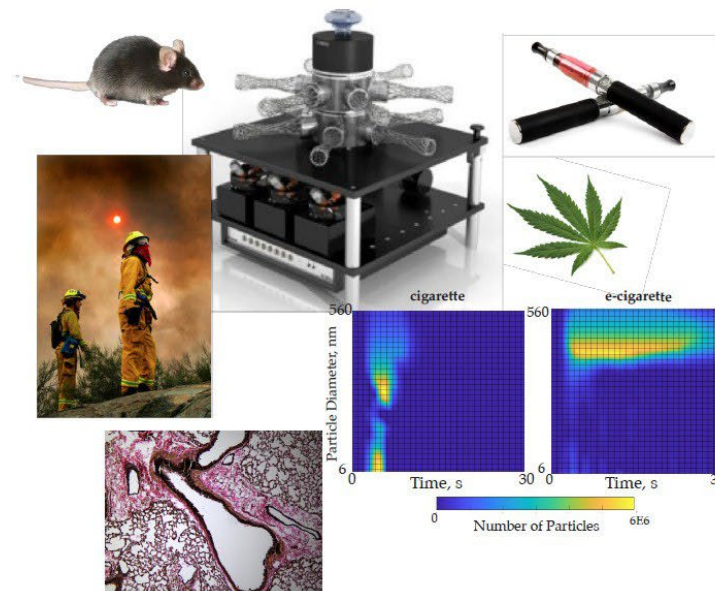
Jessica Oakes

Assistant Professor of Bioengineering

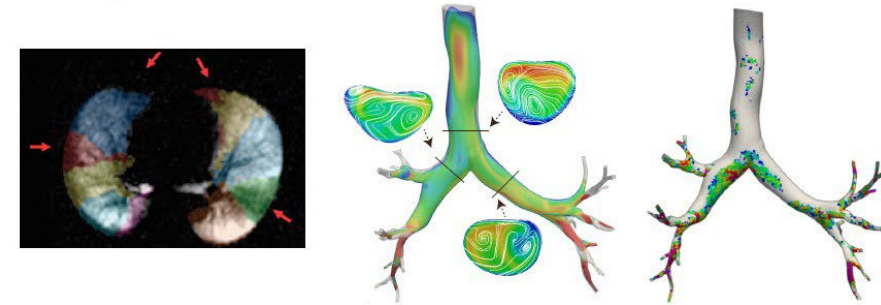
j.oakes@northeastern.edu

Research Area 2: Biomechanics, Biotransport and Mechanobiology
Research Area 4: Systems, Synthetic and Computational Bioengineering

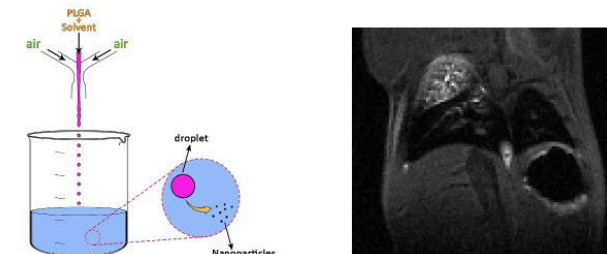
Cardiopulmonary Health Impact Following Chronic Exposure



Coupling Clinical Data with Modeling to Optimize Drug Delivery in Asthma



Targeted Nanoparticle Drug Delivery



Publications: <https://www.northeastern.edu/biofluids/>

Profile: <https://coe.northeastern.edu/people/oakes-jessica/>

Teaching: Transport and Fluids for Bioengineers and Computational Biomechanics



Hari Parameswaran

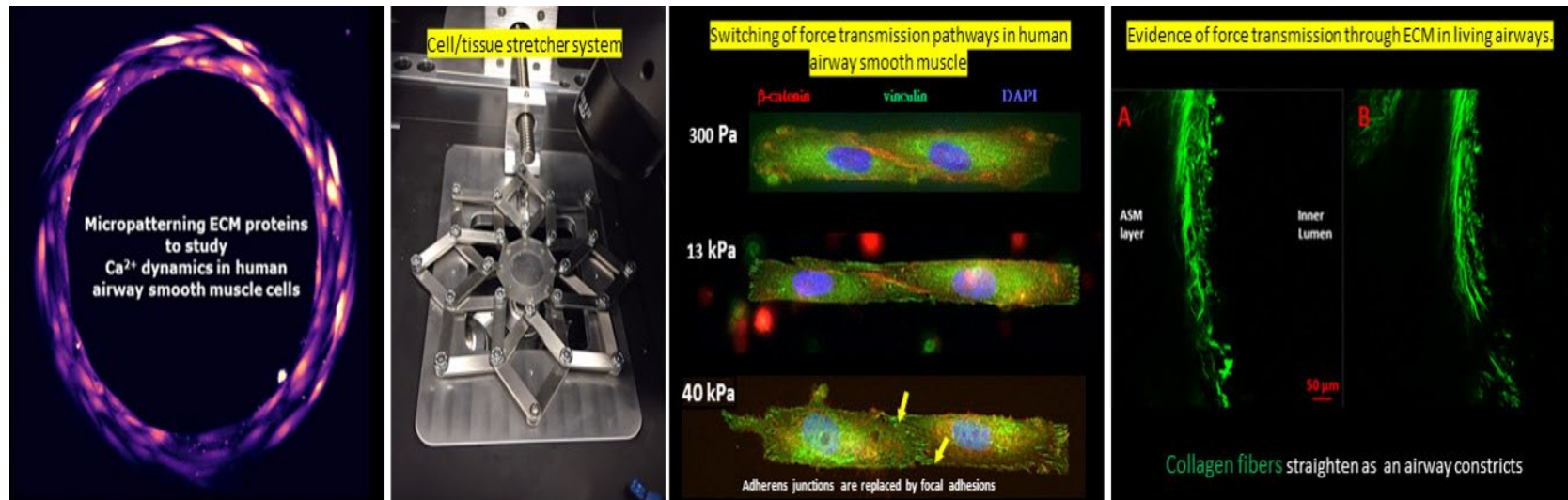
Assistant Professor of Bioengineering

h.parameswaran@northeastern.edu

Research Area 2: Biomechanics, Biotransport and Mechanobiology

Research Area 3: Molecular, Cell, and Tissue Engineering

Research Interests: Mechanotransduction, multiscale Mechanobiology, Computational modeling, Cell-Cell communication, **[Current:]** Dynamic switching of force transmission pathways in multicellular ensembles



Adherens junctions are replaced by focal adhesions

Lab website: <https://web.northeastern.edu/breathe/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/parameswaran-harikrishnan/>

Teaching: GE 2361 Mathematical methods for Engineers, BIOE 5060 Mechanotransduction in cells and tissue



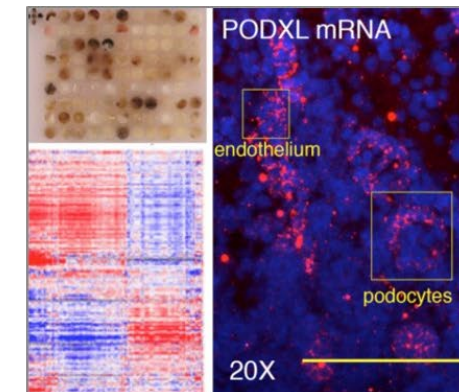
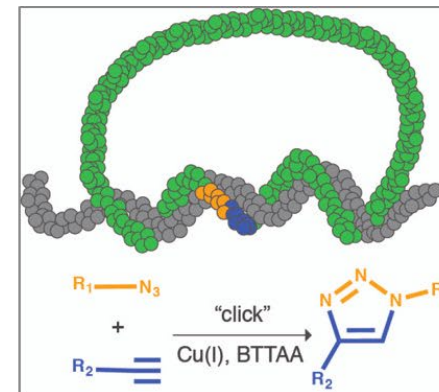
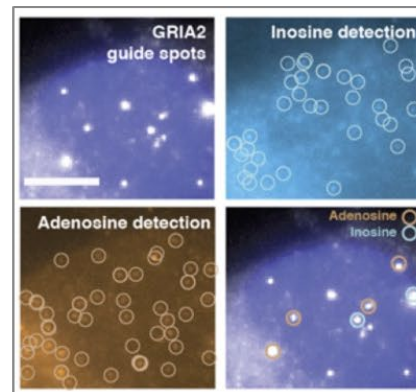
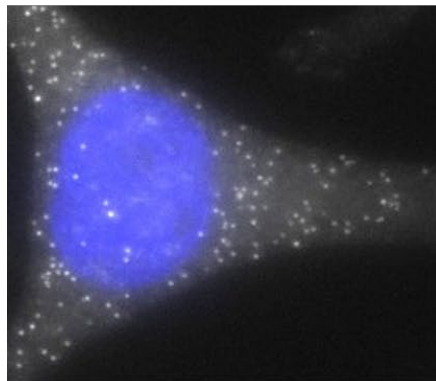
Sara Rouhanifard

Assistant Professor of Bioengineering

s.rouhanifard@northeastern.edu

Research Area 3: Molecular, Cell, and Tissue Engineering

Research Interests: Development of single-cell technologies for DNA+RNA, Nucleic acid detection as a diagnostic tool, RNA modifications in developing neurons.

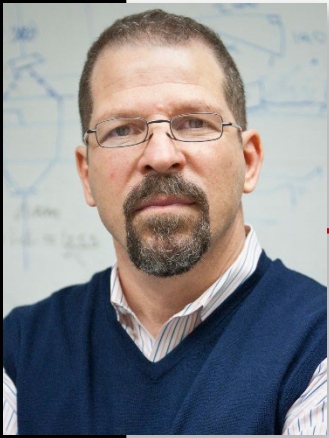


Lab: <https://rouhanifardlab.com/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/rouhanifard-sara/>

Teaching: BIOE 3380



Jeffrey Ruberti

Professor of Bioengineering

j.ruberti@northeastern.edu

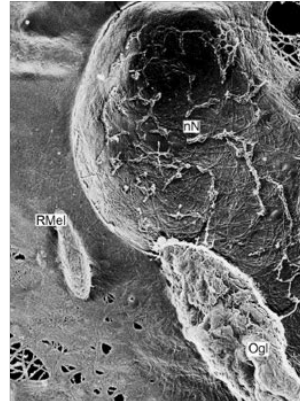
Research Area 2: Biomechanics, Biotransport and Mechanobiology

Research Area 3: Molecular, Cell and Tissue Engineering

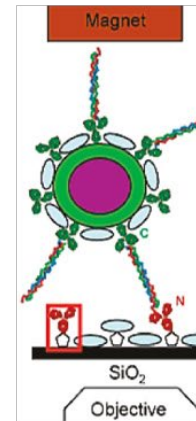
Research Interests: My lab focuses on the role matrix molecules play in the transition of animals from a loosely-connected grouping of cells to a fully-connected, mechanically robust structure. The relevant disciplines are: Mechanochemistry, Mechanobiology, Mechanobioreactor Development, Cell Culture, Single Molecule Light Microscopy, High Resolution Electron Microscopy.



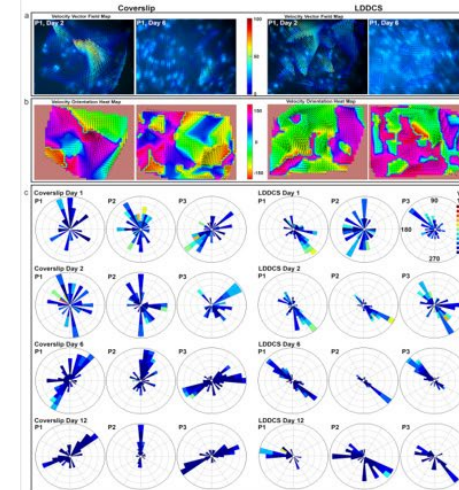
Mechanochemistry:
Extensional strain
drives collagen fibrillogenesis.
Fluorescence images show strain
field in fluid
ACS Nano 2016



High Resolution Microscopy:
Hole in cell matrix left
behind by cell nucleus
Exp Eye Res 2017



**Single Molecule
Mechanochemistry:**
Force slows enzymes
JACS 2011



**Mechanobioreactors : Quantifying
Cell Mechanodynamics**
Tissue Eng A 2016

Publications: [Google Scholar](https://scholar.google.com/citations?user=j.ruberti)

Profile: <https://coe.northeastern.edu/people/ruberti-jeffrey/>

Teaching: Principles of Bioengineering, Quantitative Physiology, Capstone Design



Sandra Shefelbine

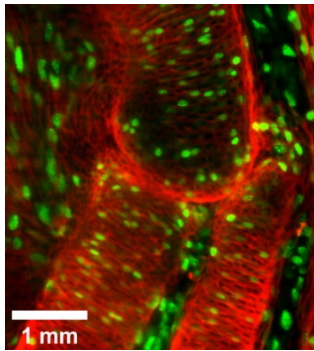
Professor of Bioengineering, jointly appointed in

Mechanical and Industrial Engineering

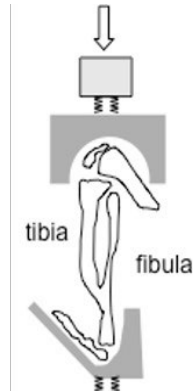
s.shefelbine@northeastern.edu

Research Area 2: Biomechanics, Biotransport and Mechanobiology

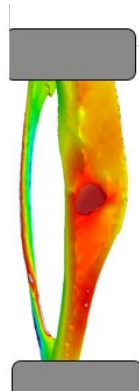
Research Interests: multi-scale mechanics of bones; adaptation of bone to mechanical loading during growth and ageing



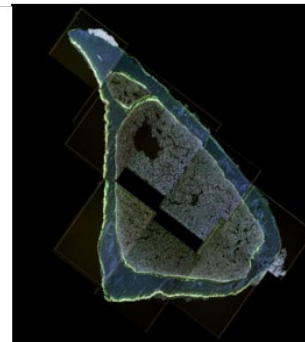
molecular microscopy



in vivo
experiments



FEA



histology



musculoskeletal
modeling



translational therapies

Lab: www.shefelbine.org

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/shefelbine-sandra/>

Teaching: ME 5665 Musculoskeletal Biomechanics, BIOE 2350 Biomechanics



Nikolai Slavov

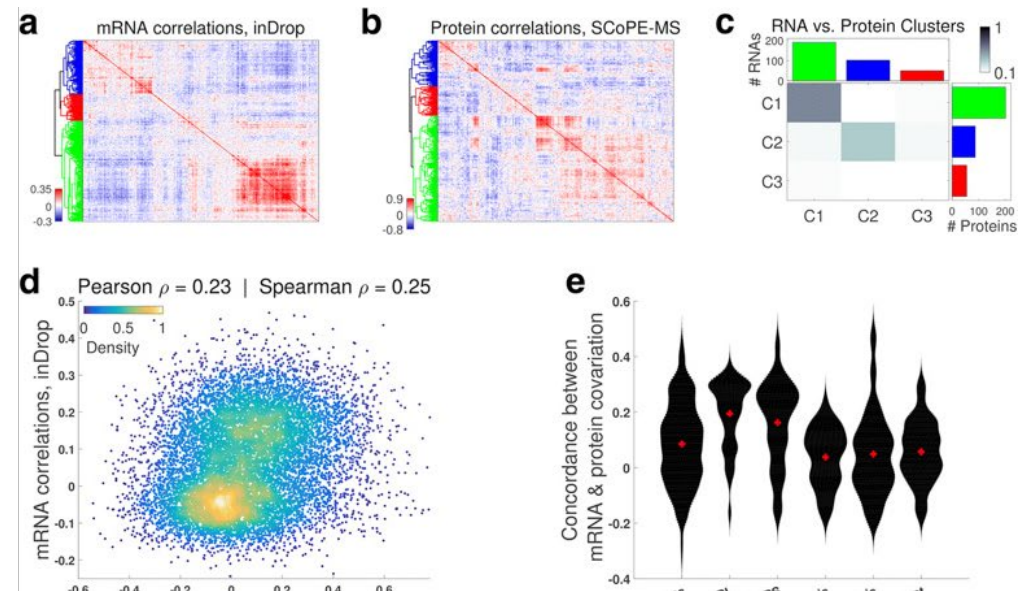
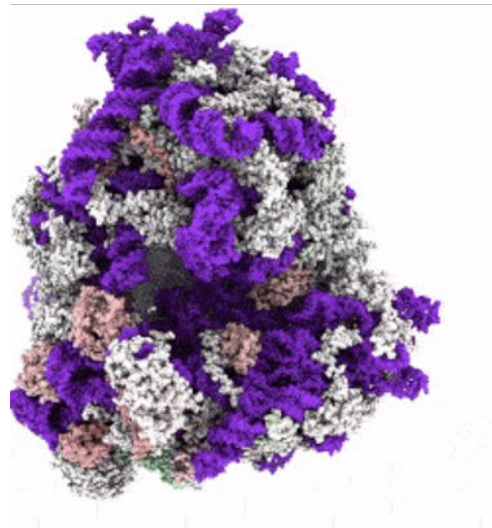
Associate Professor of Bioengineering

Affiliated Faculty, Biology

n.slavov@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Rationally engineered directed differentiation, single-cell analysis, ribo- some-mediated translational regulation, proteomics, cell signaling, systems biology



Lab: <https://slavovlab.net/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/slavov-nikolai/>

Teaching: Mathematical Methods for Engineers and Methods and Logic in Systems Biology



Eduardo Sontag

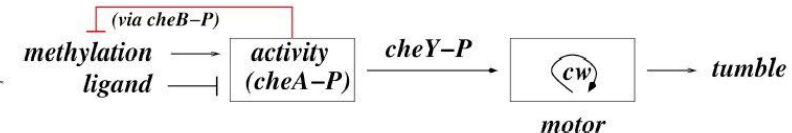
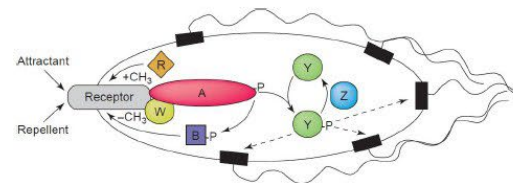
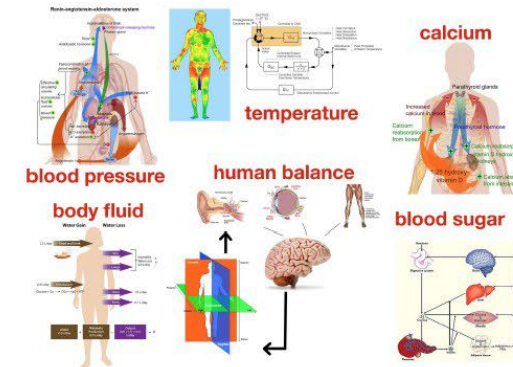
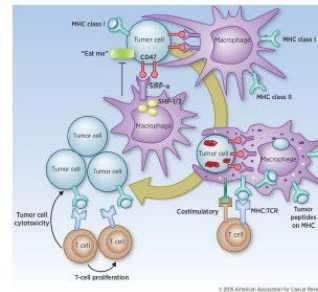
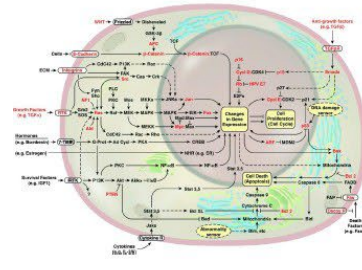
University Distinguished Professor

Electrical & Computer Engineering & Bioengineering Faculty, Program in Therapeutic Science, Harvard Medical School

e.sontag@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Systems and Synthetic Biology, Control Systems in Biology and Engineering, Biocomputing, Immune/Tumor Interactions, Optimal Control of Cancer Therapy, Phenotypic Resistance, Reverse Engineering Cell Signaling, and Gene Networks, Resource Competition in Cells.

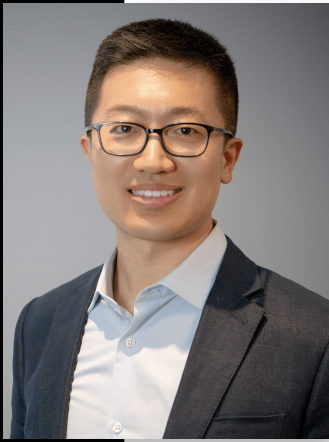


Lab: <http://www.sontaglab.org/>

Publications: [Google Scholar](#)

Profile: <https://coe.northeastern.edu/people/sontag-eduardo/>

Teaching: BIOE 5115 Dynamical Systems in Biological Engineering



Tao Sun

Assistant Professor

Bioengineering Faculty

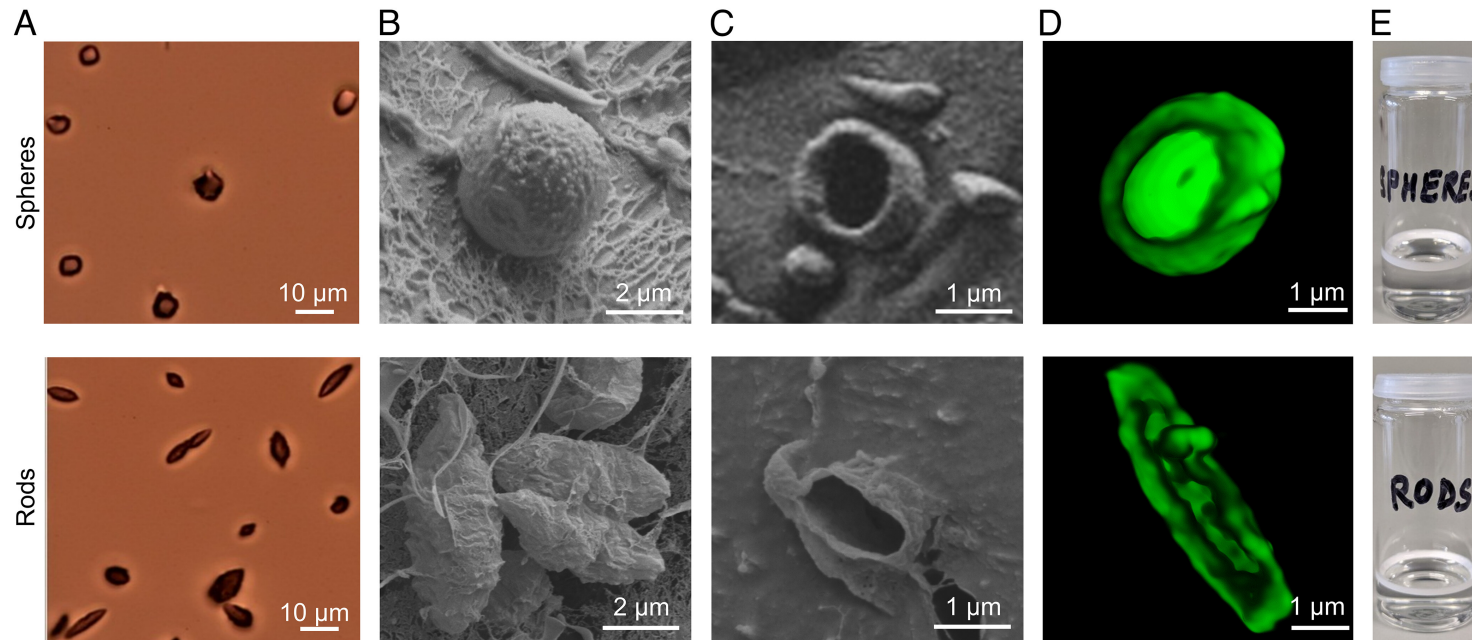
t.sun@northeastern.edu

Research Area 1: Biomedical Devices and Bioimaging

Research Area 2: Biomechanics, Biotransport and Mechanobiology

Research Area 3: Molecular, Cell and Tissue Engineering

Research Interests: Focused Ultrasound, Ultrasound Imaging, Neuroimaging, Drug Delivery, Immunomodulation and Immunoengineering, Glioblastoma, Alzheimer's Disease.



Profile: <https://coe.northeastern.edu/people/sun-tao/>

Teaching: BIOE 5235 Biomedical Imaging



Raimond Winslow

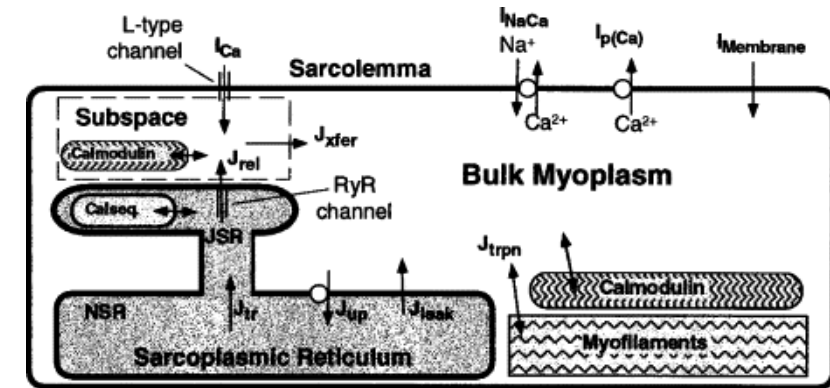
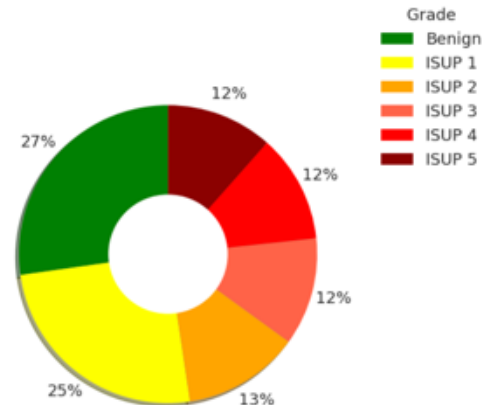
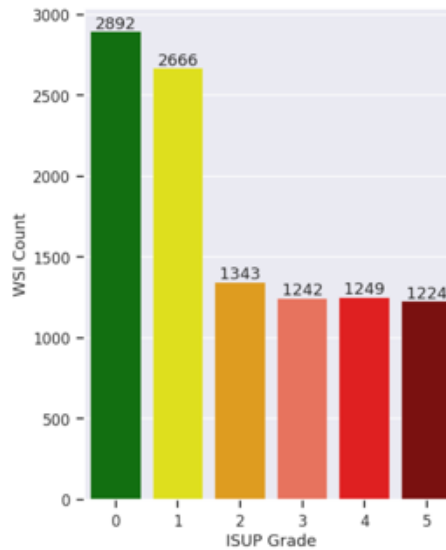
Professor of Bioengineering

Director of Life Science and Medicine Research, Roux Institute

r.winslow@northeastern.edu

Research Area 4: Systems, Synthetic and Computational Bioengineering

Research Interests: Computational modeling of the cardiac myocyte to understand the molecular basis of arrhythmias; machine learning in critical care medicine to identify those patients who require urgent care.





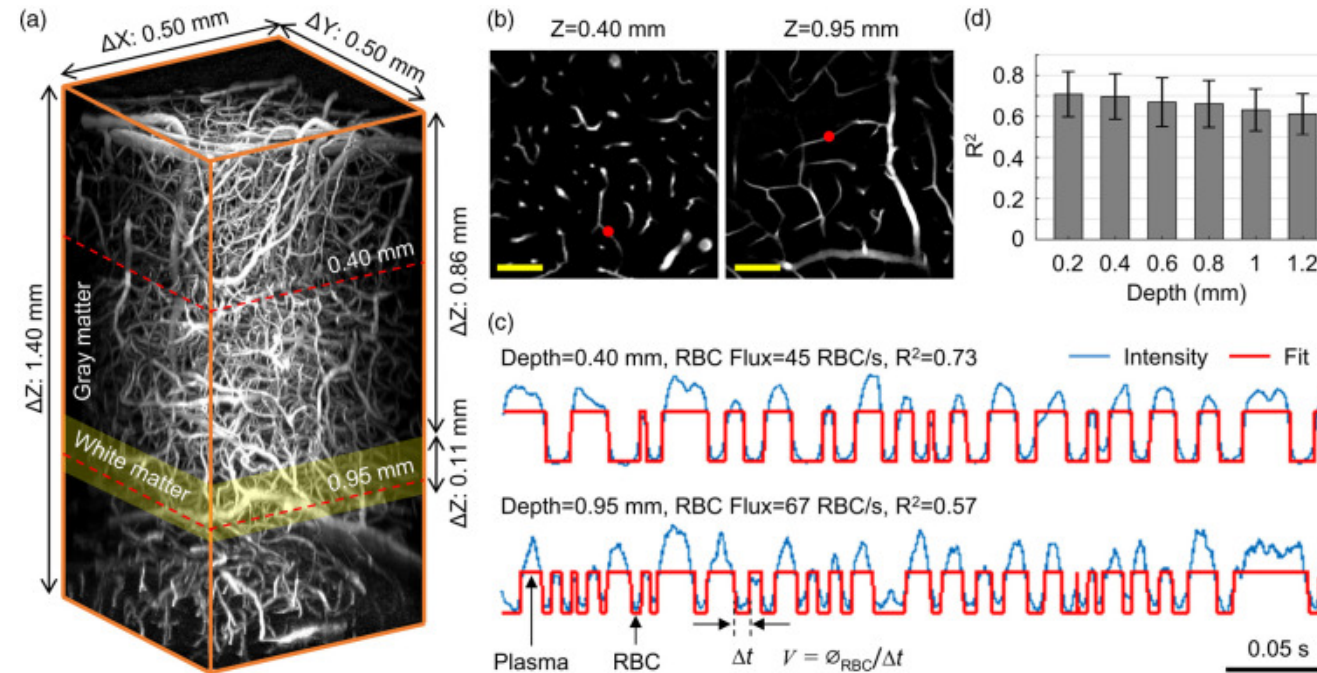
Mohammad Abbas Yaseen

Assistant Professor of Bioengineering

m.yaseen@northeastern.edu

Research Biomedical Devices and Bioimaging

Research Interests: Advanced microscopy for minimally invasive, in vivo characterization of brain function



Lab website: <https://www.yaseen-omnilab.org/>

Profile: <https://coe.northeastern.edu/people/yaseen-mohammad-abbas/>

Bioengineering Overview

- **650** undergraduates, **259** graduate students including **144** Masters, **115** PhD (Spring 2023)
- **64** tenured/tenure-track faculty including affiliated, **5** teaching faculty
 - **6** Distinguished Professors
 - **10** Young Investigators Awards
 - **11** Professional Society Fellowship
- **180** Co-op employers in Boston area
 - Bio-rad, Boston Scientific, Moderna, Covidien, Genzyme, MIT Lincoln Labs, Novartis, Smith and Nephew, Vention Medical, Wyss Institute for Biologically Inspired Engineering, etc
- ABET accredited

Bioengineering Overview

- **\$24M** external research awards (2021-2022)
- Recent external funding sources:
 - National Science Foundation
 - National Institutes of Health
 - Paul G. Allen Frontiers Group
 - National Cancer Institute
 - American Heart Association
 - National Institute of Arthritis and Musculoskeletal and Skin Diseases
 - Department of Homeland Security
 - National Institute of Neurological Disorders and Stroke