Emily Zhang

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Biomedical Engineering and Systems Engineering student with extensive experience in computational data analysis, medical imaging, and hands-on projects. Passionate about leveraging engineering and computational methods such as data analysis, machine learning (ML) and mathematical simulation to optimize medical research and healthcare operations.

EDUCATION

University of Pennsylvania, School of Engineering and Applied Sciences, Philadelphia, PA.
BSE in Bioengineering and Systems Science Engineering Dual Major, Computer Science and Mathematics Minor *Expected May 2026*

- **Cumulative GPA:** 3.82/4.00
- **Relevant Coursework:** Machine Learning, Artificial Intelligence, Signals Processing, Dynamical Systems, Scientific Computing, Computer Systems, Statistics, Data Science, Control for Autonomous Robots, Physiology, Bioengineering Modeling Analysis and Design.
- **Extracurriculars:** Research Peer Adviser, AI@Penn, Weingarten CEngineers in Medicine (EMed) - Research Committee Lead, Penn Appétit Magazine Editorial Board, Society of Women Engineers (SWE), Penn Club Swim (PCS).

EXPERIENCE

Undergraduate Researcher
Penn Medicine, Penn Image Computing and Science Laboratory (PICSL) *February 2024 – Present*

- Developed Python-based algorithms for real-time spatial and temporal image registration of bicuspid aortic valve image datasets.
- Analyzed CT and TEE images with automated preprocessing workflows implemented and executed via Unix command-line scripts.
- Leveraged tools such as ITK-SNAP and ParaView to visualize multi-dimensional imaging data for diagnostics and surgical planning.
- Utilized Git for version control to manage code development, track changes, and ensure reproducibility of imaging workflows.
- Developing a machine learning (ML) model for ultrasound transducer pose estimation to improve imaging accuracy and outcomes.

Undergraduate Researcher
Children's Hospital of Philadelphia, Gottardi Bio2 Lab *June 2023 - December 2024*

- Generated findings towards *in vitro* validation of gradient porous synthetic scaffolds for tissue engineering osteochondral defect repair.
- Maintained cell cultures and optimized infiltration protocols of rabbit mesenchymal stem cells (rMSCs) into Poly-L-Lactic Acid scaffolds.
- Collected scaffolds for RT-qPCR analysis to quantify cell growth and tissue formation post differentiation in biphasic bioreactor.
- Performed histological, immunofluorescence, and immunohistochemistry (IHC) stains on tissue and scaffold sections for visualization.

Student Tutor
University of Pennsylvania, Weingarten Center *January 2023 - August 2024*

- Worked closely with assigned student groups on a weekly basis, providing personalized guidance and study strategies for each group.
- Led weekly drop-in sessions, offering on-demand support to students for courses in Multivariable Calculus and General Chemistry.
- Served as a peer-content expert and student panelist for the Weingarten Center's 2023 Calculus Start-Up event.
- Represented the Weingarten Center during the annual Quaker Days for admitted students, providing insight on available resources.

SKILLS

- **PROGRAMMING & SOFTWARE:** Python (Numpy, Scipy, Matplotlib, SciKit, PyTorch, openCV), Java, C, C++, MATLAB, OCaml, R, SQL, Command Line Tools (Linux/Unix, Convert3D), Simulink, Arduino, ITK-SNAP, ParaView, LoggerPro, Digital Oscilloscope, Computer-Aided Design (Onshape, SolidWorks), Embedded Systems, Git & GitHub, Image Processing, Machine Learning, Signals Processing.
- **LABORATORY:** Cell and Tissue Culture, Real-Time qRT-PCR, Tissue Sectioning (Microtome and Cryostat), Histology and Immunofluorescence, Agarose Gel Electrophoresis, Circuit Building, Instron Material Testing, Dialysis, 3D Printing, Laser Cutting, Electrocardiography ECG, Electromyography EMG, Synthetic Biology, Microfluidics, Hardware & Software Filtering, Signal Processing
- **INTERPERSONAL:** Research Communication (Written and Spoken), Public Speaking, Platform Presentation, Collaboration.
- **LANGUAGE:** English (Native Proficiency), Chinese (Native Proficiency), Spanish (Limited Working Proficiency).
- **OTHER:** Microsoft Office (Word, Excel, PowerPoint), Adobe Creative Suite (InDesign, Illustrator, Photoshop), Google Suite, Poster Design.

ADDITIONAL PROJECTS

- Applied machine learning algorithms in MATLAB to decode neural network activity, performing sensitivity analysis to assess memory.
- Designed a smartwatch prototype with multi-sensor integration as a preliminary diagnostic for Carpal Tunnel Syndrome detection.
- Developed and validated a portable spectrophotometer for biochemical measurements, leveraging light absorbance analysis.
- Engineered a Human-Cockroach Machine Interface, utilizing real-time signal frequencies for biomechatronics and prosthetic control.
- Designed a microfluidic system using Solidworks/Onshape and laser machining for time-specific delivery of fluids to detection sites.
- Modeled gene expression using mathematical models and spectrophotometer data in MATLAB for characterizing GFP expression.
- Developed image processing and computational models to characterize quorum sensing of controlled gene circuit behavior.
- Designed a real-time ECG monitoring system for heart and respiration rate using embedded hardware and software signal processing.
- Designed a system using a Raspberry Pi embedded system to receive EMG Bluetooth data for reaction to muscle control rehabilitation.
- Programmed a functional Little Computer-4 (LC4) processor in C, simulating instruction-level execution and control flow.

POSTERS & PRESENTATIONS

- ***In vitro validation of gradient porous scaffolds for osteochondral engineering and defect repair***
  Oral Presentation - 2024 Biomedical Engineering Society Conference
- ***Surface-based TEE-CT image registration for bicuspid aortic valve repair***
  Oral and Poster Presentation - 2024 National Research Conference at Penn, 2024 Penn Fall Research Expo
- ***Improving cell infiltration and visualization of synthetic scaffolds for osteochondral defect repair***
  Poster Presentation - 2024 National Research Conference at Penn, 2023 Penn Fall Research Expo

AWARDS

- **2024 Lucid Communication Challenge - Physical Sciences & Engineering Division, 2nd Place.** Recognized for presenting innovative research addressing 4D CT-TEE Image Registration. Judged by experts in the field for scientific merit, impact, and presentation quality.
- **2024 Abraham Noordergraaf Research Fellowship.** Competitive fellowship awarded by the University of Pennsylvania Department of Bioengineering to support summer research, with a preference for projects focused on cardiovascular systems.
- **2023 Penn Undergraduate Mentoring Program Award.** Highly selective summer research program enabling undergraduates to conduct advanced research under direct faculty mentorship at the University of Pennsylvania.