Yutong Zhu

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https://yutong-zhu.github.io/ | Baltimore, MD, USA

Education

Baltimore, MD, USA
Sep 2022 – Apr 2024

M.S.E. in Chemical and Biomolecular Engineering, Johns Hopkins University
Essay-Based Track

Toronto, ON, Canada
Sep 2017 – Apr 2022

B.A.Sc. in Engineering Science, University of Toronto
Biomedical Systems Engineering Major
Engineering Business Minor

Research Experience

Baltimore, MD, USA
Sep 2022 – Ongoing

Department of Pathology, Johns Hopkins University School of Medicine | Graduate Student
Supervised by Prof. Ashley Kiemen and Prof. Denis Wirtz, Digital Pathology Laboratory

- Conducted literature review on the female reproductive system to identify potential research gaps.
- Designed computational algorithms to process and register hematoxylin and eosin (H&E) images.
- Utilized and optimized ResNets-based deep learning approach to segment specialized tissue types.
- Utilized three-dimensional reconstruction technique to map the mouse reproductive system at single-cell resolution.
- Performed qualitative and quantitative analysis on the reconstructed three-dimensional volumes.
- Designed and conducted in vitro experiments and validated with human samples in areas of interest.
- Trained and mentored junior students to learn and assist with the project.

Toronto, ON, Canada
Sep 2021 – Apr 2022

Institute of Biomedical Engineering, University of Toronto | Research Assistant
Supervised by Prof. Eli Sone, Biological and Bioinspired Materials Laboratory

- Investigated adhesive protein mechanisms through analysis of zebra mussel protein localization and post-translational modification (PTM) of quagga mussel proteins.
- Extracted fresh proteins from freshwater mussels' phenol glands, bulk plaques, threads, and footprints.
- Designed and characterized chemical buffers for protein extraction, purification, and storage.
- Performed SDS-PAGE for protein separation and gel imaging through staining with different approaches that achieve distinct objectives.
- Utilized high-performance liquid chromatography (HPLC) to achieve protein purification.

Toronto, ON, Canada
Jan 2021 – Sep 2021

Institute of Biomedical Engineering, University of Toronto | Research Assistant
Supervised by Prof. Michael Garton, Synthetic Biology Laboratory

- Designed and developed a library of landing pad Hek293T cell lines for AAVS1 and pSH231 safe harbour sites for exchange of expression cassettes.
- Evaluated existing cassette exchange methods and conducted literature review for improvements and modifications.
- Performed synthetic biology techniques such as bacterial/tissue cell culturing, PCR, and molecular cloning, and analyzed resulting data using gel electrophoresis, spectrophotometry, and fluorescent microscopy.
- Performed computational work such as designing plasmids, primers, and restriction enzymes using Benchling.
- Delivered progress updates and a final presentation including results, conclusions, and future work within the research group.

Toronto, ON, Canada
May 2019 – Aug 2019

Institute of Biomedical Engineering, University of Toronto | Research Assistant
Supervised by Prof. Alison McGuigan, Tissue Architecture and Microenvironment Design Laboratory

- Designed a high-throughput TRACER platform that is compatible with the 96 well-plate formats through stacking 6 layers of scaffold.
- Evaluated existing deigns of the platform in the literature and proposed suitable improvements and modifications.
- Characterized various parts of the device including a custom well plate, scaffolds, and seeding device/pipeline using AutoCAD, SolidWorks, and G-code.
- Extended the original design to function under smaller dimensions for various applications.
- Analyzed and processed data and images obtained through fluorescent microscopy using ImageJ.

Publications

2023 | 1. Braxton+, A. M., Kiemen+, A. L., Grahn, M. P., Forjaz, A., Parksong, J., Babu, J. M., Lai, J., Zheng, L., Niknafs, N., Jiang, L., Cheng, H., Song, Q., Reichel, R., Graham, S., Damanakis, A. I., Fischer, C. G., Mou, S., Metz, C., Granger, J., Liu, X.-D., Bachmann, N., **Zhu, Y.**, Liu, Y., Almagro-Pérez, C., Jiang, A. C., Yoo, J., Bridgette Kim, S. D., Foster, E., Hsu, J. Y., Rivera, P. A., Chu, L. C., Liu, F., Fishman, E. K., Yuille, A., Roberts, N. J., Thompson, E. D., Scharpf, R. B., Cornish, T. C., Jiao+, Y., Karchin, R., Hruban, R. H., Wu, P.-H., Wirtz+, D. & Wood+, L. D. Three-dimensional genomic mapping of human pancreatic tissue reveals striking multifocality and genetic heterogeneity in precancerous lesions. *Nature (Submitted)* (2023).

2022 | 2. Li, N. T., Wu, N. C., Cao, R., Cadavid, J. L., Latour, S., Lu, X., **Zhu, Y.**, Mijalkovic, M., Roozitalab, R. & McGuigan, A. P. An off-the-shelf multi-well scaffold-supported platform for tumour organoid-based tissues. *Biomaterials* (2022).

Presentations

2023 | **Annual ChemBE Research Poster Session, Johns Hopkins University**
Generated and presented a research poster to showcase the topic of "Three-dimensional and Multi-Organ Mapping of the Female Mouse Reproductive System as a Function of Age".

Design Projects

Toronto, ON, Canada
Sep 2020 – Dec 2020 | **BME489 Biomedical Systems Engineering Design, University of Toronto**
Subtalar Joint Preparation Device for Fusion During Tibiotalocalcaneal Arthrodesis
Designed and simulated a device that prepares the subtalar joint for fusion during tibiotalocaneal arthrodesis, which consists of 2 modular components: a cutting tool and a guide tube.

Toronto, ON, Canada
Jan 2020 – May 2020 | **BME346 Biomedical Engineering Omics Technologies, University of Toronto**
Effects of Drugs on Breast Cancer Cell Metastasis
This project focused on the combined effects of drugs on cancer metastasis. Our team discovered great potential in the combination of platelet inhibition and natural killer (NK) cell enhancement, where platelet inhibition sensitizes tumor cells to NK cell activity and NK enhancement increases cytotoxic effects.

Toronto, ON, Canada
Sep 2019 – May 2020 | **University of Toronto Aerospace Team**
"HERON" Biological Payload Design
The payload subteam of the UTAT Space Systems division specialized in assessing the risk of infection during long term space missions. The objectives were to engineer C. albicans to express GFP with specific genes and create a statistical method for quantifying this gene expression.

Toronto, ON, Canada
Jan 2019 – Apr 2019 | **AER201 Engineering Design, University of Toronto**
Traffic Cone Deployment Robot
This project focused on the design and fabrication of a fully autonomous mobile robot that can deploy miniature traffic cones based on the detection of "cracks" and "holes". The robot was constructed with mecanum wheels, infrared sensors, and an interactive LCD/keyboard UI.

Honors, Awards and Grants

2022-2023 | **Cervical Cancer SPORE Grant, Department of Pathology, Johns Hopkins Medicine**
A specialized program of Research Excellence (SPORE) in Cervical Cancer with a multimillion-dollar grant from the National Cancer Institute (NCI) to explore groundbreaking cervical cancer research, prevention, and treatment.

2020-2022 | **Faculty of Applied Science and Engineering Dean's Honors List, University of Toronto**
The Dean's Honors List recognizes excellence in student's academic records of the year.

Technical Skills

Biomedical Experimentation: Tissue Cell Culture, Bacterial Cell Culture, Mice Experimentation, Fluorescence Microscopy, Molecular Cloning, PCR, qPCR, CRISPR, SDS-PAGE, Staining, Spectrophotometry, High-Performance Liquid Chromatography (HPLC)
Biomedical Computation: MATLAB, Python, Deep Learning (TensorFlow, ResNets), G-code, C, Java
Image Processing and Data Analysis: ImageJ, Simulink, Microsoft Excel
Biomedical Design: AutoCAD, Solidworks, Benchling