Yangruirui ZHOU

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EDUCATION

Boston University, Boston, MA 09/2020-01/2026
Doctor of Philosophy (Ph.D.) candidate in Computer Engineering
GPA: 3.91/4.00
Advisor: Douglas Densmore
Research Focus: AI-enabled microfluidic CAD, formal verification, and multicellular biological system design.

University of Electronic Science and Technology of China (UESTC), Chengdu, China 09/2016-06/2020
Bachelor of Engineering in Software Engineering *(Elite program)*
GPA: 3.94/4.00 (Rank: 6/740)
Thesis: Analysis of Postoperative Applications of Pose Tracking Algorithms.

RESEARCH INTERESTS

[1] AI-driven design automation for biological and microfluidic systems
[2] Constraint-based optimization and graph algorithms for multicellular computation
[3] Formal verification and compiler infrastructures for biological CAD
[4] Large language model (LLM)-enabled scientific design and laboratory automation
[5] Data-driven platforms for programmable biological systems and automated experimentation

PUBLICATIONS

Google Scholar (https://scholar.google.com/citations?user=Zel-iSQAAAAJ&hl=en)

Journals:

[**J1**, IEEE-TCAD] **Zhou, Y.**, Oliveira, S. M., Sanka, R., McIntyre, D., & Densmore, D. (2024). Vespa: Logic-Level Constraint-Based Validation for Continuous-Flow Microfluidic Devices.
(Formal verification and constraint-based validation for large-scale microfluidic systems)

[**J2**, Nature Chemical Biology] Padmakumar, J. P., Sun, J. J., Cho, W., **Zhou, Y.**, Krenz, C., Han, W. Z., ... & Voigt, C. A. (2024). Partitioning of a 2-bit hash function across 66 communicating cells.
(Distributed multicellular biological computation, experimental validation)

[**J3**, IEEE-TCBB] **Zhou, Y.**, Voigt, C. A., & Densmore, D. (2025). Constraint-Based Sub-Graph Partitioning for Multi-Cellular Biological Networks.
(Graph-based optimization for scalable multicellular biological systems)

Conferences & Workshops:

[**C1**, IWBDA'22] A Conceptual Interactive Microfluidic Design and Control Workflow
[**C2**, IWBDA'25] LaNVis: Biological Constraint-based Large Network Visualizer (Accepted for oral presentation)

Manuscripts in Preparation:

[**J4**, in progress, targeting Nature Computational Science] *Neptune: Web-based Automated Design and Synthesis Platform for Microfluidic Devices.*
(LLM-enabled natural language design, formal grammar, automated synthesis and fabrication for microfluidics)

RESEARCH EXPERIENCE

Boston University, Boston, MA 07/2020-Now
Research Assistant, **CIDAR lab (**Supervisor: Prof. **Douglas Densmore**)

Massachusetts Institute of Technology, Boston, MA 11/2022-Now
Collaborative Research Assistant, **Voigt lab (**Supervisor: Prof. **Christopher Voigt**)

The Chinese University of Hong Kong, Hong Kong, China 03/2023-Now
Collaborative Research Assistant, **Ho lab (**Supervisor: Prof. **Tsung-Yi Ho**)

University of California, Santa Barbara, CA 06-08/2019
Student Research Internship, **Four eye's lab (**Supervisor: Prof. **Matthew Turk** and Prof. **Tobias Höllerer**)

AWARDS & HONORS

iGEM "**Gold medal**" (Student Mentor, wiki: https://2024.igem.wiki/bostonu/) 11/2024
China Youth Science and Technology Innovation Award (Nominated by UESTC) 05/2020
Most Outstanding Students of UESTC 2019 (成电杰出学生, **10/5000** in UESTC, **1/740** in department) 12/2019
iGEM "**Gold medal**" and "**Best Software Project**" (wiki: https://2019.igem.org/Team:UESTC-Software) 11/2019
Outstanding Graduates Award of UESTC 10/2019
"Wu Liang Ye" Enterprise Scholarship (**2/740** in Software Engineering department) 09/2019

PROFESSIONAL SERVICES & ACTIVITIES

International Workshop on Bio-Design Automation (IWBDA'25), **Oral Presentation** 09/2025
International Genetically Engineered Machine competition (iGEM'19, iGEM'24) 11/2019, 11/2024
Inventor/Contributor, **Patent: Agricultural Heavy Metal Biosensor-Integrated Device** 05-11/2024
Student Mentor of iGEM team: BostonU 04-10/2024
Chicago BioEngineering Conference (CBEC'24) 09/2024
Teaching Assistant, **EC504: Advanced Data Structures and Algorithms**, Boston University 01-05/2022, 01-05/2023
Engineering Biology Research Consortium (EBRC'23) 06/2023
International Workshop on Bio-Design Automation (IWBDA'22), Poster Presentation 10/2022

MENTORSHIP

Mentor, **EBRC Mentorship for Undergraduate and Master's Students Program (EMUMS)** 04/2025-Now
Direct Mentor, **Eric Xie**, Undergraduate Research Assistant, CIDAR Lab 06/2023-Now
Student Software Mentor, **iGEM Boston University Team** in 2024 04-10/2024

JOURNAL REVIEWER

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (IEEE-TCAD)
eLife
International Conference on Computer-Aided Design (ICCAD'22)

TECHNICAL SKILLS

AI & Data Science: PyTorch, TensorFlow, NetworkX
Systems & Software: Python, C/C++, Java, TypeScript, HTML, Linux Shell, LaTeX
Biological & Microfluidic Fabrication: CNC milling, laser cutting
Design & Modeling Tools: Fusion 360

PROFESSIONAL SOCIETIES

Institute of Electrical and Electronics Engineers (IEEE, graduate student membership) 02/2024-Now