Alexander Speigle

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SUMMARY

Biomedical Engineering Master's student with a dual background in Biomedical Engineering and Mathematics, specializing in computational and systems biology. Experienced in combinatorial optimization, deep learning, and neural networks for drug discovery. Skilled in statistical experimental design and convex optimization, with a strong track record of developing efficient computational models and processing large biological datasets.

EDUCATION

University of Michigan Ann Arbor, MI

Master of Science in Biomedical Engineering (Concentration: Biotechnology and Systems Biology) *May 2026*

Bachelor of Science in Engineering in Biomedical Engineering *May 2025*
Bachelor of Science in Mathematics (Concentration: Mathematical Biology)
Minors: Biochemistry, Computer Science

Courses: Machine Learning, Real/Complex Analysis, Advanced ODE's, Immunoengineering, Bioinstrumentation

WORK EXPERIENCE

Course Grader - Applied Math For Biomedical Engineers *Sep 2023 - Present*

- Reviewed and provided feedback on submissions to enhance understanding of coding and math concepts.
- Identified common errors and collaborated with instructional staff to refine course materials and address gaps.

Bioinformatics Intern - Metacoder AI *Oct 2024 - Aug 2025*

- Developed natural language processing algorithms to classify 800,000 disease descriptions into organ-specific categories
- Implemented graph traversal algorithms to partition 50,000 data points into accurately labeled training data, reducing compilation time by 40%.
- Generated molecular SMILES structure for candidate drugs from 300 GB of organ toxicity data.
- Processed assay data of biomarkers to identify potential drug candidates with 96% accuracy.
- Streamlined training data collection, formatting, and labeling to improve neural network performance, reducing training time from 12 to 4 hours.

Lead Student Information Technology Consultant *May 2024 - May 2025*

- Coordinated staffing and scheduling for an 8-person team, ensuring efficient monitoring of computer lab usage and wait times during peak hours.
- Migrated departmental website materials to an updated WordPress platform during Windows CrowdStrike outages.
- Proctored math exams and quizzes, providing guidance on study strategies to enrolled students.

RESEARCH EXPERIENCE

Graduate Researcher - Jensen Lab *Aug 2025 - Present*

- Employed high dimensional regression methods to predict significant gene interactions of *S. mutans.*
- Developed mathematical models to improve stochastic combinatorial optimization methods for reinforcement learning training datasets and simulated Monte Carlo Tree Search on gene networks.

Undergraduate Lab Research - Chandrasekaran Lab *July 2023 - Oct 2024*

- Converted literature data into linear program inputs and analyzed probabilistic outputs using MATLAB and R.
- Validated predicted transcription factors against flux balance predictions from the Cobra toolbox.
- Developed neural networks to reconstruct transcription networks following downregulation from microarray.
- Presented methodological updates and results at weekly lab meetings to facilitate collaboration and feedback.

PROJECTS

SafeBite Capstone Project *Aug 2024 - Dec 2024*

- Designed a portable allergy testing kit for mobile clinics serving low-income communities.
- Analyzed existing devices in literature and market to identify design improvements within a market niche.
- Prepared detailed reports documenting design ideation, development process, and biochemical test validation.
- Produced a video presentation showcasing the kit's benefits to the target population for the NIH challenge through DEBUT (Design by Biomedical Undergraduate Teams).

Directed Study - Abstract Algebra *May 2024 - Aug 2024*

- Studied material from Dummit and Foote textbook on the analogous material with weekly mentorship from a graduate student in specializing in commutative algebra and algebraic geometry.
- Analyzed algorithm efficiency in arbitrary domains such as polynomial division and complex numbers.
- Developed graphical models demonstrating the effect of deviations from optimality on algorithm run time.

Directed Study - Partial Differential Equations *Sep 2023 - Dec 2023*

- Studied material following the analogous PhD course with weekly graduate mentorship.
- Focused on fluid mechanics within biological tissues and systems and complemented current coursework.
- Modeled drug diffusion of a BMP coated hip implant through the femur using the heat equation in COMSOL.
- Presented the heat equations structure of the radial symmetries in an end of semester project to math peers.

SKILLS

Languages: Python, C++, MATLAB, R, Bash, Typescript
Other: COMSOL, Copasi, SolidWorks, Sheets, Mathematica

ACTIVITIES

Math Department Walking Club: Evening Walk Host
Society of Undergraduate Math Students: Activities Coordinator