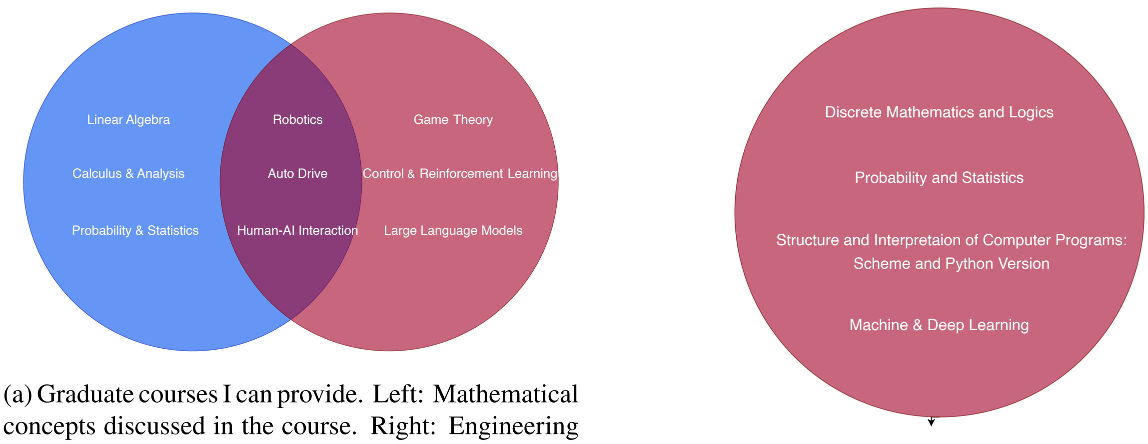
TEACHING STATEMENT

My goal in teaching is to **develop students into critical thinkers and problem solvers** by integrating three essential components: a **solid foundation in mathematics**, **rigorous analytical thinking**, and the **ability to apply theoretical concepts to real-world challenges**. Through this integrated approach, students learn to bridge the gap between abstract models and practical applications, developing both intuition and methodological precision. I have refined these teaching methods through extensive experience tutoring calculus and real analysis in the mathematics department at SUSTech, and more recently, through teaching GNU $\TeX_{\text{MACS}}$/Mogan and Goldfish Scheme at LIII NETWORK. This diverse teaching background, combined with my expertise in mathematical theory and computational applications, qualifies me to teach a range of courses—from **graduate-level subjects such as control theory, reinforcement learning, and game theory** to **undergraduate courses in programming and discrete mathematics** (Fig. 1).



(a) Graduate courses I can provide. Left: Mathematical concepts discussed in the course. Right: Engineering topics covered in the course. Middle: Real-world applications.

(b) Undergraduate courses I can provide.

Figure 1: Summary of courses I can provide.

TEACHING PHILOSOPHY & METHODOLOGY

My course preparation is guided by 3 fundamental questions that reflect the evolving of education and technology:

1. What enduring conceptual insights should students retain long after specific technical details have faded?
2. How can the course content enable students to approach and solve diverse real-world problems?
3. Which skills developed in this course will remain uniquely human and valuable in an increasingly AI-driven future?

These questions shape my teaching methodology, ensuring courses deliver both immediate learning objectives and lasting value. This approach prioritizes deep understanding over memorization, practical application over pure theory, and the development of enduring human capabilities in an evolving technological landscape.

Building Intuition and Motivation in Learning: My teaching methodology prioritizes developing students' conceptual understanding over mere memorization—an approach particularly valuable in an era where AI excels at storing information but lacks true intuition. Through backward-design principles guided by my core teaching questions, I structure courses to build strong conceptual foundations while systematically developing technical competence.

I have successfully implemented this approach in linear algebra, calculus, and SICP courses[1] at SUSTech and LIII NETWORK, reaching over 300 students from diverse academic backgrounds. Teaching such a varied student population—spanning mathematics, finance, and computer science—presents unique challenges in bridging different levels of technical preparation. To address this, I develop frameworks that connect abstract principles to intuitive examples and real-world applications. For instance, in linear algebra (although not typically offered in the CS department, the concepts in this course require frequent review across many CS courses due to their widespread application), I use 2D rotation mapping as a unifying concept,

[1] Some lectures are open accessed on the internet. For example, "What is linear, what is algebra, and what is linear algebra?" and "SICP with Mogan and Goldfish Scheme".

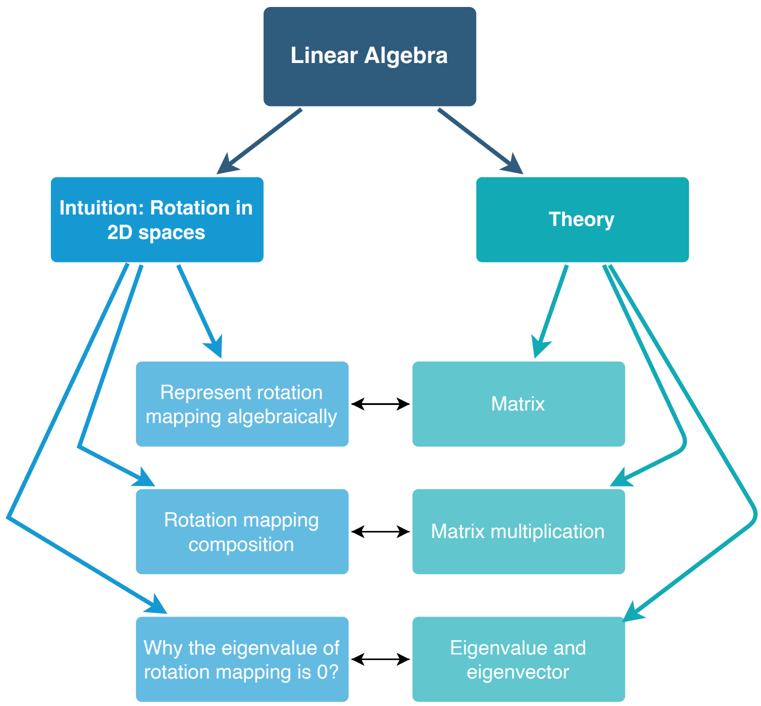


Figure 2: Use linear algebra as an example to bridge abstract concepts to real-world applications.

allowing students to visualize and manipulate complex transformations. This approach of anchoring abstract concepts in tangible representations has proven highly effective in developing deeper mathematical intuition across diverse student backgrounds. (Fig. 2)

Interactive Learning Through Technology Integration: My teaching methodology prioritizes interactive learning tools over traditional presentation methods, an approach proven to enhance student engagement and strengthen connections between theory and practice. As a co-founder of LIII NETWORK, I helped develop GNU $\TeX_{\text{MACS}}$/Mogan, an integrated educational platform that combines a WYSIWYG $\TeX$-like editor (allowing users to type equations as quickly as handwriting), interactive programming environments, visualization tools, and LLM integration into a unified learning system.

We implemented Mogan extensively in our SICP course, a foundational programming curriculum originally from MIT. The platform serves multiple crucial functions: it enables real-time code execution, provides blackboard-like mathematical expression capabilities, and facilitates dynamic visualization of complex concepts. This integration allows students to seamlessly move between theoretical understanding and practical application, with built-in LLMs offering opportunities to compare traditional and AI-driven problem-solving approaches.

The platform's effectiveness stems from its ability to unify various teaching tools into a single, coherent environment. Students can engage with mathematical concepts, run code, and explore visualizations within the same interface, while instructors can easily distribute comprehensive learning materials for continued study beyond the classroom.

TEACHING INTERESTS

My teaching interests encompass both graduate and undergraduate education, with a consistent focus on connecting theoretical foundations to practical applications. At the graduate level, I am prepared to teach control theory, reinforcement learning, and game theory, emphasizing the implementation of these frameworks in real-world systems beyond their mathematical abstractions. I am also developing a specialized seminar on integrating LLMs in decision-making, preparing students to adapt traditional methodologies for the AI era.

At the undergraduate level, I offer courses in programming, probability, optimization, and discrete mathematics, designed to illuminate the fundamental connections between mathematical concepts and computer science applications.

MENTORING

My mentoring experience centers on guiding STEM undergraduates toward doctoral studies, particularly in navigating interdisciplinary transitions. A notable success story involves two SUSTech mathematics major who, despite initial struggles with abstract mathematics and a low GPA, which hindered their confidence and academic aspirations. To address this, I focused on helping them connect mathematical principles to practical examples that resonated with their experiences. By using clear, relatable applications—such as demonstrating how linear algebra can simplify complex systems or how differential equations describe dynamic processes—I guided them through the underlying logic and structure of these topics. As we worked through these examples together, their understanding of mathematical concepts deepened, and they gradually developed a genuine interest in engineering. Additionally, I provided guidance on time management and study strategies, helping them identify and focus on core areas where they could excel while improving their overall GPA. I also encouraged them to take specific elective courses in CS department to gain exposure to interdisciplinary research and to build a portfolio of work showcasing their ability to apply mathematical tools to engineering challenges. I helped them craft a compelling personal statement that highlighted their journey, emphasizing their perseverance and growth in overcoming mathematical challenges. With persistent effort and strategic guidance, they gained the confidence and skills needed to pursue their goals, ultimately earning admission to Ph.D. programs in CS and ECE. This experience reinforced for me the value of personalized mentorship in transforming struggles into success.

Drawing from this approach, I have successfully mentored students from Mathematics, Statistics, Physics, and Computer Science in their transitions to engineering Ph.D. programs. My mentees now pursue doctoral studies at prestigious institutions including the University of Florida, University of Illinois, Duke University, and UW-Madison, [2] demonstrating the effectiveness of bridging disciplinary boundaries through targeted mentoring.

LEADERSHIP

As a co-founder of LIII NETWORK, I have led the development of GNU $\TeX_{\text{MACS}}$/Mogan, an open-source WYSIWYG $\TeX$-like editor that integrates interactive programming environments including Python, Julia, and Mathematica REPLs. This GPL-licensed project, written in C++ and Scheme, demonstrates both technical innovation and commitment to open-source principles. A key component of Mogan is its custom Scheme interpreter, Goldfish Scheme, which enhances usability by incorporating Python-like features.

The development of Goldfish Scheme showcases my leadership abilities in coordinating teams and fostering innovation. Leading a diverse group of undergraduate and graduate students, I created an environment that encouraged collaborative problem-solving and creative decision-making. This project served dual purposes: delivering a valuable technical solution while providing students with hands-on development experience in a supportive, mentorship-driven environment.

[2] For example, see: Yingyao Zhou, Chongyang Shi, Junze Deng, Du Chen, and Langtian Ma,