

Why You Should **All** Become Computer Engineers

ECE 29401 Sophomore Seminar

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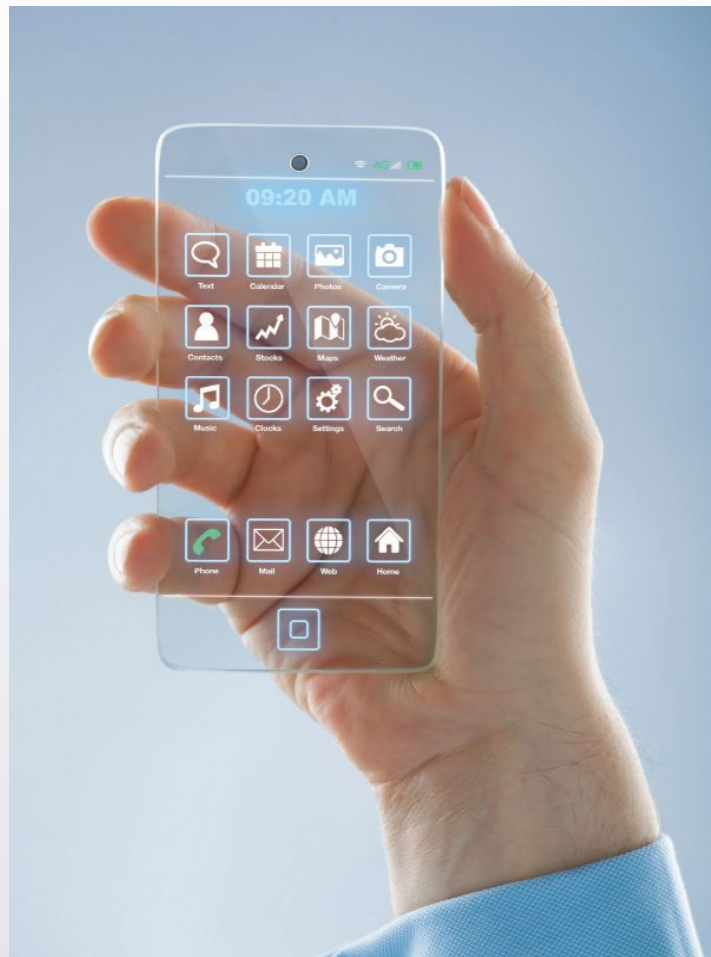
Area Chair, Computer
Engineering

Purdue University

Purdue ECE: Technical Areas

- Purdue ECE is divided into seven research areas
 - Computer Engineering
 - VLSI and Circuit Design
 - Communications, Networking, Signal & Image Processing
 - Microelectronics and Nanotechnology
 - Power and Energy Systems
 - Fields and Optics
 - Automatic Control
 - Education
- Each ECE faculty has a primary affiliation with one of these areas

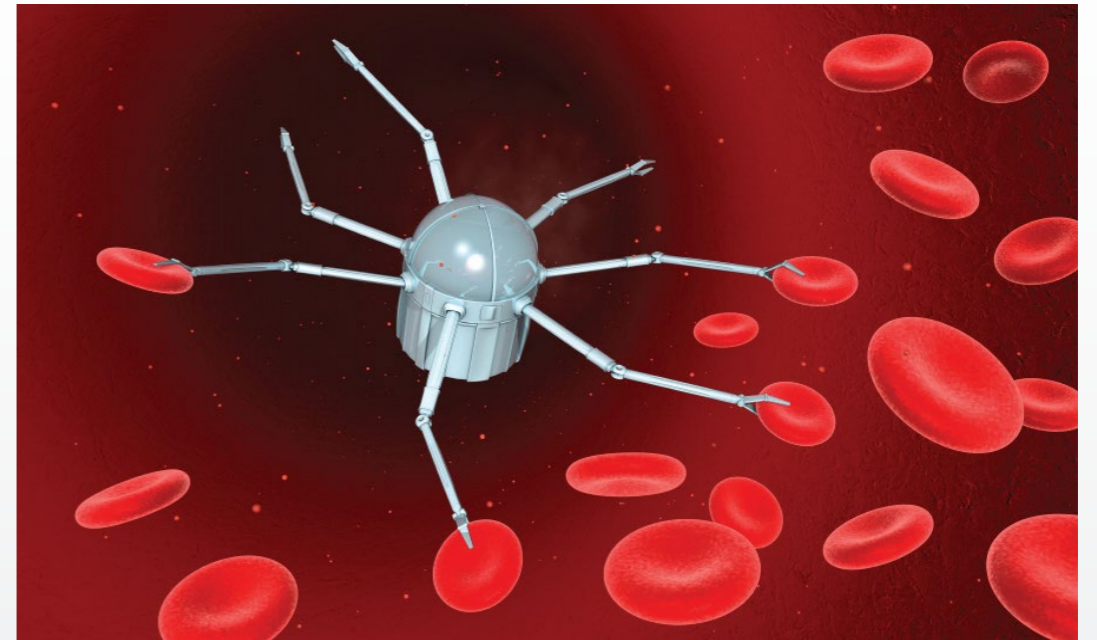
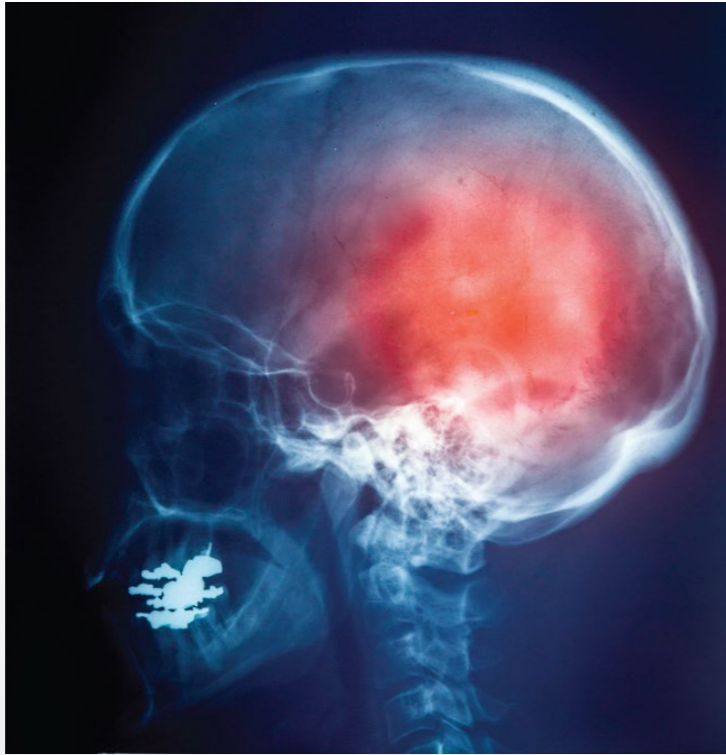
Designing the iPhone 17 or Pixel 10?



What does it involve?

**Hardware, Software, Algorithms, Signal Processing,
Wireless Communication, Industrial Design**

Medical Breakthroughs of the Future



- You may tell your grandkids one day everyone with a diagnosis took the same medicine
- Future of medicine is personalized health
- You can help usher this in as a Computer Engineer
 1. Develop algorithms for analyzing symptoms and correlating with medical history
 2. Create devices that can sense physiological signals
 3. Reduce the cost of the software and the hardware thus making these accessible








Demand and Supply

- According to the most authoritative source: US Department of Labor, Bureau of Labor Statistics (May 2024)

Demand & Supply

1. 317,700 openings are projected each year, on average
2. 112,720 (2022-23) bachelors degrees awarded in "computer and information sciences"

Show me the \$

	OCCUPATION	JOB SUMMARY	ENTRY-LEVEL EDUCATION	2024 MEDIAN PAY
	<u>Computer and Information Research Scientists</u>	Computer and information research scientists design innovative uses for new and existing computing technology.	Master's degree	\$140,910
	<u>Software Developers, Quality Assurance Analysts, and Testers</u>	Software developers design computer applications or programs. Software quality assurance analysts and testers identify problems with applications or programs and report defects.	Bachelor's degree	\$131,450
	<u>Computer Network Architects</u>	Computer network architects design and implement data communication networks, including local area networks (LANs), wide area networks (WANs), and intranets.	Bachelor's degree	\$130,390
	<u>Information Security Analysts</u>	Information security analysts plan and carry out security measures to protect an organization's computer networks and systems.	Bachelor's degree	\$124,910
	<u>Database Administrators and Architects</u>	Database administrators and architects create or organize systems to store and secure data.	Bachelor's degree	\$123,100
	<u>Computer Systems Analysts</u>	Computer systems analysts study an organization's current computer systems and design ways to improve efficiency.	Bachelor's degree	\$103,790
	<u>Computer Programmers</u>	Computer programmers write, modify, and test code and scripts that allow computer software and applications to function properly.	Bachelor's degree	\$98,670

Question Above All Questions

Does the GenAI boom mean careers in CE/CS are doomed?

No, but ...

- If you are “Joe the Programmer” then your job has been automated away
- But ... you will have a fantastic career in computing
 - If you know how to optimize AI-generated code
 - If you learn how to architect software
 - If you know how to gather user requirements and translate to implementable software specification
 - If you learn to detect, and to fix, reliability and security blindspots in AI-generated code
 - If you can be the wonderfully unpredictable, imaginative, persevering, spirited self that only humans can be

Courses (Software)

- ECE 20875 - Python for Data Science
- ECE 26400 - Advanced C Programming
- ECE 30861 - Software Engineering
- ECE 30862 - Object-Oriented Programming in C++ and Java
- ECE 30864 - Software Engineering Tools
- ECE 36800 - Data Structures (and Algorithms)
- ECE 39595 - Programming with C++ or Java Lab
- ECE 40400 - Computer Security
- ECE 40875 - Data Mining Basic Concepts and Techniques
- ECE 46300 - Introduction to Computer Networks
- ECE 46800 - Introduction to Compilers
- ECE 46900 - Operating Systems Engineering
- ECE 47300 - Introduction to Artificial Intelligence

Courses (Hardware)

- ECE 33700 - ASIC Design Laboratory
- ECE 43700 - Computer Design and Prototyping
- ECE 47700 - Digital Systems Senior Project
- ECE 40862 - Software for Embedded Systems

Senior Design

- Hardware-focused:
 - ECE 47700 - Digital Systems Senior Project
- Software-focused:
 - ECE 49595 - Open Source Software Senior Design Projects

Key Things to Keep in Mind

- To be a *standout* computer engineer, you must often know both hardware and software (you will likely specialize in one, but should have a good understanding of how the other works)
- You will learn much more by actually doing than by hearing, watching, or reading
- **Dare to be different:** An innovative project perhaps
- **Keep the big picture in mind:** The reason you are here is to learn and get prepared for the real world, not just to get a grade

Possible Career Paths

For someone with a Software focus

1. Designing and implementing software

- ▶ Software development including web development, security issues, mobile development, and interface design
- ▶ Bachelor's degree usually sufficient for entry but professionals often come back for a Master's

2. Devising new ways to use computers

- ▶ Refers to innovation in the application of computer technology
- ▶ Sometimes involves advanced graduate work, followed by position in a research university or industrial research and development laboratory
- ▶ Can involve entrepreneurial activity

3. Planning and managing organizational IT infrastructure

- ▶ Manage people to get projects done
- ▶ Make cost-benefit decisions about what kind of IT infrastructure to adopt for efficiency, scalability, usability, future evolution
- ▶ Professionals often come back to get an advanced degree

What Skills You Should Look To Pick Up

1. Technical computing skills

- ▶ Problem-solving ability, recognizing levels of abstraction in software, hardware systems, and multimedia
- ▶ Practical skills such as building and using database management systems and other sophisticated software tools
- ▶ Programming, including using existing software libraries to carry out a variety of computing tasks, such as creating a user interface
- ▶ Being aware of the uses to which computers are put, recognizing issues to do with security, safety, etc.
- ▶ Looking at innovative ways of using computers, creating tools, providing support

2. General professional skills

3. (Optionally) Specialized domain knowledge

What Skills You Should Look To Pick Up

1. Technical computing skills

2. General professional skills

- ▶ Communicating in writing, giving effective presentations and product demonstrations, and being a good negotiator
- ▶ Preparing for a job search; this involves building an impressive curriculum vitae and basing this confidently on your skills
- ▶ Being an effective team member
- ▶ Understanding the special requirements of a globally distributed project with participants from multiple cultures
- ▶ Recognizing the challenges and opportunities of keeping skills up-to-date and understand how to do so

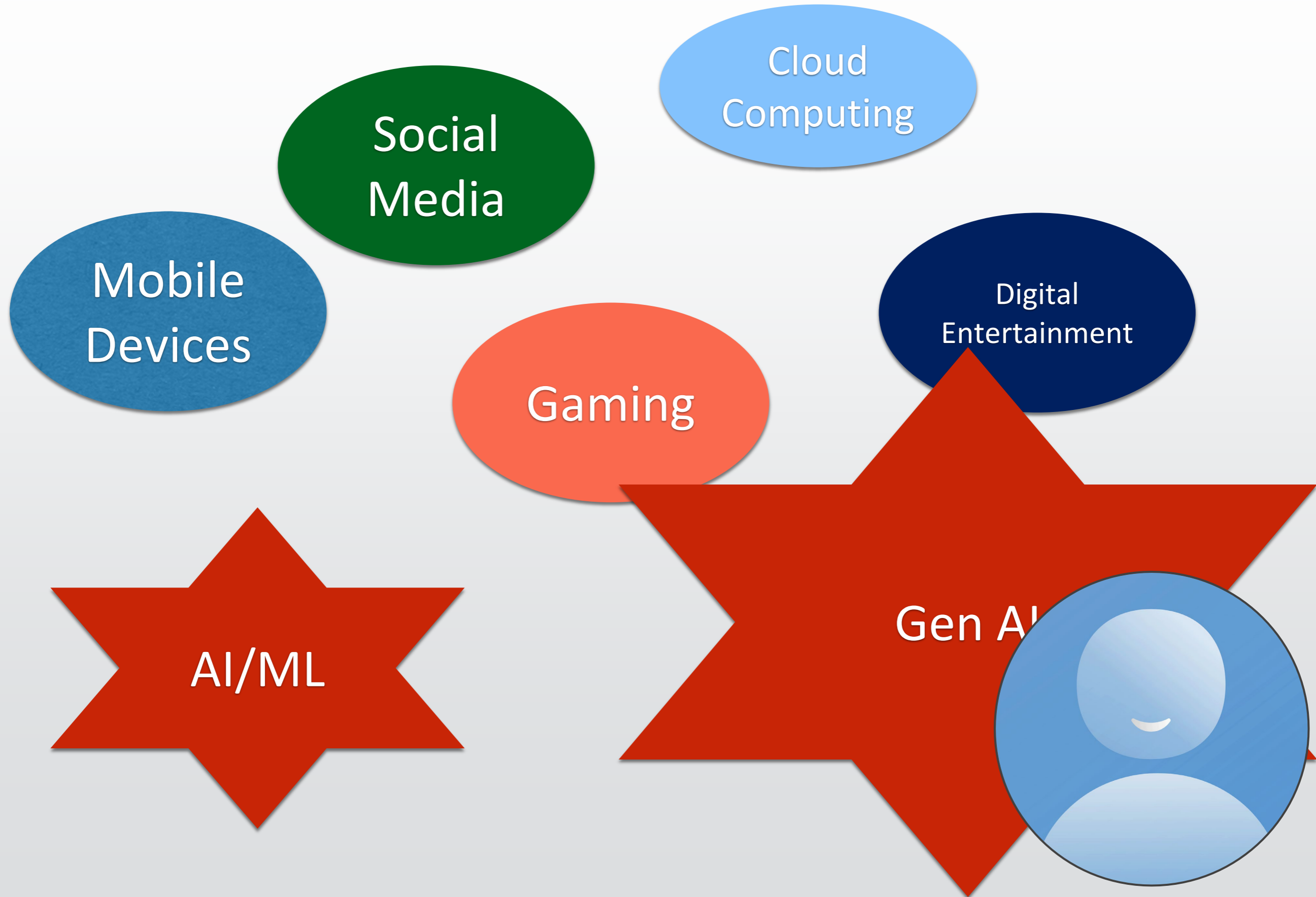
3. (Optionally) Specialized domain knowledge

- ▶ Example: Medicine, if you want to go into applications of computer technology to healthcare
- ▶ Example: Business, if you want to start up a company

A Note About Course Scheduling

- Most of you looking for jobs will interview in the Fall semester of your senior year (assuming you plan to graduate at the end of Spring)
- Make sure you complete as many ECE courses as you can by then
- For example, software focused BSCmpE students should have completed (or currently doing) 437, 468, and 469. Hardware focused students should (ideally) have completed (or currently doing) 337, 437, and 456
- You have a choice of electives (Complementary Elective, CmpE elective) - Choose wisely!

Where Else Can You Make Impact



Questions?

Quiz

