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ECE 410/510: Hardware for AI and ML

Recap and reminders

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This is not your regular class…

And that's by design!

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Analogy: Collecting diamonds

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The things you should do

- Keep track of everything you accomplished. Create a portfolio of your work that you can showcase.
- Solve at least one challenge per week.
- Complete the main project.
- Show up.
- Engage
  - It's easy to get answers in these days.
  - It's hard to ask the right questions.

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What if you are…

- …taking the easy route.
- …taking shortcuts (a.k.a. "cheating").
- …not showing up.
- …not putting in the work.
- …unwilling to learn and to be challenged.

Then perhaps this class is not for you.

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Create a portfolio of your work

- Github
- A platform of your choice:
  - Blog (e.g., Wix, Wordpress, Squarespace, GoogleSites)
  - Technical reports on Github
  - Github wiki
  - A weekly medium article
  - …
- Everything needs to be public

- Goal: impress your future employer!

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I see my role as…
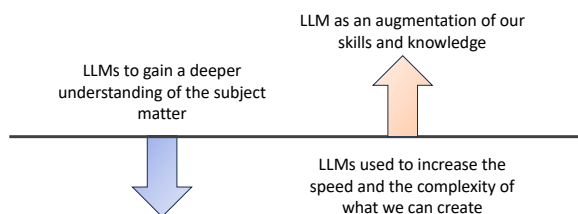
- …providing a framework to learn (and fail).
- …providing plenty of opportunities to shine.
- …helping you to be successful, not just in this class, but in your career.
- …guiding you on your educational journey.
- …nurturing your curiosity.
- …being a role model.

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"Vibe coding"

- "Vibe coding is an AI-dependent programming technique where a person describes a problem in a few sentences as a prompt to a large language model (LLM) tuned for coding.
- **The LLM generates software, shifting the programmer's role from manual coding to guiding, testing, and refining the AI-generated source code.**
- Vibe coding is claimed by its advocates to allow even amateur programmers to produce software without the extensive training and skills required for software engineering.
- The term was introduced by Andrej Karpathy in February 2025."
- Karpathy: "**The hottest new programming language is English.**"
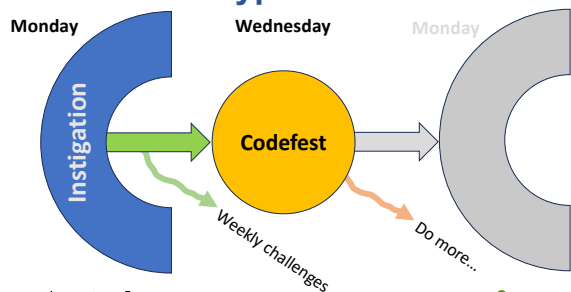
https://en.wikipedia.org/wiki/Vibe_coding

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LLMs to design more, better, and quicker

LLM as an augmentation of our skills and knowledge

LLMs to gain a deeper understanding of the subject matter

LLMs used to increase the speed and the complexity of what we can create

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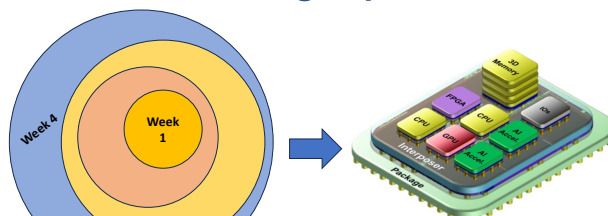
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Engineering mindset

- Make things better! This is the essence of computer engineering: make things better, faster, more efficient, etc.

- See what your LLM generates as a starting point.
- Make it better. Use the LLM to make it better.
- Make it perfect!

- Use the LLM for explanations: "Explain me what happens on lines 3-10 and why"

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A typical week

Monday

Wednesday

Monday

Instigation

Codefest

Weekly challenges

Do more…

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Incremental building/experimentation

Week 4

Week 1

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Participate in an educational study and publication

- **Now**: complete an initial skills/knowledge assessment.
- **End of term**: complete the same survey.

- Agree to have your deliverables/products assessed.
- Participate in a focus group at the end of the term.

- **Why participate?**
  - Help to make this a better class for future students
  - Be part of the change
  - Co-author a publication?

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Prep for next Monday

- C. Guo et al., "A Survey: Collaborative Hardware and Software Design in the Era of Large Language Models," in IEEE Circuits and Systems Magazine, vol. 25, no. 1, pp. 35-57, 2025, https://doi.org/10.1109/MCAS.2024.3476008

- [OPTIONAL] G. De Michell and R. K. Gupta, "Hardware/software co-design," in Proceedings of the IEEE, vol. 85, no. 3, pp. 349-365, March 1997, https://doi.org/10.1109/5.558708

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