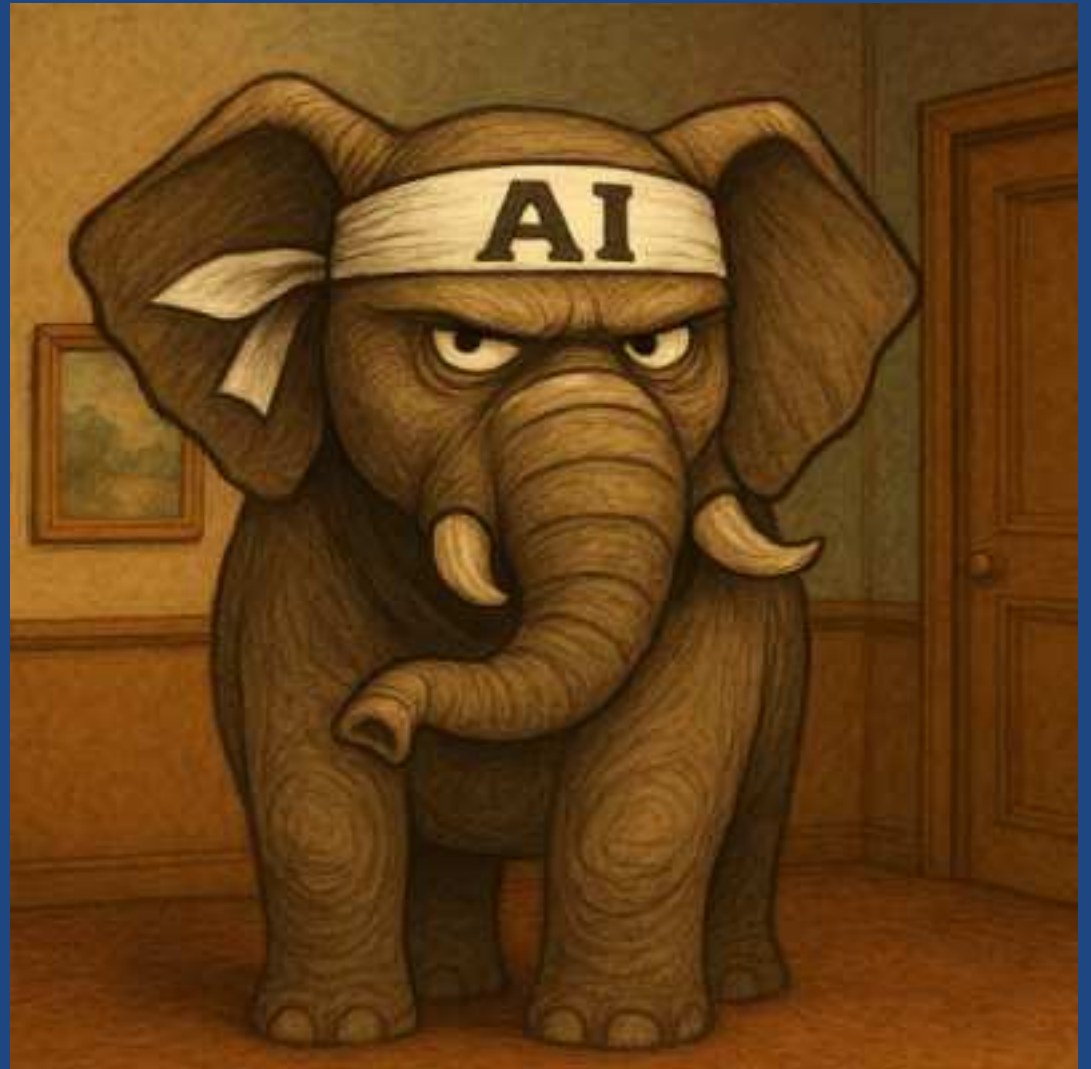


AI & Learning



Why are we here?!



- Why are you pursuing your degree?
 - a) Get a good job.
 - b) Love learning.
 - c) Make the world a better place.
 - d) Better than the alternative (someone made me).
- What is the most important thing to get out of your university studies?
 - a) Knowing how to learn.
 - b) Knowing how to breakdown a complex problem.
 - c) Knowing how to use tools, like AI.
 - d) Knowing how to follow directions.
- What part of your courses teach this?
What does using AI on an assignment teach?



How can we learn Kung Fu (or Karate)?



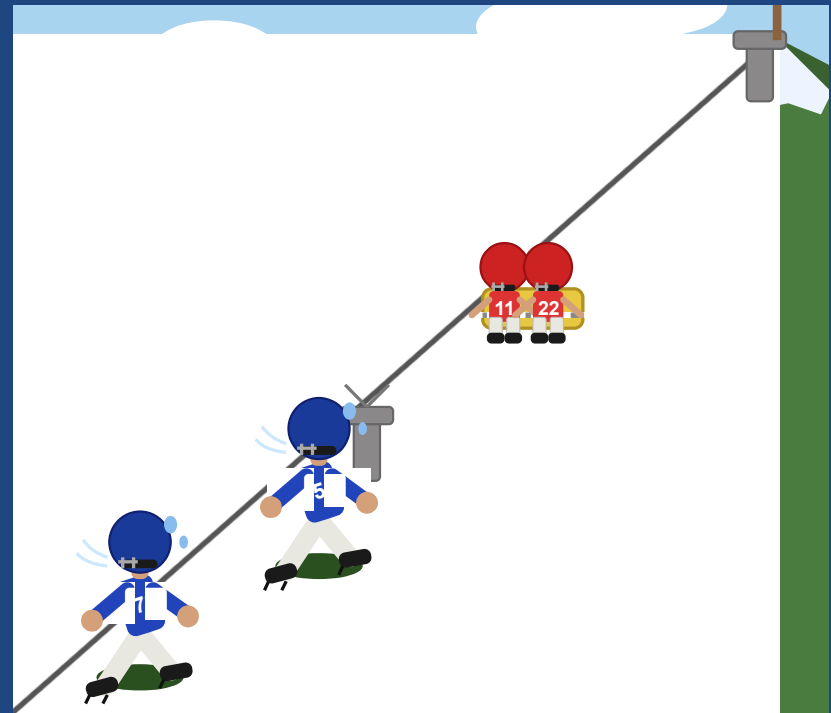
The Matrix (1999)



Karate Kid (2010)

How AI Effects Learning

- AI can quickly produce “good” output with minimal prompting.
 - GenAI automates the generation of content.
 - GenAI does not automate learning.



Productive Struggle

- Humans need a **productive struggle** to learn
 - **Neuroplasticity** allows your brain to rewire (learn) through activation.
 - **Struggling through a task helps your brain understand the task and rewire to do it better.**
- **E.g.: MIT Experiment -- Fortran and LLMs (~2024)**
 - Divide class into groups; solve a coding problem with an unknown language (Fortran)

Groups	Exercise	Tested on how <i>they</i> solved <i>the problem</i> (from memory)
ChatGPT Group	Fastest to get a solution.	
Google Use Group	Slowest to get a solution.	

AI and Coding

Context on AI

- AI is dramatically changing software development
 - It can write code fast.
 - It can provide a (good?) analysis of code.
- Does this make software developers obsolete?
- I feel that to be an efficient developer with AI you must:
 - 1) Be an skilled software developer.
 - 2) Know how to efficiently use AI tools.

AI can make you 10 times as productive.
But you have to already be productive!

Why you need development skills?

- ..
- **AI tools generate quantity over quality.**
 - **You** must review the quality of generated code.
 - **You** must direct the AI how to meet your goals.
- **You need the skills to know good code, and know what is needed to improve it.**
 - This course is mainly about **building your skills as a software developer.**

- **Lecture** teaches us ideas, but most of us learn software development best by..
 - **Assignments** are how we code in this course.
- **Our Coding Process:**
 - a) **Code a little** (but of course it's wrong!)
 - b) **Run it** and see where output is incorrect, or **Read code** and see it's a mess (design/details/...)
 - c) **Find** where in the code is the problem.
 - d) **Decide** how to correct the code.
 - e) Goto 1.
- **ABCD - With a partner**
Where in this does your learning happens?

Limit of AI

- **AI Limits Learning**
 - Using AI tools can..
 - This limits the skills you learn and **stunts your growth.**
- **AI mostly "understands", most of the time**
 - **e.g.:** asked to refactor code that used a Java interface, AI gave me **3 different ideas on how to instantiate an interface,** but identical code for each!
- **AI often favours Quantity over Quality**
 - Some open source projects are banning AI because **it creates a lot of low-quality code:** experienced developers sift through to find good changes.
 - Benefits of AI use is an area of active research!

Use of AI in this course

- Use AI to help you learn by having it:
 - Explain code
 - Quiz you on course content
 - Discuss debugging when truly stuck
 - Get help like stack-overflow
e.g., "How to generate random number in C++?"
- Don't use AI to write your code.
Your value to a company is the skills you bring: you must be a strong developer to effectively use AI.
 - Don't let it make design decisions.
 - Don't let it write your code.
 - Don't let it refactor code to clean it up.

Things to Know

- 1) Don't use AI for anything you want to get better at:
use it as an aide to learning.
 - Humans have to struggle to learn.
- 2) Anything coming out of GenAI is not yours
regardless of the code you fed it.
- 3) Each assignment may have unique AI use requirements
 - Using too much AI is a violation of academic honesty:
Get 0 on the assignment & reported to university.
- 4) Course tries to grade learning not produced work.