CMSC 412

Feb 10, 2026
Guest speaker, Bill Pugh

Everything is Bill's personal opinion,
not necessarily course guidance

Unfortunately, no one can be told what AI coding is

You have to experience it for yourself

AI coding tools and CMSC 412

You are under no obligation to try or use AI coding tools in this class

- But it would be wise to use them enough to understand what they can do

Except for simple problems/assignments, it isn't just a matter of giving them the assignment and saying "Solve this"

If you have some experience using them

- You can use them to get programming assignments done quickly
- without learning much about what the assignments is supposed to help you learn
  - unless you make *learning* part of your goal in using them

Slides shown at faculty meeting Feb 6th

Code red on the abilities of AI coding tools

The impact it going to be much broader than "what do we do about cheating on programming assignments?"

AI coding tools gained significant new capabilities in November/December,

- a huge leap over summer 2025.

Many professional developers now use them to *type* over 80% of their code, though developers remain deeply involved in software creation.

News flash!
Claude Opus 4.6 and OpenAI gpt-5.3 codex released Feb 5th
Saas company stock prices plummeted that week

Big changes may come soon

We must prepare for the possibility of a bigger impact than anticipated

● Both software development and CS curriculums face transformation.

Not just coding tools. AI agents can do proofs and most theory homework

Expect another substantial performance leap by fall semester.

Claude Opus 5.0?

We can no longer dismiss these tools as crap or simply ban their use in classes for the next year or two

Students will need these skills to be competitive for internships and jobs

In house experiments

Programming projects for CMSC 412 based on geekOS

Both Pete and Bill used Claude Opus 4.5 to complete the projects

- Needed experience in using Claude
- Needed to provide guidance and suggestions as Claude worked on the projects
- Claude made mistakes, needed help understanding and fixing them
- All code was typed by Claude

Bill completed his first run without learning much about operating systems internals (deliberately)

Claude found long standing concurrency bugs in geekOS code given to students

Officehours has been substantially rewritten using Claude

The officehours software (quuly) hadn't been touched in years, had outdated dependencies, featured "Coming soon" features that were never going to come

- Students who initially wrote it had moved on.
- Written with Go backend, React front end.
- CS lab staff didn't have skills needed to update it

Bill significantly updated it using Claude, fixing issues, streamlining and improving experiences, live now

CS lab staff now prepared to update and maintain it using AI coding tools

- taking feature requests and bug reports

Back to presentation for this class

Keeping up with what is happening

It is challenging and dizzying to try to keep up with what is happening.

You could easily spend hours a day trying to keep up

My suggestion for the highest payoff: follow Simon Willison's blog

https://simonwillison.net

Mike Krieger, Chief Product Officer at Anthropic

what we are witnessing today is not an incremental improvement in software development but a fundamental shift in its very nature. Writing code is no longer the core human skill; instead, the human role has evolved into setting direction, defining constraints, and evaluating outcomes, while artificial intelligence increasingly takes on the full responsibility of producing code end to end in many real-world scenarios.

[Post on Facebook](#)

[YouTube video](#)

AI coding tools as a learning tool

Can you use AI coding tools as a learning tool?

- Yes, but it requires you to use them in certain ways

I've done project 0 at least a dozen times

- As I've done that, I've had lots of interesting and deep conversations with Claude about aspects of the design of GeekOS and OS coding

We are providing scaffolding to guide Claude to work better as a tutor

- We *hope* this will help them work well for you, and
- be the start of something much more broadly applicable

What AI coding tools to use?

6-9 months ago, a lot of attention on IDE's with AI powered auto-complete, smart paste, etc.

Current models work very well just in a loop on conversation with the user, tool use, and thinking

    Can just do this in a terminal window

IDEs still really useful for viewing, understanding and reviewing code

Which coding model?

We are providing scaffolding that works with Claude. Claude Opus 4.6 in particular

    Open AI ChatGPT 5.3 Codex is also very good, has a different personality

    Scaffolding has be designed for Claude, not tested with Codex

I'm comfortable anthropomorphizing AI coding tools

    In talking with Claude, I'll sometimes say "please do …"

    I know they are not conscious

    Up to you how you talk with them

Key needs of AI coding tools

Specs/Context - They need information to understand the task

- Convert PDF files to markdown
- Test suites are one form of spec

They need to be able to use tools: compilers, build scripts, automated testing

- Stunning that they can do as much as they can with token prediction
- But the use of tools takes them to an entirely different level

Looping & iteration

- Give them sufficient ways to verify/validate a solution, they will often get the task done

Getting access to Claude Code

At the moment, campus isn't providing students with access to a coding model

- Campus is only providing access to GPT codex for a few faculty

Personal subscription is $20/month

- Should be more than sufficient

Show up at Claude Builders Club meeting on campus, get free access for 6 months

Everyone should have an opportunity to try Claude

I can provide access via an Anthropic API key with a limited amount of funds

If you want to try without having a personal subscription, we can provide you with that access

This will be a API key I set up and am paying for

- I won't have access to any of the data
- There will only be a few keys given out, each with a cap on usage
- Don't abuse this. If you make excessive use of the key you get, you will shut out other students

Personal subscriptions are much more cost effective than paying by API keys

Basics of how Claude works

Just install claude, start it in the root directory of the project you want to work on

If you start something brand new, start it in an empty directory

If you start in a project that hasn't been used with Claude before, use /init as one of your first commands

Claude will examine the files, create a CLAUDE.md

When you start Claude, it always looks for and reads a CLAUDE.md

Instructions in that file are kept front of mind

Don't make it too big. Strive for less than 500 lines

Claude in terminal or IDE

You can open a chat window with Claude directly in VS Code

Need to install Claude plugin, use /ide command in claude

I like doing this when I have a huge window

When working just on my laptop, I'm often switching windows between VSCode and chat window

Markdown

[Markdown](#) is a way to describe formatted text which is also easy to read without formatting.

> .md file extension

Has become the standard way to provide documentation to AI tools

Can be previewed in VSCode, can incorporate Mermaid diagrams for pictures

If you have PDF documents, convert them to Markdown

Unorganized thoughts

Using tools

Are you proficient with git? With bash? With docker? With qemu?

You should have the power of these tools available to you, and be using them

Claude is very good with tools like this, it can perform actions, or write scripts to automate tasks

Dangers of using AI coding tools

Leaking data

- With a personal subscription, you can ask them not to use your data for training purposes.
    - By default, they generally can
    - But even if they do, there isn't a giant repository of all the source code every uploaded to the model that their engineers can review

It can make stupid mistakes, generate insecure code

It can mess you up, delete your database or home directory

Consider sandboxing

Claude / commands

Lots of specialized commands available in claude, invoked with /

Can be specialized with user defined or installed skills

Things to do with Claude I've not yet tried

You can run Clause in the cloud, even give it access to your git repository and have it work entirely in the cloud

[Orchestrate teams of Claude Code sessions](#)

Claude tutor for Geek OS

Getting Claude to work as a tutor

This is an experiment. It might or may not go well.

Even if it *seems* to go well, you may miss out on important learning opportunities

I think it is important to see if we can get AI coding tools to work as a tutor

Even if this experiment doesn't work, hopefully other approaches will

You are responsible for achieving the learning objectives of the projects

We want to learn as much as we can from this experiment

    Evaluate how well this approach works, ways to improve it

This is an unstable alpha test

Lots of iteration over just over the weekend, even last night

  Adding stuff for collecting your experiences

  Tweaking things for Open 4.6

  We keep on doing runs on project 0 and 1, trying to fine tune things

THINGS WILL GO WRONG

  You may experience suboptimal results

Files being used for Claude tutor

.claude - customization of Claude

CLAUDE.md - master instructions

docs - documentation, mostly derived from PDFs you are given and examination of source code

tutor - guidance to Claude in how to be a good tutor. If using Claude, no need to read these

    If you are not using Claude as tutor, you might find these worth reading

        Particularly project specific folders

session - records of your progress and experience - private, not submitted

shared-experience - shared experiences to include with submission

Sharing experiences

The information in the session directory is just for you

When you submit your final project, we would really appreciate it if you would share your experiences with us

- The progress.md and session.md files from your session directory
- Maybe even the entire transcript of your session with Claude
- Copied to the share-experience folder, is submitted with your project

Will have no impact on your grade

Steps taken to evaluate them without associating them with your id

But we may try to determine, in a linked but anonymous way, impact on whether students achieved learning objectives.