

Exploring the Integration of Generative AI Tools in University Education

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What I will *not* talk about

Generative AI used for anything else than university education

GAI used for creating:

- programs
- pictures
- deep fakes
- music
- ...

Artificial General Intelligence (AGI)

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Suno

Flowy R&B inspireret af jazz, bossanova og pop – inspireret af den danske kunstner Anya – med danske sangtekster.

R&B fluido ispirato al jazz, alla bossanova e al pop – ispirato all'artista danese Anya – con testi in danese.

<https://www.dr.dk/nyheder/kultur/de-tog-ai-ti-sekunder-producere-et-nummer-som-anya-her-er-hendes-dom>

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Test First – or Test After...



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Nov. 30, 2022 => autumn '23

Today's agenda:

- pre-autumn '23 (*first wave*)
- autumn '23 (second wave)
- *reflections on autumn '23*
- autumn '24 (third wave)
- plans for autumn '25 (*fourth wave*)
- take-aways

I was positive right from the start:

- it is just another tool
- it is **not** going to replace me

LU: “panic” – stop cheating students

HBPE: “constructive/embracing”

- GAI “agnostic” examination
- *integrate in teaching*
- create a course

Nov. 30, 2022 => autumn '23

So, how to *integrate* GAI in my course?

- teaching SCM in a better way
- teaching students how to use GAI
 - to be more efficient *students*
 - to be able to use it in their future *job*

HBPE: “trivia”

- weak students perform better (45%)
- strong students perform worse (20%)

Nov. 30, 2022 => autumn '23

The use of GAI tools in courses is permitted if these pedagogic conditions are met:

- teachers can still confirm that students have achieved learning outcomes themselves
- if GAI tools are recommended, all students must have equal access
- students should not be required to give personal data or copyrighted material in order to use GAI tools unless the tool has been legally approved
- teachers must provide clear information about what is permitted and acceptable

autumn ‘23 – webpage

The use of "artificially intelligent" tools on the course

To a certain degree "artificially intelligent" tools (like ChatGPT and others) are just tools. You are allowed to use spell-checking tools to allow better spelling in your hand-ins - and you are also allowed to use "artificially intelligent" tools to improve the *contents* in your hand-ins. However, in an academic context there is one very important requirement to your work - and that is that it is clear what is the "works of others" and what is your "**independent**" work.

So try to think of ChatGPT (or other similar tools) as a *person*. If you do that, it should be very clear that there are two things that you are **not** allowed to do:

- you are not allowed to let another person do the work for you. So you cannot let another person write a lab report and then put your name on it (that is called ghost-writing). You cannot let another person write a project report or parts of a thesis and then put your name on it. If you are a group it does not mean that everyone has to write on all sentences, but neither does it mean that one person in the group can write the whole report and everyone gets their name on it. Everyone in the group has to contribute to the report - and ChatGPT is not a member of your group :-)
- you are not allowed to copy text that others have written and pretend that it is your own text (that is called plagiarism). Obviously you can use text that others have written, but that requires that it you put it in quotes (so it is clear that it is not your own text) and that you put a reference to it (so it is clear who is the original author). Just like you can use text from one of my papers (if you quote and reference it), you can also use text that has been created by ChatGPT (if you quote and reference it - and as part of the reference, I would like to know what you instructed ChatGPT to do). So just like you can quote "in his lecture note, Lars Bendix claims that git has support for the change set model", you will also be allowed to use claims from ChatGPT.

So, do use all possible sources of information - course literature, other literature, things from the lectures, labs, exercises - and discussions in your group (or with ChatGPT) - you are following this course **to learn** (I hope). However, in your hand-ins and your project report it has to be clear what is yours and what comes from others - and at the oral exam I will evaluate your ability to select and use and apply all these sources of information.

In the exercises and labs parts of the course there will be some *optional* tasks where you can use ChatGPT (or other tools). The purpose is that you should explore to what degree the tool provides good answers (compared to what you know about the topics) - and experiment with how you should formulate questions/tasks to obtain better/perfect answers from the tool (again compared to the knowledge you have). Using tools like ChatGPT for these optional tasks is in no way cheating - it will help you investigate how such tools can be used to help you **learn more** in a shorter time.

Updated September 5, 2023

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autumn ‘23 – Rules of the Game

that it is clear what is the "works of others" and what is your "*independent*" work

you are not allowed to let another person do the work for you. So you cannot let another person write a lab report and then put your name on it (that is called *ghost-writing*)

you are not allowed to copy text that others have written and pretend that it is your own text (that is called *plagiarism*)

help you investigate how such tools can be used to help you **learn more in a shorter time**

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autumn ‘23 – “Learning Objectives”

How to use GAI:

- in your education
- in your future job

What are the risks and limitations of GAI?

Prompt engineering:

“The quality of GAI’s answers depends on the quality of our questions”

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autumn ‘23 – Prompt engineering

deeplearning.ai course on prompt engineering:

- principle 1: write clear and specific instructions (clear is **not** short)
- principle 2: give the model time to think
 - specify the steps to complete the task
 - instruct the model to work/reason out its own solution

Iteratively develop your prompt

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Reflections on autumn '23

In reality I let down my students: “Carry out your own experiments – explore what works and what doesn’t”

- not systematic/structured
- not consistent/complete
- no explicit feedback from students

How to ask good questions in order to:

- learn about something new
- examine students (or Copilot?)

In the student situation you have no possibility to apply critical thinking – only blind faith

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autumn '23 => autumn '24

LU webinars got much more positive/constructive:

- how teachers can use it to teach
- how students can use it to learn
- but still “grains of cheating aspects”

Copilot (pro) gives you its sources – so you can check them just like you check references/referencing in a thesis/paper

In general students lack “critical thinking” **also** when searching and using literature for their project/report

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So, what was I was doing?

The Italian saying "Hai voluto la bici, ora pedala" literally translates to:

"You wanted the bike, now pedal."

It's a colorful way of saying: You made a choice, now deal with the consequences. Or more broadly: You asked for it, now follow through.

English equivalents or idiomatic translations include:

"You made your bed, now lie in it."

"Be careful what you wish for."

"You've got to face the music."

"You wanted it, now own it."

"You signed up for this, now see it through."

Each version carries a slightly different tone—some more resigned, others more assertive. If you're translating for a specific context (e.g., humorous, serious, motivational), I can help tailor it further. Would you like that?

autumn '23 => autumn '24

Many positive “anecdotes” about brainstorming sessions with GAI:

- the partner that is always there
- the partner that never gets tired
- the partner that never gets annoyed

but...

- you must have insight to brainstorm
- basic knowledge
- **critical thinking**
- reflection

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autumn '24 – Critical thinking

Do the students realise it when GAI is hallucinating and comes up with:

- fictive answers
- fake news
- hot air
- total bullshit

autumn '24 – webpage

Rules of the game:

Oh - and by the way - no, you cannot bring Copilot (or other GAI tools) to the oral exam ;-)

Learning Objectives:

- how to use GAI tools to provide information about SCM concepts and principles
- to have a critical approach to the information that GAI tools provide
- how to ask better questions to GAI tools to get better/trustable information

autumn '24 – first lecture



ChatGPT/Copilot

Generative AI – but:

- do not **cheat**
- academic **dishonesty**
- *optional* exercises:
 - critical sense
 - prompt engineering
 - “constructive” use

autumn '24

More systematic/complete:

- (optional?) questions for most exercise and lab sessions
- assignments were more specific

Discuss the answer in group and produce a motivated critique.
What is right? What is wrong? What is missing?

What extra information/questions do you need to provide Copilot to get a correct/complete answer?

autumn '24 – student feedback

	very little	sometimes	often	very often
use of GAI	29,2	45,8	16,7	4,2
reliable	29,2	41,7	20,8	4,2
valuable/informative	29,2	12,5	45,8	8,3

often/very often				
reliable	40	20	20	20
valuable/informative	40	20	20	20

autumn '24 – student feedback

Very helpful:

asked it to compare CVS and Perforce
repetition of fundamental concepts
quick repetition
 just the writing part
 help with the tools (labs)
to structure papers and handle information
definitions and fast way to get info
 to explain concepts in different ways
brainstorming
 helped me write my synopsis
explaining concepts
 summarising sections of existing text and explaining SCM
summarising key points
 when getting summaries of well-known concepts
 general terms in SCM
 to understand difficult topics

autumn '24 – student feedback

Absolutely useless:

anything about papers (unless you upload pdf)
 literature specific questions
for facts
definitions
to explain definitions and course terms
 to explain concepts from the articles
answering questions about topics for the exam
 long transactions
help understand some papers
 when getting detailed information of niche concepts
 to ask about info covered in readings

autumn '24 – student feedback

How can GAI be integrated in the course:

- students must understand and summarise to ask good questions
- as it was
- to summarise contents
- **show concrete examples of good prompts**
- as they have been now
- explaining complex subjects, simplifying to understand, giving examples to better understand
- as a learning tool for the theories' application

autumn '24 – Reflections and more

Own experiments:

negative:

- Wayne Babich
- (strict) long transactions
- “exam-like” questions

positive:

- git
- grammar and style

Copilot: what is the purpose of using long transactions in version control?

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autumn '24 => autumn '25

More of the same stuff :-)

Some live Copilot sessions at the lectures to exemplify

Larger exercises with “hand-ins” and “peer review”

How to use Copilot to prepare for the exam

Let Copilot create multiple-choice questions for each week's Learning Objectives (“demo”)

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autumn '24 => autumn '25

More of the same stuff :-)

March: seminar in Oslo

- GAI requires *new types* of exercises

May: seminar at LTH

- students wish two things:
 - to know what is *allowed* and not
 - to be taught *how to* use GAI

“Examination” style usage

Oral exam:

- student: grade
- GAI: exploration

Examiner:

- professor: expert
- student: “ignorant”

So, what is it that we want from GAI?

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GAI as a tutor

5 million flies can't be wrong?

Yes they can!

There is a lot of “urban myths” around used for training

For SCM there is very little quality material for training

Can GAI be used as a tutor to guide you into a subject?

What is $2 + 2$? (demo + “demo”)

GAI as a teaching assistant

What is it that a teaching assistant does:

- answers questions from students
- gives feedback on assignments
- helps out with small, specific problems
- does **not** teach
- so, students must show up “sort of **prepared**”

GAI as a study partner

“I didn't quite understand what “high cohesion” means and why it is useful – could you please explain that?”

“I think that the root cause of the “Double Maintenance” problem is that things are copied, but should remain identical – it that correctly understood?”

brainstorming

GAI for the teacher

GAI to “automate” feedback to students:

- is academic “dishonesty”
- present system stimulates reflection and learning
- teach them how to ask GAI for feedback – **after**

GAI to create “simple” multiple-choice questions (“demo”)

GAI to create “complex” case studies (demo)

Supervising master's thesis students (demo)

GAI for the teacher

I am a university teacher in *subject*. Next semester, I will be teaching a course on *course title* for the first time. The learning outcomes are *insert your learning outcomes for the whole course or module*. Generate an outline syllabus for a 12 week teaching term. There will be *two lectures and two two-hour seminars* every week. The *sixth* week will be a reading week and a summative assignment will be submitted at the end of *the twelfth week*. There will be formative assignment in *week 7*. Please suggest some ideas for both the formative and summative assignment as well. We use a grading system of *fail, pass, excellent*. Generate suitable grading criteria for the summative assignment based on the learning outcomes.

There is no free lunch

The perfect (almost) tool for brainstorming, but:

- good, useful answers require good questions
- good questions require some basic knowledge
- it requires practice – walk before you can run
- it requires time – GAI needs detailed instructions

GAI is a **machine/tool**, but

- you should treat it as if it was a human(oid)
- so, engage in interactive dialogue and conversation
- if you don't take control, GAI will

Summary

I was positive right from the start:

- it is just another tool
- it is **never** going to replace me

I **still** am, but

- a fool with a tool is still a fool
- teaching assistants might be replaced
- there is too little training material of good quality on SCM

Students need skills to:

- **prompt** the tools
- **assess** the answers