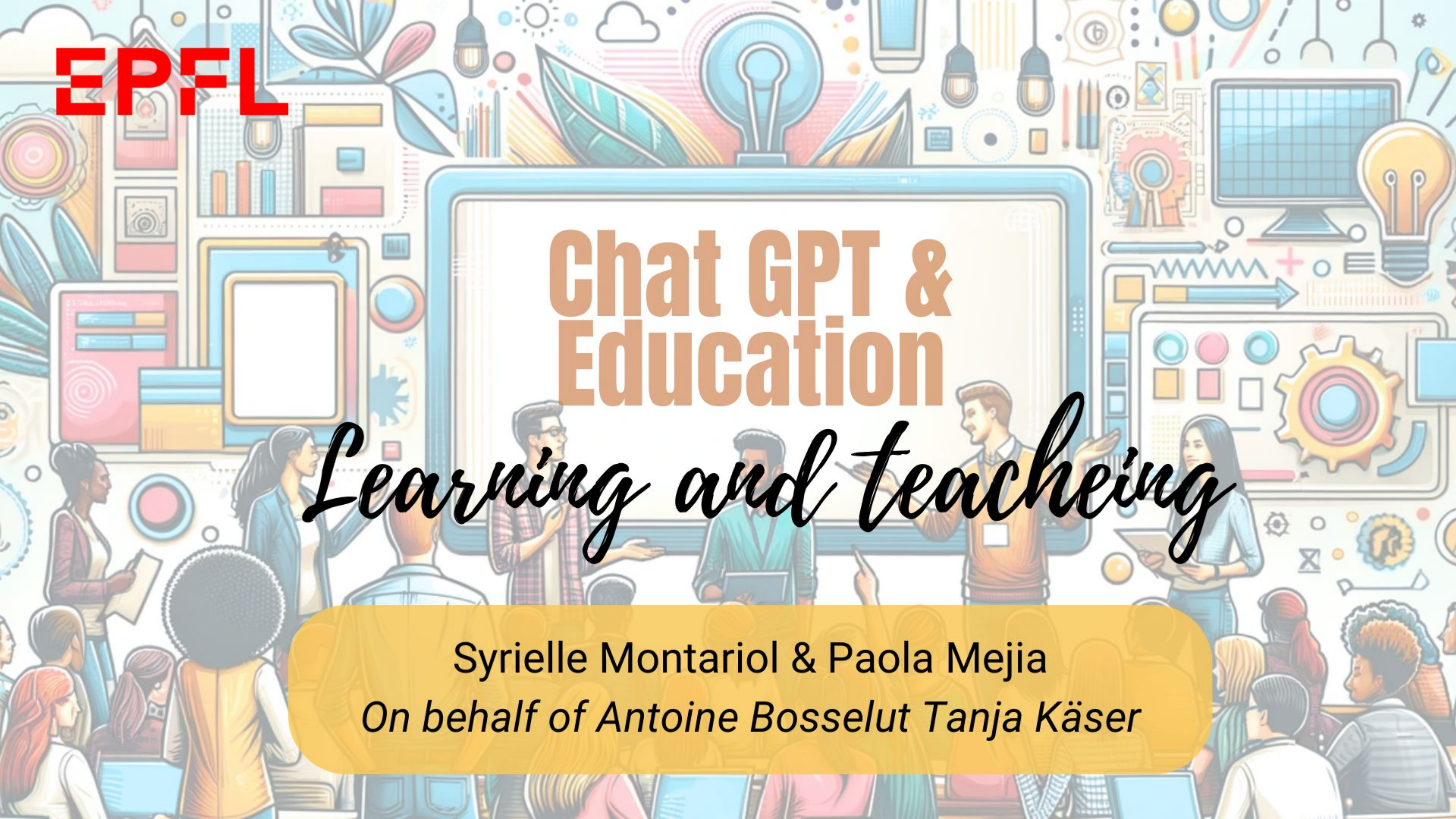


Chat GPT & Education

Learning and teacheing

Syrielle Montariol & Paola Mejia

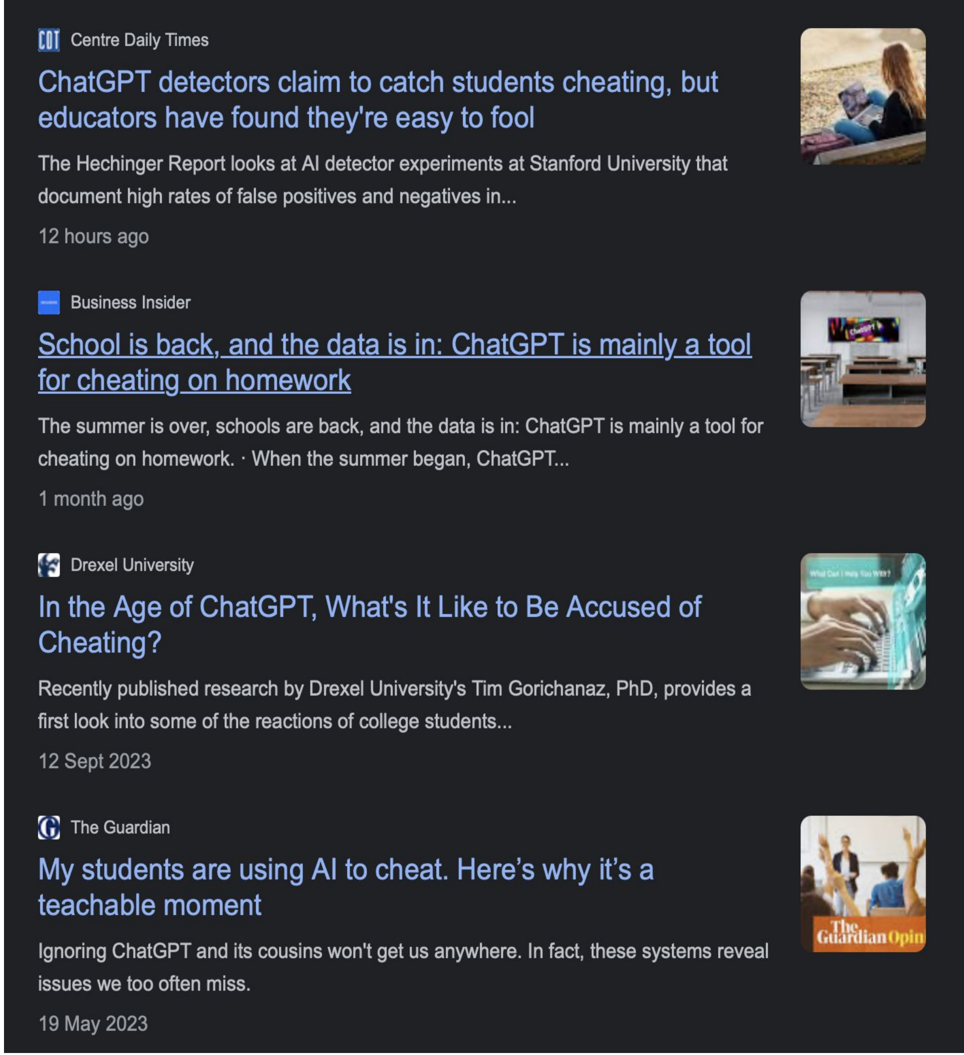
On behalf of Antoine Bosselut Tanja Käser

Overview

1. ChatGPT for students
2. ChatGPT for teachers

Motivation

How to fight with ChatGPT, and not against?



Centre Daily Times

ChatGPT detectors claim to catch students cheating, but educators have found they're easy to fool

The Hechinger Report looks at AI detector experiments at Stanford University that document high rates of false positives and negatives in...

12 hours ago

Business Insider

School is back, and the data is in: ChatGPT is mainly a tool for cheating on homework

The summer is over, schools are back, and the data is in: ChatGPT is mainly a tool for cheating on homework. · When the summer began, ChatGPT...

1 month ago

Drexel University

In the Age of ChatGPT, What's It Like to Be Accused of Cheating?

Recently published research by Drexel University's Tim Gorichanaz, PhD, provides a first look into some of the reactions of college students...

12 Sept 2023

The Guardian

My students are using AI to cheat. Here's why it's a teachable moment

Ignoring ChatGPT and its cousins won't get us anywhere. In fact, these systems reveal issues we too often miss.

19 May 2023

How can we use LLM models in education?

A large-scale project at EPFL, started early 2023:

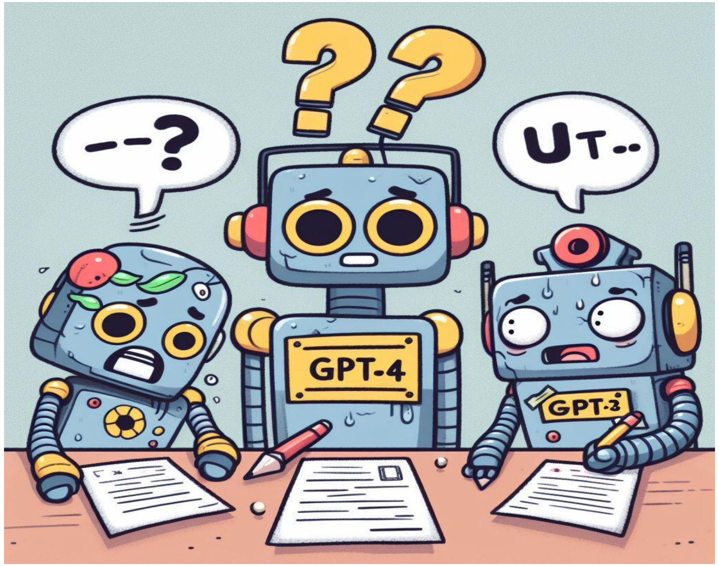
- We collected exercises and solutions from **142 EPFL courses**
- **6442** multiple-choice and open-ended questions

We prompted **GPT-3.5** and **GPT-4** to:

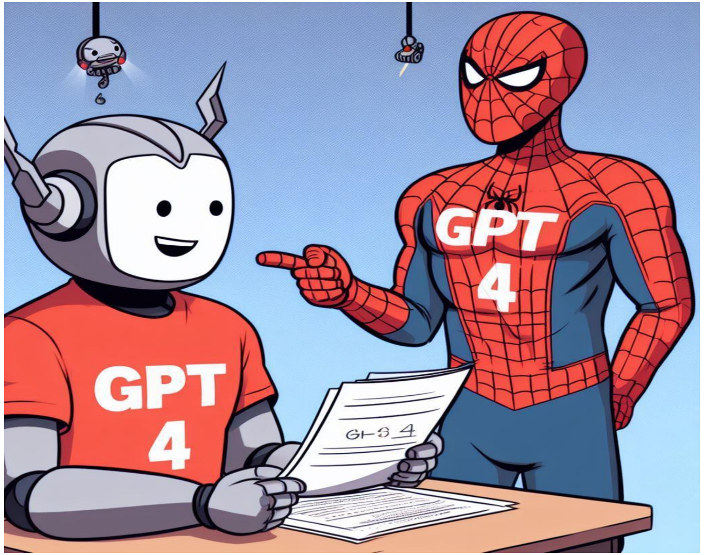
  - Generate a solution to a given question: different strategies!
  - Grade a given solution

Goal

How good a student are GPT-3.5 and GPT-4?



How good of a grader is GPT-4?



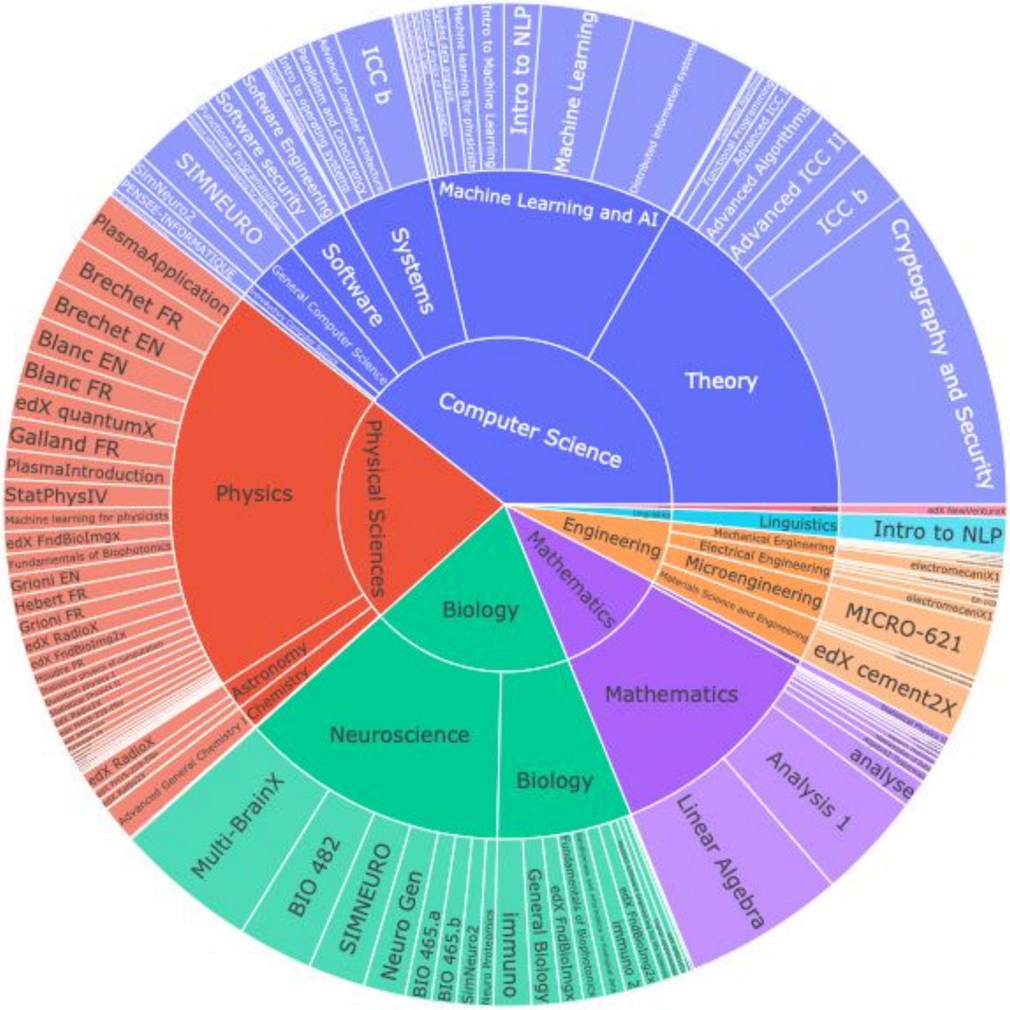
Dataset

6442 questions

4039 MCQs
2403 Open-Answer

4725 in English
1717 in French

1565 from Bachelors
1907 from Masters
2970 from Online Courses



Prompting Strategies

Direct prompting

- Zero-shot
- One-shot
- Expert

Reason-first prompting

- Zero-shot CoT
- Four-shot CoT
- Metacognitive
- Tree of Thought

Reflective prompting

- Self-critique

Prompting Strategies

Direct prompting

- Question-only
- One example
- Ask several times and average

Reason-first prompting

- Ask for reasoning
- Ask for reasoning With 4 examples
- Follow list of reasoning steps
- Simulate a discussion between experts

Reflective prompting

- Validate a given reasoning and answer

Grading Strategies

	GPT-4 Grading	Human Grading
MCQ	MCQ Auto-Scoring	
Open Answer	Direct Grading	“Gold” Grading

Only a subset of the courses

Can GPT-3.5 and GPT-4 pass EPFL courses?

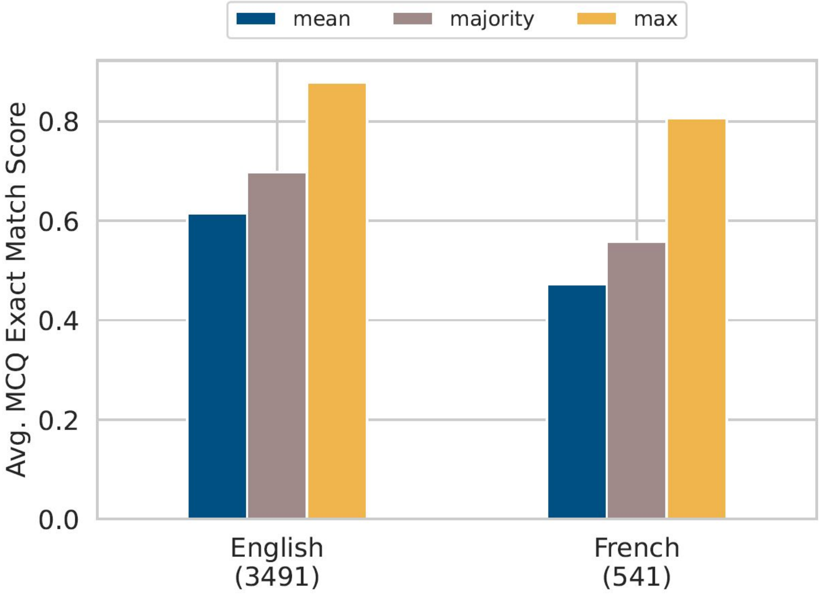
At best, GPT-4 would pass 85/142 courses

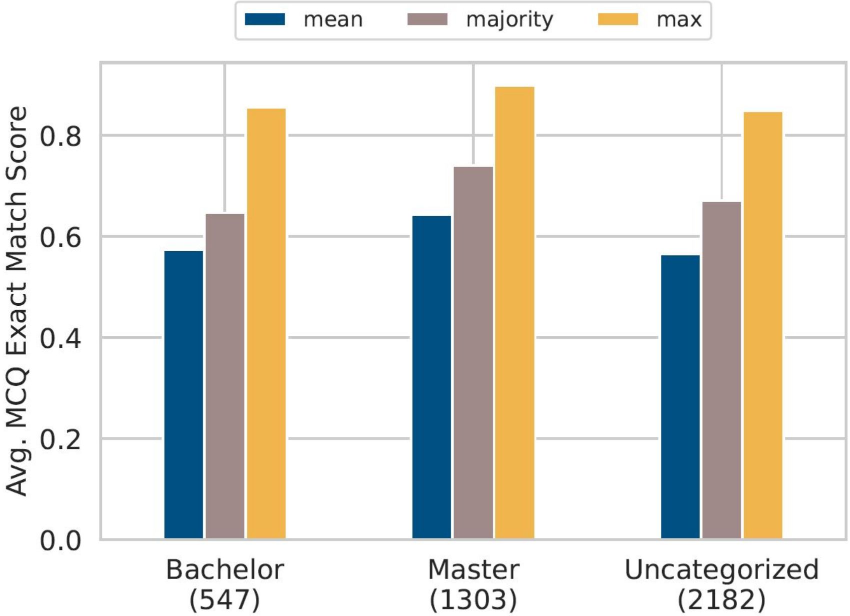
- 40/67 “MCQs courses”
- 45/75 “open-answer courses”

At best, GPT-3.5 would pass 43/142 courses

- 20/67 “MCQs courses”
- 23/75 “open-answer courses”

What impacts their performance?





What impacts their performance?

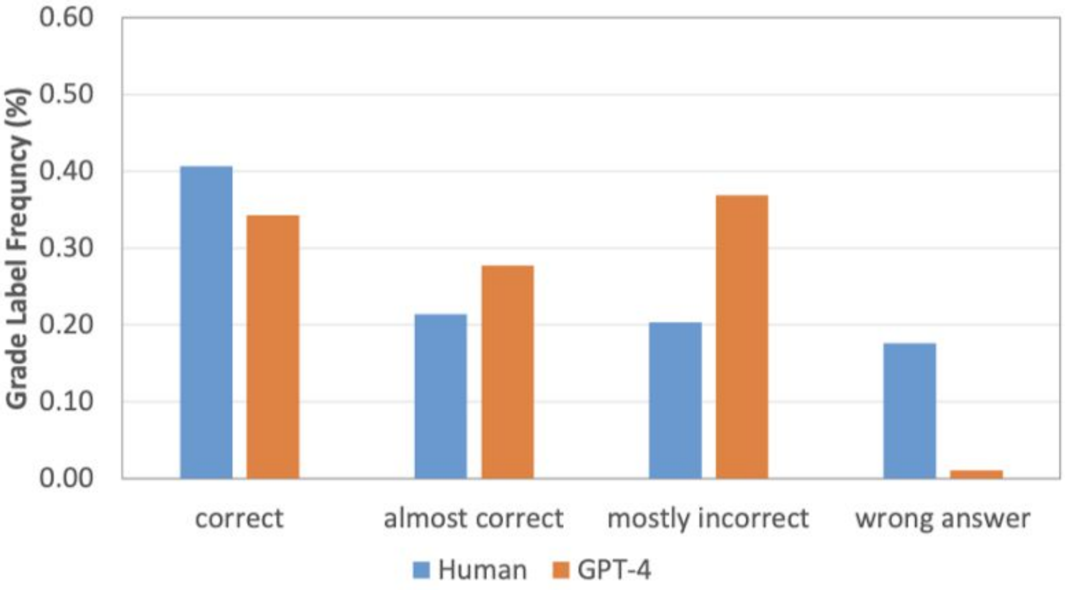
- Both GPT-4 and GPT-3.5 are better on English questions, both on MCQ and open-answer questions.

- *Computer Software* and *Computer Systems* are the best performing topics
- *Mechanical Engineering*, *Linguistics* and *General Computer Science* among the topics GPT-4 is weakest at.

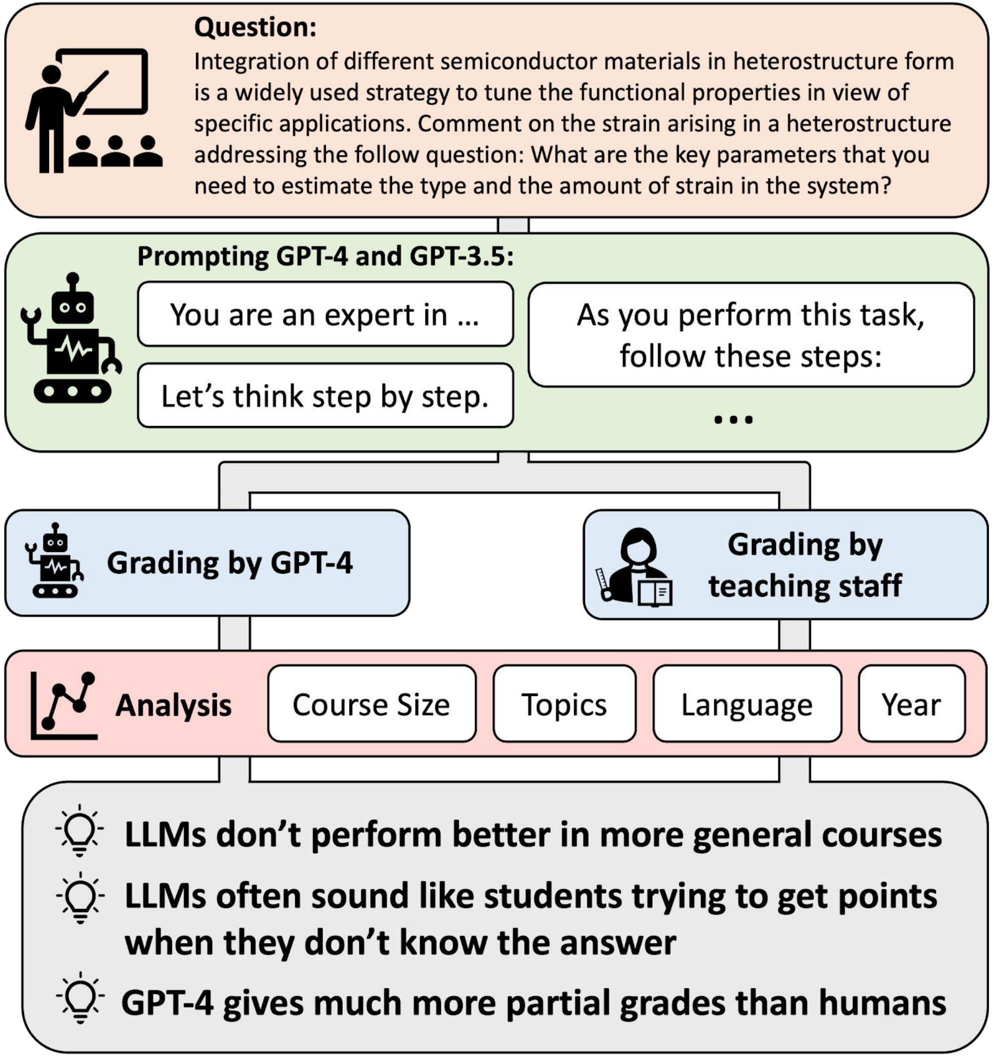
Can we use GPT to grade students' solutions?

GPT-4 vs the courses' teaching staff:

- GPT-4 almost never grades answers as wrong,
- GPT-4 grades answers as correct at a lower rate than humans
- Correlation between human and GPT-4 grading is low.



Summary



Question:
Integration of different semiconductor materials in heterostructure form is a widely used strategy to tune the functional properties in view of specific applications. Comment on the strain arising in a heterostructure addressing the follow question: What are the key parameters that you need to estimate the type and the amount of strain in the system?

Prompting GPT-4 and GPT-3.5:

You are an expert in …

Let's think step by step.

As you perform this task, follow these steps:

…

Grading by GPT-4

Grading by teaching staff

Analysis

Course Size

Topics

Language

Year

- **LLMs don't perform better in more general courses**
- **LLMs often sound like students trying to get points when they don't know the answer**
- **GPT-4 gives much more partial grades than humans**

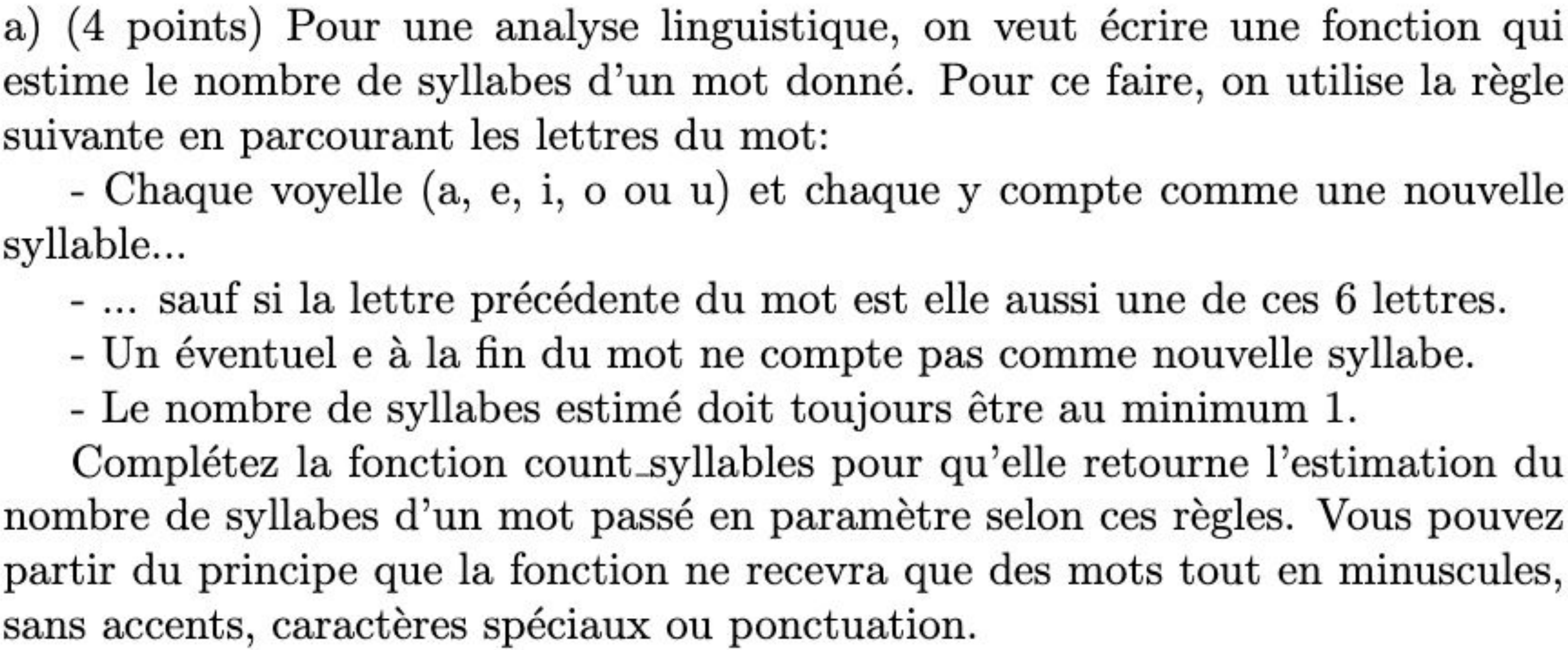
Can we use GPT to provide feedback?

Motivation: Feedback (formative assessment) is more useful than grades (summative assessment).

How do students perceive AI-generated feedback?

How does it compare to the TA-generated feedback?

Example - Programming Exercise

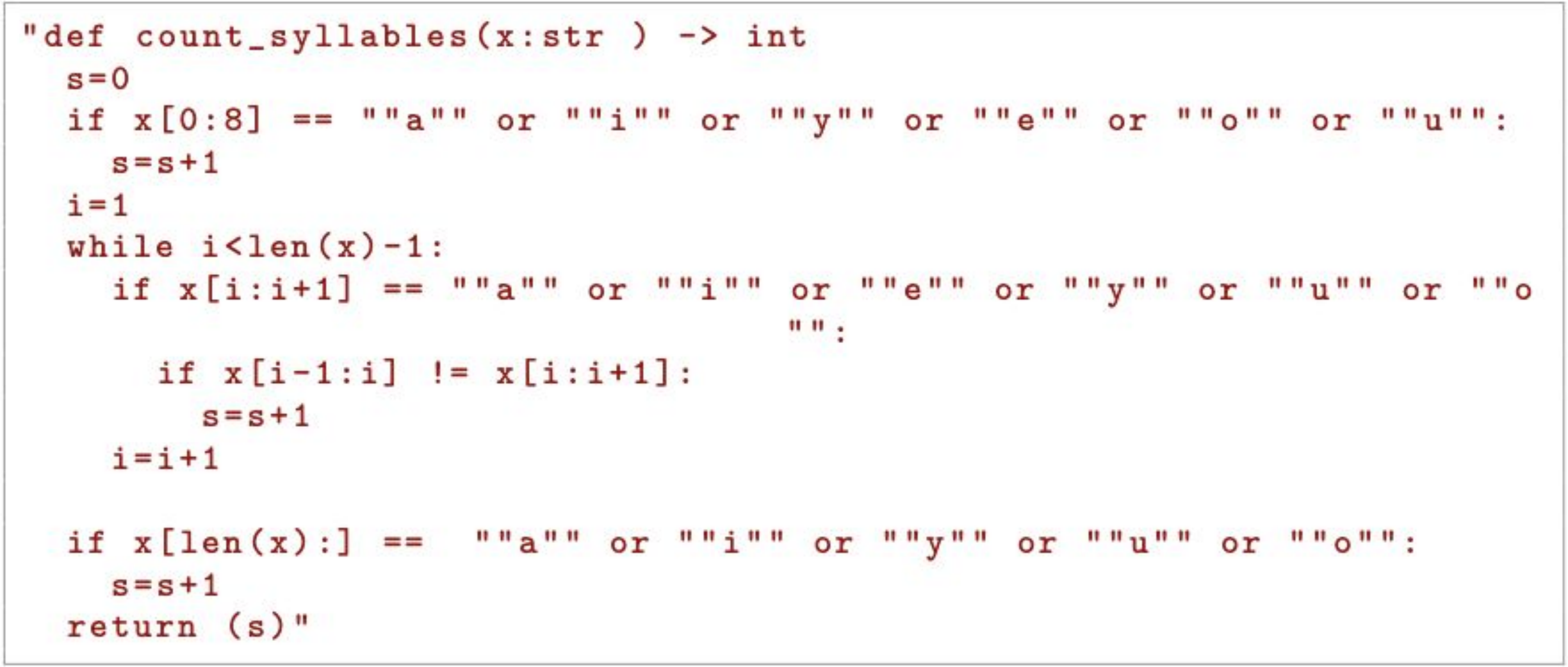


a) (4 points) Pour une analyse linguistique, on veut écrire une fonction qui estime le nombre de syllabes d'un mot donné. Pour ce faire, on utilise la règle suivante en parcourant les lettres du mot:

- Chaque voyelle (a, e, i, o ou u) et chaque y compte comme une nouvelle syllable...
- ... sauf si la lettre précédente du mot est elle aussi une de ces 6 lettres.
- Un éventuel e à la fin du mot ne compte pas comme nouvelle syllabe.
- Le nombre de syllabes estimé doit toujours être au minimum 1.

Complétez la fonction count_syllables pour qu'elle retourne l'estimation du nombre de syllabes d'un mot passé en paramètre selon ces règles. Vous pouvez partir du principe que la fonction ne recevra que des mots tout en minuscules, sans accents, caractères spéciaux ou ponctuation.

Example - Student Solution



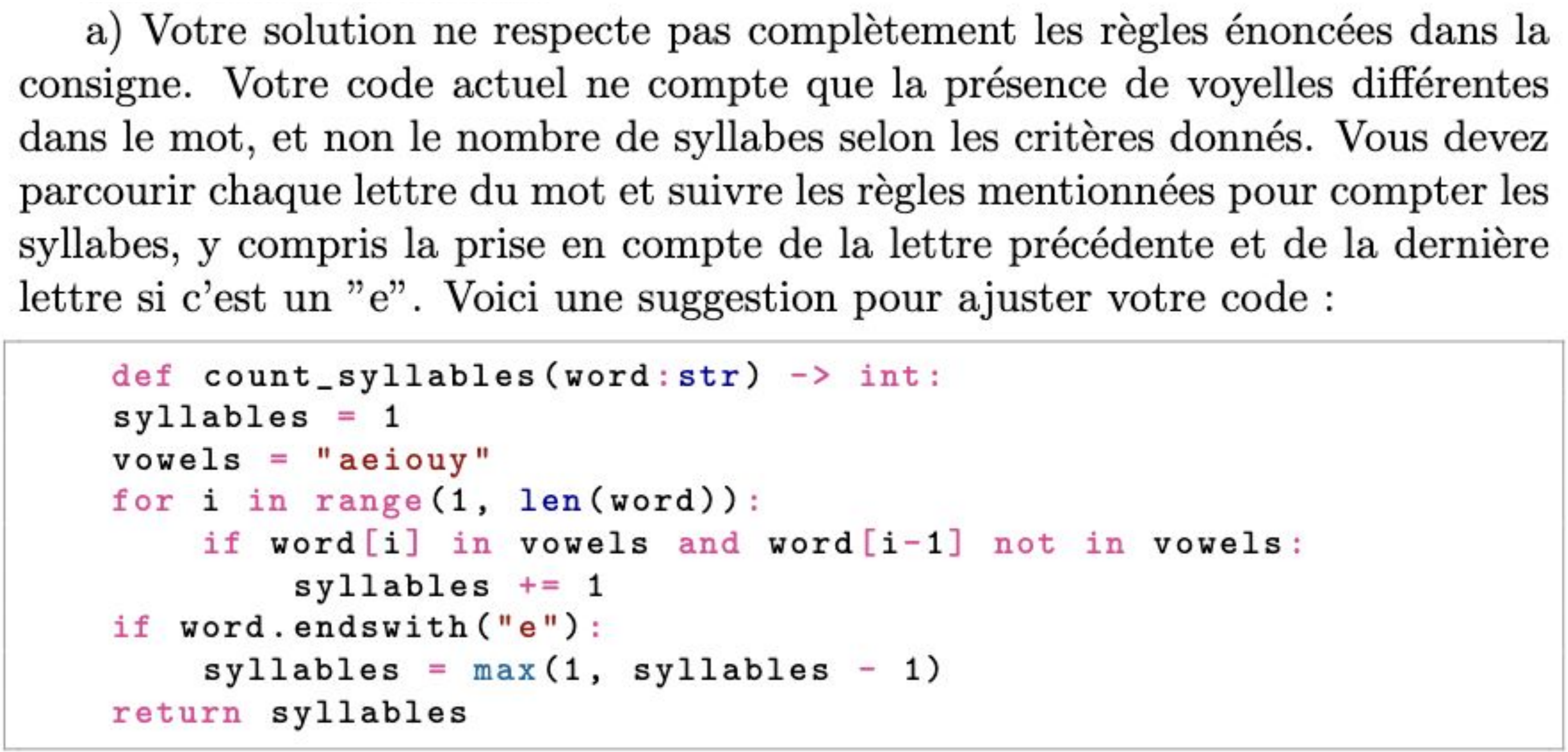
```
"def count_syllables(x:str ) -> int
  s=0
  if x[0:8] == ""a"" or ""i"" or ""y"" or ""e"" or ""o"" or ""u"":
    s=s+1
  i=1
  while i<len(x)-1:
    if x[i:i+1] == ""a"" or ""i"" or ""e"" or ""y"" or ""u"" or ""o
                                                  "":
      if x[i-1:i] != x[i:i+1]:
        s=s+1
    i=i+1

  if x[len(x):] ==  ""a"" or ""i"" or ""y"" or ""u"" or ""o"":
    s=s+1
  return (s)"
```

Your turn!
Give feedback to the student

5 minutes

Feedback generated by a LLM



a) Votre solution ne respecte pas complètement les règles énoncées dans la consigne. Votre code actuel ne compte que la présence de voyelles différentes dans le mot, et non le nombre de syllabes selon les critères donnés. Vous devez parcourir chaque lettre du mot et suivre les règles mentionnées pour compter les syllabes, y compris la prise en compte de la lettre précédente et de la dernière lettre si c'est un ”e”. Voici une suggestion pour ajuster votre code :

```python
def count_syllables(word:str) -> int:
syllables = 1
vowels = "aeiouy"
for i in range(1, len(word)):
    if word[i] in vowels and word[i-1] not in vowels:
        syllables += 1
if word.endswith("e"):
    syllables = max(1, syllables - 1)
return syllables
```

Discussion time

1) First, discuss the following questions in groups.
    a) What do you think of the GPT generated feedback? Is it correct? Is it useful?
    b) Have you already used GPT in your classroom? How?
    c) What are other applications of GPT that you could imagine using in your classroom?

2) Share your ideas!
    a) 2 minutes: present your group's opinion and idea to everyone

What do you think of the GPT generated feedback? Is it correct? Is it useful?

Have you already used GPT in your classroom? How?

What are other applications of GPT that you could imagine using in your classroom?

Thank you for your participation!

If you are interested in using GPT for feedback, please contact us to participate in our user study.

Contact person: tanya.nazaretsky@epfl.ch