How to detect signs and handle Plagiarism / AI usage

- Tips and Reflections from a CS3520 TA -

Hi everyone, I'm Tianye and past TA for CS3520 Programming in C++, summer 2025. This is near the end of semester, so I would just like to take some time to reflect on my TA work on assignment grading. And in this document, I will summarize my experiences, and provide a few tips, insights and strategies on approaching AI and Plagiarism issues, to the best of my knowledge.

Course Policy

To begin with, let us examine the Course Policy related to AI and plagiarism. This will serve as a basis for grading considerations. Please note this screenshot is from this semester and might subject to change in the future, so you need to check out the newest Syllabus and the FAQ section.

Firstly, let's look at parts regarding plagiarism:

Unless otherwise stated, we expect you to personally author all assigned work.

You are always permitted to discuss the requirements and specifications of an assignment with others. You may discuss high-level algorithmic approaches and the concepts being studied. Moreover, you are encouraged to use resources from the internet to improve your understanding of course concepts especially when it relates to documentations for any cpp library or understanding of cpp syntax. However, the write-up and implementation of all programs must be entirely your own individual work *unless specifically allowed*. You are responsible for protecting your work and don't let any one use your work (with or without your permission).

Besides group assignments, collaboration is not allowed, here is a bullet list of specific actions they should not attempt:

❌ Cut and paste code from some other source (e.g., Wikipedia, Generative AI i.e., ChatGPT and others, or the random blog returned by a Google search) into your fil.

❌ Ask members of the wider community (e.g., StackOverflow, friends who took this class previously) to solve your homework problems for you

❌ Make electronic or printed versions of your solutions available to another student.

❌ Take a photograph of another student's work (whether it be on paper, a whiteboard, or a computer screen) with or without their permission.

❌ Ask another person to send you their solutions to a homework problem.

❌ Offer your homework answers to another student.

Here is the FAQ section regarding Generative AI:

> ***Q11: What is the policy on Plagiarism? Can I use Generative AI (ChatGPT, Claude, etc.)***
> ***A:*** *Students are encouraged to engage in discussion or use other resources (such as research papers, library books or internet articles) but must write their own answers/code and provide references to the resources used. At any time, student MUST NOT reproduce code/answers from other resources (AS IS or with cosmetic changes) and your answers must not be shared with others. Any plagiarism (even partial work) or cheating is NOT acceptable and will result in an immediate failure from the class.* ***Use of ChatGPT or other Generative AIs are NOT permitted****. All course assignments, discussions, projects are assigned for individual work. No group work is permitted unless specifically allowed.*

In short, AI code/text generation is also not allowed for any assignments, AI generated text/code is forbidden to be included in the submission.

Lastly, the policy generally summarized how the TA should take action after spotting the issue:

> **To ensure that students have completed the work themselves (and have gained necessary understanding), instructors might require students to explain the work they have submitted. We will consider adjusting grades based on your understanding of the course material .**

That is all the policy sections related to AI and Plagiarism occurrences in grading. So

it's important to remember these policies and refers to them whenever needed. Just to reiterate and clarify a few points:

• Collaboration is only allowed for group assignments

• Students should be responsible for keeping privacy of their own work

• Students can use AI to understand course materials and clarify concepts

• AI generated text and code are not allowed as part of submission

• TA will contact student in suspicion, and check their explanation and understanding of the work

Inspecting Students' Submissions

1) Plagiarism

With the policy in mind, we shall start with detecting the plagiarism issue. Plagiarism might happen when they copy code online or from other classmates. To check if they copied from the web, the first foremost step is look at all of the comments in the code, if the plagiarizing student is not careful to check, the copied code could include watermark comments, comments related to author detail, website info or other comment sentences that just doesn't seem fit.(If you find a comment line "all rights reserved Stack Overflow: date" it would be a direct give away.)

If there are no obvious signs they plagiarized from the web, we can use these plagiarism checkers (or you can find any other similar and effective ones) to check similarities between the class code to check if anyone plagiarized classmates' code.

1) MOSS (Measure of Software Similarity) - This is developed by Standford and support C and C++. Just read the basic guide, package all the students codes and upload, it will return a website detailing the similarities and differences of them.

2) Codequiry https://codequiry.com/ - This can detect cross language plagiarism, i.e. Python -> C++. It is quite powerful, but subscription is required to analyze large datasets, might need to consult professor for fee coverage if subscription is need.

Since this semester we used Khoury Linux, I'm not sure if there are any built-in methods to check similarities between all submissions. The above or other similar ones would be good checking tools, if next term switched to platforms like handin server then you can rely on their built-in plagiarism checking methods.

Lastly for Plagiarism, besides the tool checking, it would be nice if you carefully read each student's answer and remember them afterwards, that way you might also be able to manually spot out plagiarism(similar logical or syntaxial mistake, similar format and etc...)

2) Detecting AI Generation in Submission

This is our second part of concern. I'll break the inspection down to different parts, depending on the submission file types. There are usually 3 types of files in the submission, the text files, the diagram files, and the source code files. The first check is not aimed at a specific type, but the submission's mismatching of types. Lets look at an example from my grading and how it raised my suspicion.

Normal Submission:

```
=== -13 ===
1. Convert +13 to 12-bit binary representation: 000000001101
   Verification: 2^3 + 2^2 + 2^0 = 8 + 4 + 1 = -13
2. Since -13 is negative, flip bits: 111111110010
3. Then, add 1 in binary: 111111110011
Answer: 111111110011

=== 56 ===
1. Convert +56 to 12-bit binary representation: 000000111000
```

Anomaly Submission:

```
    cout << "Summary:" << endl;
    cout << "========" << endl;
    cout << "• -13: Can be represented" << endl;
    cout << "• 56: Can be represented" << endl;
    cout << "• -1: Can be represented" << endl;
    cout << "• -2048: Can be represented (minimum value)" << endl;
    cout << "• 2048: Cannot be represented (exceeds maximum)" << endl;

    return 0;
}
```

Notice the difference? The first is txt file, and the second is .cpp code. The question is asking step by step calculation of two's compliment of a number list, most other students are like the first submission, typed or handwritten the process, yet this student submitted a code automating the process. Each calculation is just turn binary, adding and reversing the number, each number calculation has at most 4 lines, for this assignment very few wrote over 25 lines, yet this student submitted a 120+ lines code.

AI tends to provide code than handwritten or typed step by step calculation. Because its math calculation steps are prone to occasional errors.

This clearly raised suspicion level for AI usage. This example shows 2 things, and you can also keep in mind for your grading: when student submit a format that's distinct from others, or have automation code for a procedural question, this is a red flag he/she has used AI, please investigate further.

Text Response files

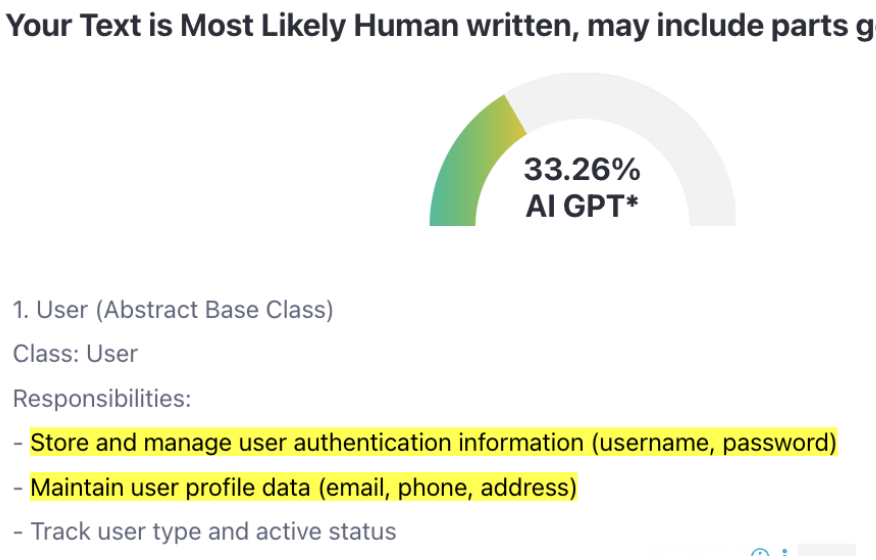
There are text response files, i.e. explaining your design paragraphs, crc cards. To check if the written texts are AI generated, here is a list of AI text detection apps that I used and recommend:

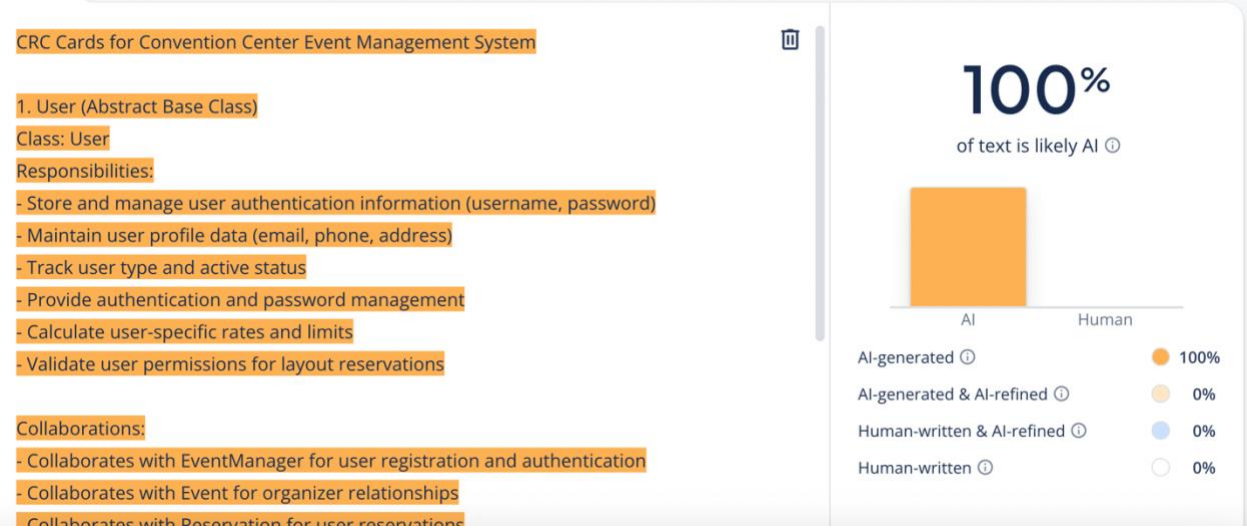
• Zero-GPT: https://www.zerogpt.com/ -> My other class's professor recommended this, he caught a student AI generating essay with this

• Grammarly AI Detector: https://www.grammarly.com/ai-detector/ -> Useful to identify AI grammar patterns

• Scribbr: https://www.scribbr.com/ai-detector/ -> This is one of the most used and highly rated ones.

They all seem to work fine, they do have different weights and strictness, for a same text, their output detection percentage may be different, as the image shown below.





Same text, Zero GPT is 33%, Scribbr is 100%

I am not an expert in understanding the detection mechanics or is able to rank and compare their effectiveness. I think it would be helpful to use different AI detections as more as possible, this way we can check their evaluation against each other. If you want to use them sequentially, I suggest use Scribbr first then Zero GPT, because Scribbr would always have a higher evaluation, if its output already very low or zero there would be no need to use Zero GPT again.

Additional and Further Inspection – Text Files

Because the student might be familiar with detection and have enough awareness and tweaked it to pass the AI. One of the most common ways is to add typos, since nowadays AI rarely make typos or grammar mistakes the detection software would Thus, please check if there are unusual frequent typos and wrong grammar. Lastly, student might as AI itself to “humanize” the text. Commonly, AI in this case would also create typos and errors, however, these errors will likely follow a fixed pattern, like occurring each sentence at same location, typos have patterns like all being truncated from the original word: (private -> priv, public -> publ).

Diagram Files

Diagram files, i.e. UML diagrams, sequence diagrams. To check the authenticity of this kind of files is less tedious, if they are in image format it is unlikely generated by AI (unless the image looks uncanny, and the letters look deformed it could be an AI generated image). On the contrary if it is in text form, (i.e. the screenshot below) it is very likely they are AI generated, because there is just no good reason to write it like this way. Please proceed to contacting the student and scheduling the confirmation meeting.

```
Class Diagram for Convention Center Event Management System

Core Classes and Their Details

1. User Class (Abstract Base)
+------------------+
      User
+------------------+
 - username: string
 - password: string
 - email: string
```

Checking Code for AI Generation

After the file type check, text and diagram files check, finally we will inspect the actual code. Unlike written text, code has syntax and repeating structure, current AI detection software (at least to my knowledge) are unable to correctly flag AI generated parts. Nevertheless you can search up and try different versions, like ChatGPT's built in AI code detector -> https://chatgpt.com/g/g-wspGz0NFg-ai-code-

detector (I uploaded my own code and it flagged it as AI generated, so I don't really think they are reliable as of now) So I was not able to find a ideal detector.

For example,

1) Have very trivial, repetitive comments -> //constructors, //getters

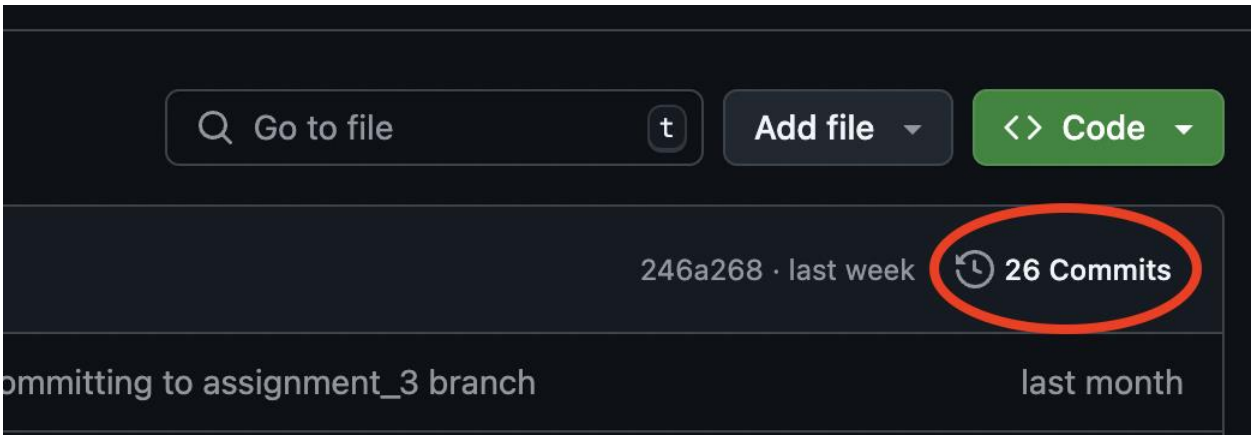
2) Have comments that seems to explain code to the reader, not written by the coder

3) Placeholder functions definitions that has return with no meaningful value

4) Most classes have toString() fromString() or other serialization methods(AI will create them for testings)

If the code matches any of these signs, it will be minor evidence to suggest AI usage. Personally, I think it is not solid enough for confirmation meeting, so you may need to combine and check if there are other issues somewhere else.

Other Minor Signs and Details



Please check other details, such as submission details on canvas, GitHub and etc.... One example is the GitHub commit, say if a student one made one big commit for a large project, it raises suspicion and need to check the code, because technically they should make small and gradual commits fulfilling each detail. One

or few big commits could suggest they just had AI generated the whole thing and they are done with it quickly.

The Inaccuracy of Code Detection Software

As mentioned earlier, detection software for both plagiarism and AI generation could make mistakes, here is a simple example, it flagged my own writing (yesterday's diary) as partially written by AI. So again, we cannot depend too much on the software but spend more carefully considerations.

> 2)Last week after finishing the finals I felt bored and decided to explore some parts of the city I haven't been to. I went south, alongside a train track so I wouldn't get lost. It started to rain, I forgot to bring an umbrella and was on a scooter, the raindrops hit my face and felt like needles pricking. I arrived at a park(neponset reservation), it was cold and rainy so no one was around. Near the park was a river, over the river I couldn't see much because of the mist. I just scooted around the park bike trail for a while. I heard a loud noise above, the humming of plane engine, it felt so close like it flew right over my head,

This also reminds us that there is no definite way to confirm a student used AI, all of our work is just raising suspicion and gather potential evidence. Unless the student confesses themselves, or we found the exact output in their AI account's history log.

After Gathering Evidence

Okay, if we went through the process, and have found signs of potential AI usage, what's next?

Emailing Student and Addressing the Issue

Once we accumulated reasonable evidence, according to the policy we should try contacting the individual student with suspicion.

> **To ensure that students have completed the work themselves (and have gained necessary understanding), instructors might require students to explain the work they have submitted. We will consider adjusting grades based on your understanding of the course material .**

To contact them, we can write an Alert Email. The exact format and wording are for your own decision and depend on the situation. It would be nice to have –

1: Quotation of the course policy, especially regarding parts student might violated.

2: Your available timing, and the platform for the confirmation meeting (i.e. Teams)

3: All the evidence so far (i.e. screenshot of detection software result, selected parts of student's code)

Once you notified the student via email or other forms, we can wait and prepare for the verification meeting. If you are unsure about the email draft wording or the course policy, you can also consult the professor or other TAs with details.

Additionally, please keep in mind that we should be careful about our choice and words, and avoid directly accusing the student and use absolute words(please see my example)

This is the first email I've sent on 6/20, I've included the policies and reasonable suspicion details.

Hi [redacted], I received your HW1 regrade, everything looks fine except the calculation for two's complement question. Can you provide an explanation why you choose to code up this than just going through the calculation process like indicated by the question? This submission type and the code format and comments raise some suspicion for AI generation. So I have to follow the process for double checking and confirmation.

Now for this there are two options, you can email me and send a detailed explanation of how this code works and the concept of two's complement calculation, to show your understanding of the code.
Or you can resubmit a handwritten or typed calculation process for this question. Or else you cannot get full credit for this question

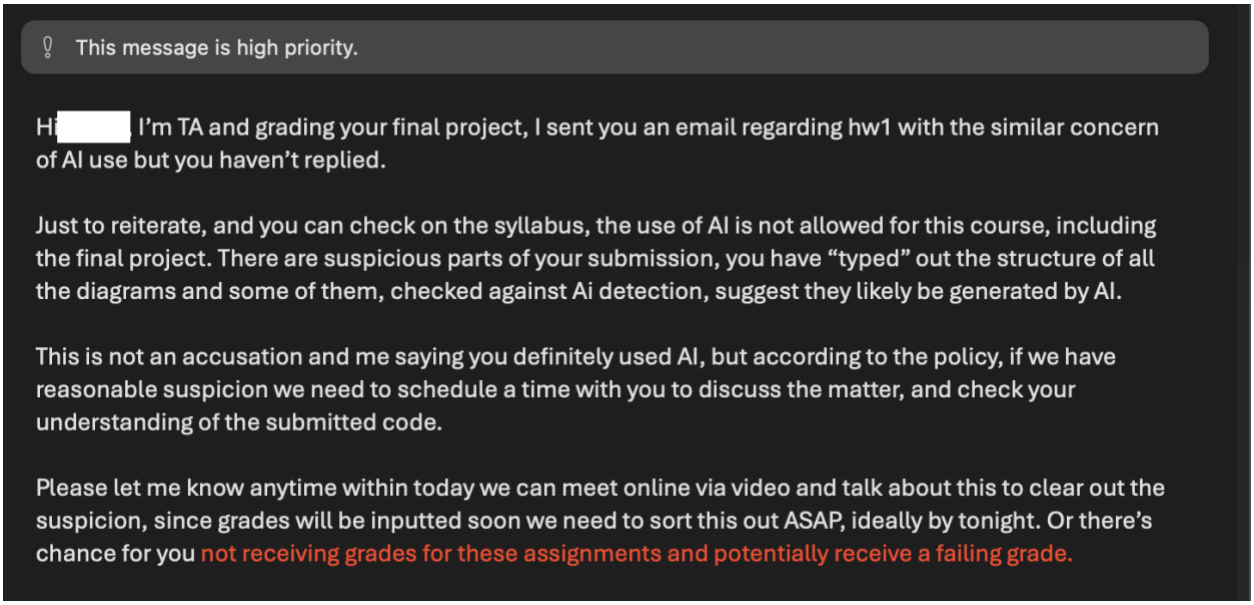
Please let me know if you have other questions.

5) Please answer the following question. Be sure to show your work and provide brief explanation. If you do not show your work or don't provide explanation, you will not receive any credit even if your final answer is correct.

- Assume that your computer uses 12-bits registers to represent numbers. If your computer can, what would be its 2's complement binary representation for -13, 56, -1, -2048, 2048.

Note: *For this question, you are welcome to complete your work by hand or type it and then submit it as docx/pdf/text file or screen grab on Canvas or push the file(s) to your repo.*

I sent it, and didn't receive any reply for several days. However, 4 days later, as mentioned earlier when grading the same students final project work, I found other signs of AI usage, and had to sent a second email.



So basically, these are the emails I sent to them to notify the issue and schedule the meeting. You can follow my format to write one or improve base on it. To make the communication more effective and efficient, and prevent students to ignore it and delay response, you can emphasize the potential consequence of not taking the explanation opportunity - receiving an F. This reminder notice is proven effective in my example, the first email didn't receive any replies for 4 days, the second one mentioning the consequence received the student's reply in 3 hours.

The Confirmation Meeting

1) Before the Meeting

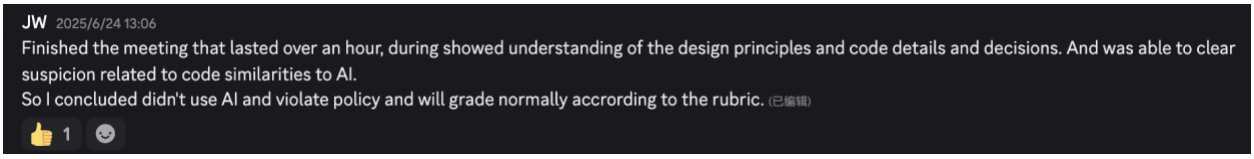
The preparation before the meeting is important, it is necessary to review the student's code, assignment details, assignment grading rubric, all the current evidence and suspicious points. Please create a well-rounded, insightful but not too complex and difficult list of questions.

2) During the Meeting

Once started, ask student to share screen and display the code, this will allow both of you on the same page with questions and prevent him/her using AI and searching for answers. Ask questions as prepared, ask additional questions depending on his/her response. Make sure the entire meeting is recorded, because it could be used as further evidence.

Next Steps

Once the meeting is over, it is important to review the criteria bullets points you have set, and determine whether the suspicion still stands. If the suspicion is cleared through the confirmation meeting, we can simply proceed to grade the assignment as normal. (If you contacted professor, keep him updated with the situation)



However, if the suspicion isn't cleared, that would mean the student is officially suspected of breaking course policy and violating academic integrity. This would be a more complex situation. I don't have the experience so I cannot give the following detailed steps (as shown above I cleared the student's suspicion in the end). At this point, it would be best to send all the evidence and notify the professor with the result. The professor will probably then make the final decision and make communications with related school departments.

After the class and semester ended, I think it would still be necessary to keep an eye out for emails from the professor, Khoury college department or academic integrity office like OSCCR. Because keep in mind you are the one who gathered the

evidence and confirmed the suspicion. It is likely that if in the future, you will need to testify in the academic hearing or provide the aforementioned evidence. Thus, it would be necessary to store all the evidence (screenshots, students submission files and data, confirmation meeting recording and etc…) in safe location and ideally with online backups.

For Additional information related to the process once a student is reported to OSCCR for academic integrity violations. Visit their website: https://osccr.sites.northeastern.edu/academic-integrity-policy/

That would be all the process and tips, thank you again for reading and attention to this matter!