

Can ChatGPT do computer vision?

Instructions

Introduction

Your team is given a research project to study the question: “Can ChatGPT do computer vision?” This research question is broken down into two sub-questions:

- RQ1: Coding: How well can ChatGPT write computer vision programs?
- RQ2: Explaining: How well can ChatGPT explain computer vision concepts?
- RQ3: Variations: How well can ChatGPT adapt its solution to variations of the same problem?

Research Questions

RQ1: Coding: How well can ChatGPT write computer vision programs?

Consider the following computer vision tasks:

1. Read an image from a file
2. Resize an image
3. Rotate an image
4. Sharpen an image
5. Blur an image
6. Convert a color image into a gray-scale image
7. Detect edges in an image
8. Detect faces in an image
9. Detect cars in an image
10. Classify an image as a dog or a cat

For each of these tasks, ask the ChatGPT to write a program as the solution. Run the program and check if the program is correct. Fix the program if necessary, unless the program is completely wrong and not fixable. If ChatGPT provides multiple solutions, just pick one. Record your findings in the RQ1 sheet in your data spreadsheet.

RQ2: Explaining: How well can ChatGPT explain computer vision concepts?

Download the textbook <https://szeliski.org/Book/>. Flip through the textbook and pick 10 random computer vision terms. For each term, ask ChatGPT to explain it. Record the response from ChatGPT. Assess the accuracy of the response.

RQ3: Variations: How well can ChatGPT adapt its solution to variations of the same problem?

Pick three of the computer vision tasks in RQ1 that ChatGPT is able to do. Ask three follow-up prompts to ChatGPT to solve variations of the same task. For example, after ChatGPT responded with a solution to rotate an image by 45 degrees, ask the ChatGPT to rotate by 75 degrees. Assess the quality of ChatGPT's solution.

Data Collection

Each research question requires you to run experiments with ChatGPT and collect data. Use the spreadsheet template below to record your data.

[ChatGPT Research Data - CSCI 5722 Project 1](#)

You should make a copy of this spreadsheet.

This spreadsheet contains four sheets:

1. Contributors
2. RQ1 data
3. RQ2 data
4. RQ3 data

Note that sometimes ChatGPT may reach its capacity. You may want to start early to avoid this issue.

Quantitative Analysis (Numbers and Charts)

Analyze your data and report quantitative findings (i.e., numbers, charts), such as average, max, min, percentage, numerical distributions, bar charts, line charts, pie charts...etc.

Qualitative Analysis (Words)

Analyze your data and report qualitative findings (i.e., words), such as common patterns, outliers, and problems...etc, basically, findings that can not be expressed in numbers and charts.

Discussion

1. How would ChatGPT change the way programmers develop computer vision programs?
2. How would ChatGPT change the way students take computer vision courses and learn computer vision?
3. How much better do you think ChatGPT will become in solving computer vision problems?

Submission

Submit a PDF of your report, including a link to your data spreadsheet.

Hints

- A common fix is simply to import the right opencv library
- Some tasks are harder than others; distribute among your teams fairly.
- If you really struggle fixing a piece of code, just mark it “not fixable”


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Report

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Data

Add the link to the data spreadsheet. Make sure it's shared as "anyone with link can view."

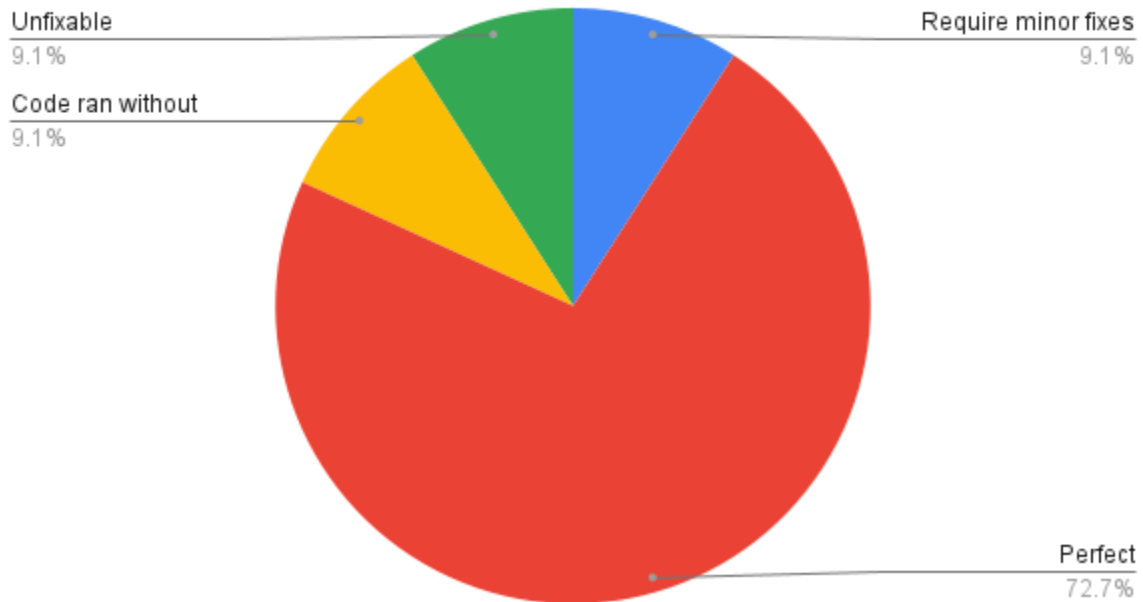
 Copy of ChatGPT Research Data - CSCI 5722 Project 1

RQ1: Coding

Quantitative Analysis

We have the following chart where we can see the percentage of tasks classified in each level of accuracy.

Accuracy



We can also say that we tested 100% of the tasks.

Qualitative Analysis

We can appreciate that ChatGPT was perfect doing the majority of tasks but it can still have issues with the harder tasks, although they can usually be fixed with small changes. So, in conclusion, ChatGPT is a very interesting tool in order to save time with minor programming problems.

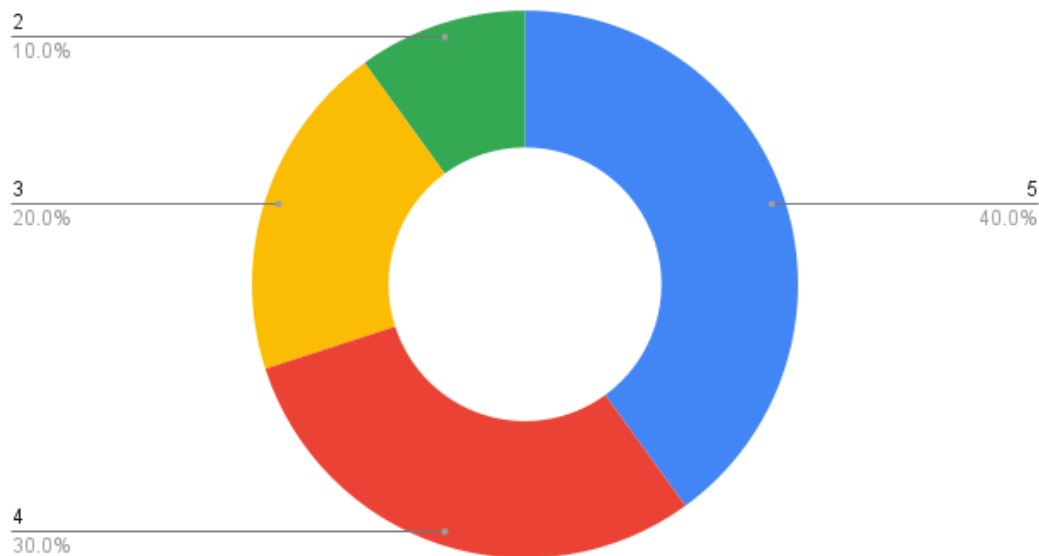
We also appreciated that ChatGPT gives you an answer even if it is not correct. Thus, you should be careful with its use and always check if the answer is correct.

RQ2: Explaining

Quantitative Analysis

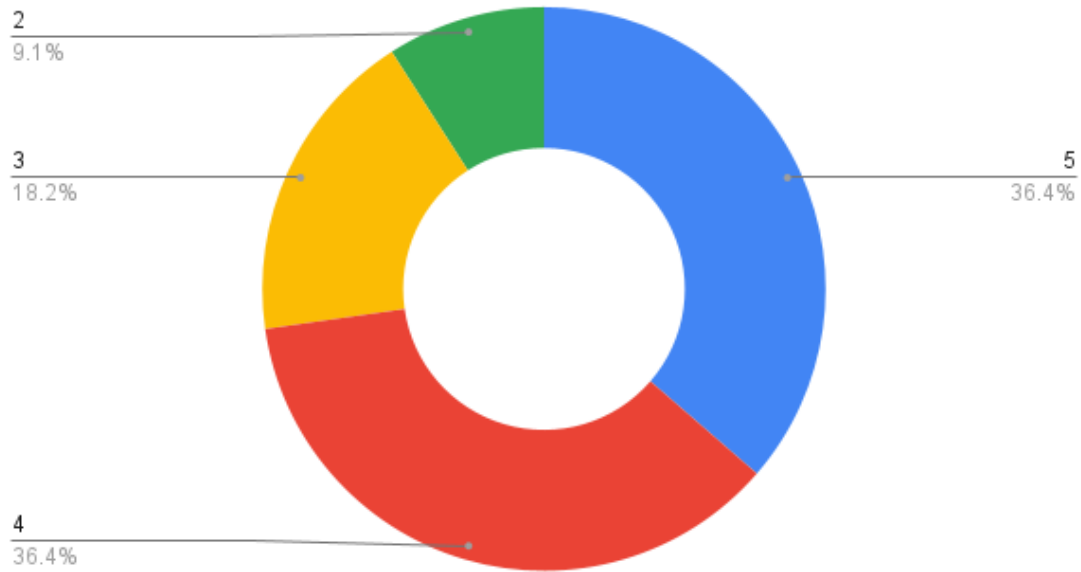
We have the following chart where we can see the percentage of tasks classified in each level of accuracy explaining computer vision concepts:

Accuracy explaining computer vision concepts



The accuracy had an average of 4 out of 5.
We have the same cart for the clarity:

Clarity



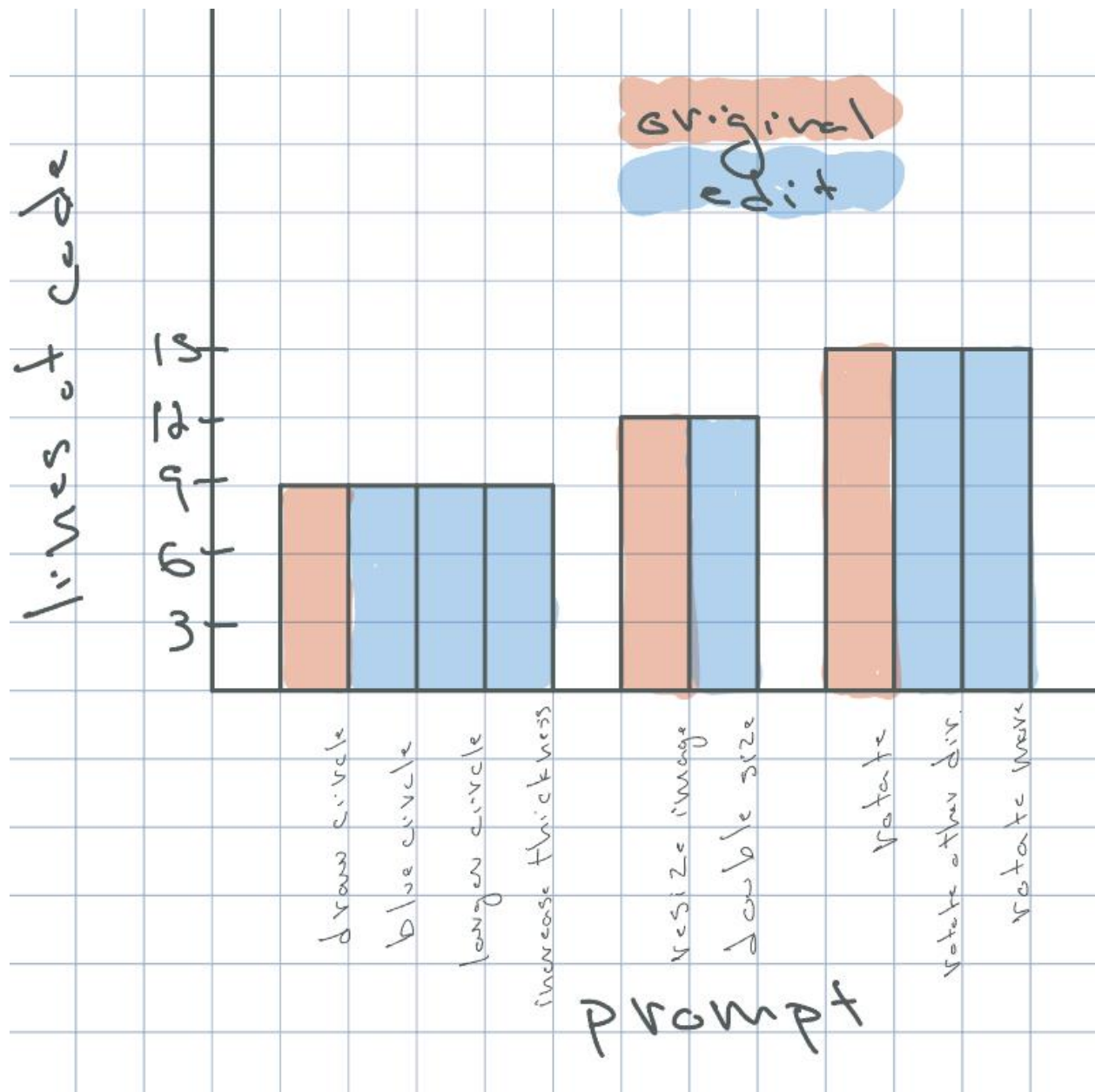
The clarity average is 4.4 out of 5.

Qualitative Analysis

We can see that the clarity is slightly higher than the accuracy. ChatGPT not only gives right answers but also very clear ones, which makes it very easy to really understand the topic that you are asking and not only copy / pasting the answer. Generally, as expected, ChatGPT does worse when asked to explain more complex topics when compared to simpler ones. It is also interesting to note that most of the time it isn't *wrong* about anything, but it may miss an important aspect of the topic it is explaining. So the information it provides is generally correct, but it doesn't necessarily provide all the information one would want.

RQ3: Variations

Quantitative Analysis



Qualitative Analysis

ChatGPT was flawless in making small changes to relatively simple computer vision programs. Often, when instructions were given to change a program it had previously written, it would make the smallest change it needed to in order to do the task correctly. For example, if the task was to rotate the image clockwise by 90 degrees instead of counterclockwise, the language model would simply change the variable it had set indicating the degree of rotation, rather than rewriting the program from scratch using, say, a different CV library.

One other interesting observation is that when we asked it to increase the thickness of a line it had drawn in a previous question by 5, it knew that 2, the previous thickness value, plus 5 would equal 7. It also knew that $256 \times 2 = 512$ when we asked to resize an image to twice the size we asked it to in a previous question. This suggests that it has some capacity to reason mathematically.

Discussion

1. In our opinion, ChatGPT will be a very important tool in the future. It will help developers to save a lot of time looking up for easy problems on the documentation. Instead of navigating some API documentation programmers will be able to just ask ChatGPT to have a much quicker answer than finding what you are looking for on the internet. Programmers will need to have the same knowledge since ChatGPT needs human supervision but it will heavily increase their productivity. One important impact to note is that “bootcamp” programmers may no longer be employable in the near future. These job searchers who don’t have a degree, only coding bootcamp experience, are typically only capable of grinding out code which ChatGPT can do instead. The aspects of software engineering that ChatGPT would struggle with such as architecture design, integration, unit testing, and optimization are typically not taught at these bootcamps.

2. ChatGPT is an awesome teacher. You can ask him to explain things in simple terms. Students are able to make questions and not only get the right answer, but an explanation with it, which is incredibly helpful when learning. Students will save time looking up simple questions about computer vision and this will help them study quicker, better and in a bigger quantity. More complex questions will still require more effort from the student. ChatGPT can also help students skip the “busy work” of labs and jump straight into the important learning aspects of them. For example, instead of spending their time figuring out how to import a certain file, sort something using built in libraries, or similar annoying things, the student can have ChatGPT do these instead. This allows the student to focus more on the learning objectives rather than the file setup.

3. We think ChatGPT still has a big improvement margin. It will continue to improve with the years, with the computational capacity, and with the training it will be exposed to. We think that in the future it will be a lot more rare to not get the right answer to a question and he will be more likely to answer harder questions with a greater accuracy.