AI Tools vs Debugging Tools: Exploring User Perceptions on Bug Locating Performance

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Introduction

Bugs are unexpected problems in software that cause them not to function properly. There are many tools out there designed to “debug”, or in other words, help developers locate errors in code. However, in recent years, AI advancements have led developers to increasingly rely on tools like ChatGPT for debugging. This study compares the effectiveness of AI in locating bugs to regular debugging tools by incorporating both approaches into the development process of a debugging tool and surveying software developers.

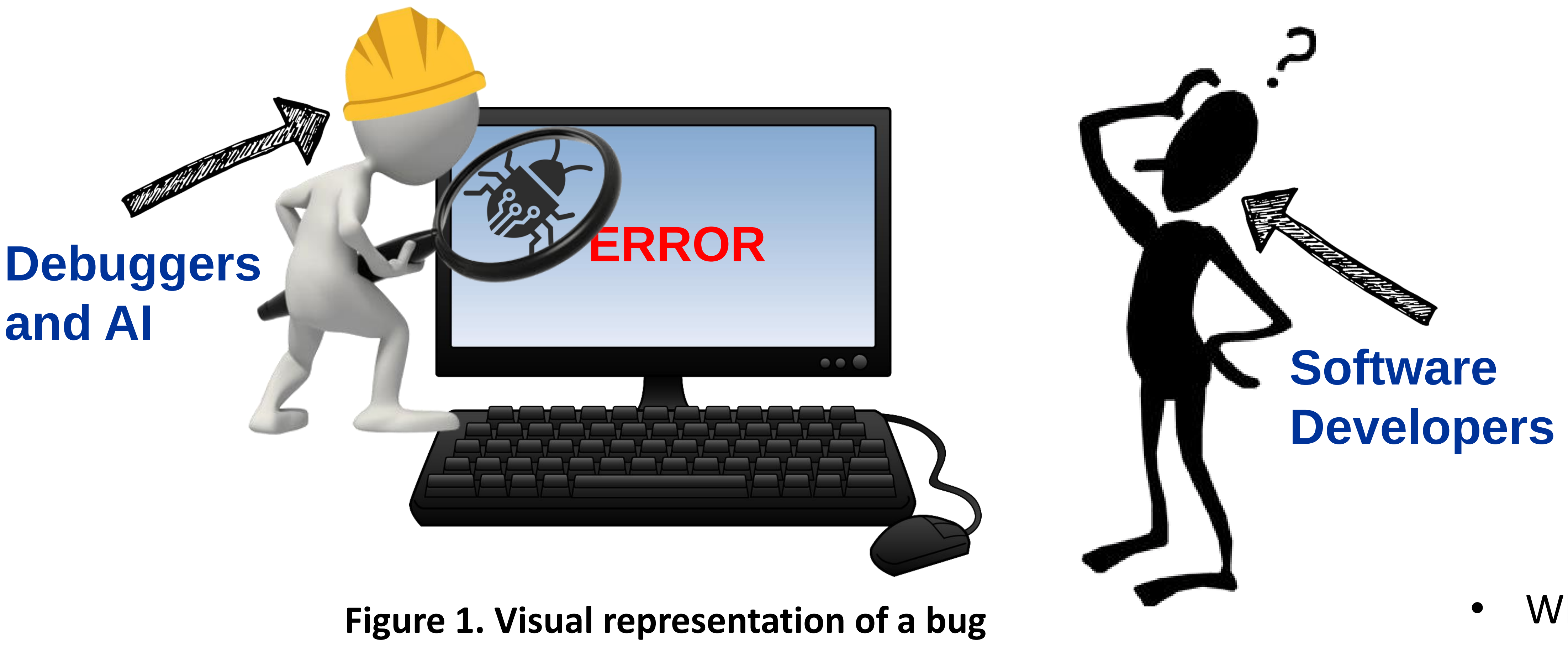


Figure 1. Visual representation of a bug in a computer program

Methods

- Assisted another member within my lab group in developing their own debugging tool.
  - Interacted with both AI tools and debugging tools and gauged their pros and cons.
- Conducted a survey with the participants being software developers from my lab groups to see their perceptions on AI tools and debugging tools.

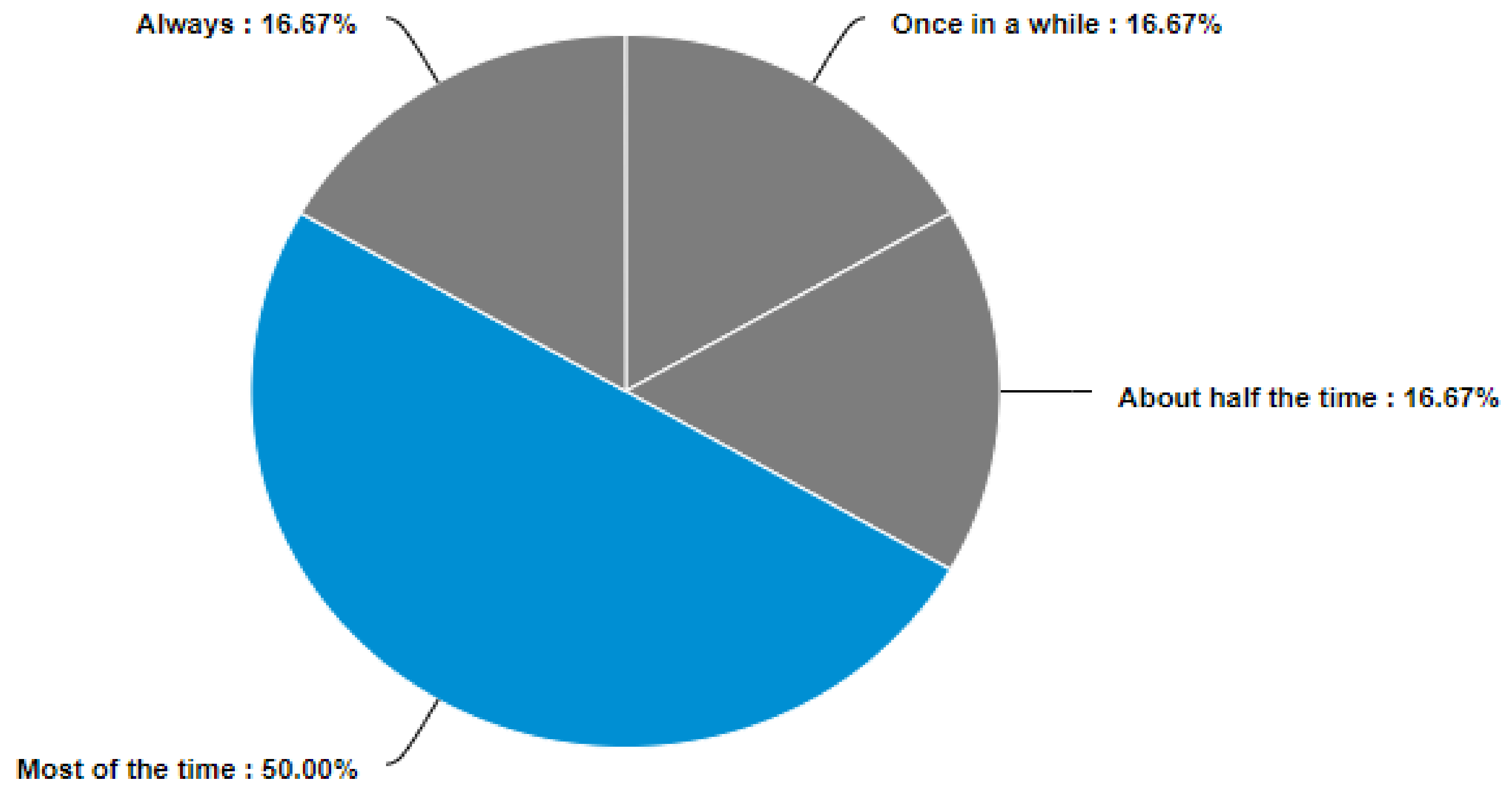
Here are the questions I asked in the survey:

1. How many years of experience do you have in software development?
2. How frequently do you encounter bugs while developing software? *
3. How often do you use AI tools, such as ChatGPT and Google Bard for debugging purposes? *
4. How often do you use debugging tools for debugging purposes? *
5. How often do you use other methods of debugging, such as inserting print statements, for the purpose of debugging? *
6. Please explain your reasoning for why you use one debugging approach more than the other. If you use any of these approaches equally, explain why. *
7. Based on your experience, what are the key advantages of using AI over traditional debugging tools, if any?
8. Conversely, what are the main advantages of traditional debugging tools over AI, if any?

Results

Survey results:

- The average participant had 2.8 years of experience in software development.
- When asked how frequently they encounter bugs, here are what participants selected:



- When asked which debugging approach they used most frequently, neither AI tools or debugging tools were the top responses! 49% of participants stated they use other methods of debugging, such as inserting print statements.

Discussion

Debugging Tools	AI
Provide precise control over code	Automate the debugging process
Offer visual representations of the code execution flow, aiding developers in understanding complex code behavior	Provide insights into code behavior Predict potential issues
Require significant effort and expertise to identify and fix bugs, especially in large programs	May not fully comprehend code intent, leading to misleading bug fix suggestions

What are print statements?

They are in every programming language, and in simple terms, are used to display data from the code onto the screen. There are times where data in the code can change due to a minor flaw in the code logic or from a simple typo, which can cause bugs to arise. As a result, developers insert print statements in various areas of the code in an attempt to locate where the data has changed and fix the bug. However, this process can be tedious as they have to manually insert and remove print statements.

To address their needs, we are working on developing a debugging tool called “AutoPrint” that automates the process of inserting and removing print statements.

Acknowledgements

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