1. **AI-Assisted Programming: Transformative Impacts**

**1.1 The benifit from AI programming assitants**

With the continuous development of AI intelligent technology, AI programming assistants developed by some companies in cutting-edge technological fields have emerged. These AI assistants currently occupy the mainstream market, including CodeX, ChatGPT and GitHub Copilot. Take Codex as an example, has 12 billion model parameters and is trained on 54 million GitHub software repositories, solved over 70% of 164 Python programming problems with 100 examples(J Yao, 2020).

Furthermore, the most well-known AI tool currently is ChatGPT developed by OpenAI, which is an AI tool based on context generation capabilities which has found utility across various sectors such as programming. ChatGPT 3.5(its latest large model version) can help programmers become more productive by creating better-performing, shorter, and more readable code(Dos Santos et al., 2024). It can be seen from the research of Dos Santos and his colleagues that AI software tools are gradually penetrating into all aspects of programming work, including coding software education, as Students have faster way to get started with programming. According to Jalil et al., ChatGPT may present a benefit or a risk to conventional teaching methods, particularly when it comes to resolving test questions for software testing education(Dos Santos et al., 2024, cited in Jalil et al., 2023).

**1.2 Some reasons for choosing AI programming assitants**

According to Smith et al.(2023), the main reasons developers employ AI programming assistants are to minimize keystrokes, expedite work completion, and help them remember syntax(Myers et al., 2023). The research has also shown some successful use cases, including quality assurance, learning and documentation. Paticipants reported using AI programming assistants for quility assurance such as generating useful log message and producing test case quickly, and they use these tools to consider edge cases. The second major finding was that participants can also utilized these tools when learning new libraries and new programming languages. The paticipants said it is especially useful when a project used complex programming language, since the codebase from AI is a polyglot project with java, golang and cpp implementations(Myers et al., 2023, p6). All kinds of phenomena are explaining to us that AI is freeing up some work that should be performed by programmers. However, the main weakness with this theory is that Myers and his colleagues ignored the code correctness. According to Brandon’s (2023) findings, Copilot still will produce erroneous code, just like ChatGPT produces incorrect statements, so humans must still be in the loop. These models don't really reason at a deep level and there isn't a clear path to getting them there. It is for that reason that Brandon think programmers will be employed for a long time, but the efficiency will improve dramatically(Brandon, 2023).

**1.3 Some ares might become redundant due to AI**

Although there are many different kinds of programmers, including front-end developers, back-end developers, and testers, Upwork claims that the greatest danger to QA and beta testers comes from artificial intelligence, which allows programmers to test their applications more rapidly and precisely. The popularity of no-code website user interface generators like Wix has already resulted in a decline in the need for front-end web developers. On the other hand, there is a greater need than ever for graphic designers to produce fresh web interfaces. Because artificial intelligence algorithms are becoming more efficient, there is a gradual decrease in the need for debuggers. Any monotonous, uninspired programming work is already being replaced or soon will be(GARG, 2023). However, one problem with AI programming assistants is that it relies on existing data, which allows creative programmers to shine through. Also, the communication skills of a programmer will also play an essential role as companies will want to hire programmers who can talk to clients and better understand their needs. Exhibiting innovation, creativity, and understanding of Artificial Intelligence on interviewer‘s resume might help them get hired easily(Myers et al., 2023).