

AI Tools for Code Generation: Transforming Modern Software Development

Geethu C Nair

Email: [geethuc12\[at\]gmail.com](mailto:geethuc12[at]gmail.com)

Abstract: *The help of artificial intelligence is an inevitable part in every field. Artificial Intelligence helps humans to minimise their workload and to do everything in a perfect manner. Like every other field, AI plays a major role in the software field too. Most of the developers use different AI tools for code generation in their professional lives. This paper evaluates various AI tools available for code generation in detail and compares their advantages and disadvantages. This study highlights the promise and ongoing growth of AI-driven tools in redefining software development. This paper offer a thorough analysis and discussion of the difficulties and constraints associated with both conventional and artificial intelligence methods for code generation.*

Keywords: workload, AI tools, code generation

1. Introduction

Programming has become an essential skill in today's society. It is used in many industries, including software, finance, and healthcare. People with programming skills are in high demand and these skills are becoming more common in various careers. However, the programming skill set requires a strong background in mathematics and knowledge of different algorithms and problem-solving techniques. As a result, the number of programmers cannot keep pace with the growing demand in the job market.

Additionally, the way programmers manually write code is often inefficient. They perform repetitive tasks and may spend a lot of time debugging and refining their code, which can slow down processes.

AI code-generation tools are a type of software that relies on artificial intelligence- typically large language models (LLMs)- to autonomously generate computer code based on natural language directives or incomplete code fragments.

The software development process is streamlined, and code writing becomes simpler for developers of all skill levels when AI technologies are used to generate computer code. The generative AI code creation tool generates the source code automatically once the user inputs a text prompt explaining the function of the code.

Additionally, it can convert code between programming languages and upgrade legacy code. These systems can generate excellent code recommendations based on user input by integrating artificial intelligence into the developer tools.

By offering simple solutions, managing repetitive coding jobs, minimising the need to transfer between contexts, and preserving mental energy, autogenerated code recommendations can boost developers' productivity and streamline their workflow.

Additionally, it can assist in locating possible security flaws and coding mistakes.

In this article, you'll learn:

- Which AI coding tools offer the best developer experience
- How these platforms handle various programming tasks

AI Progression in Coding

AI has greatly influenced the field of programming and software engineering. While starting from rudimentary features such as auto-complete, AI programming systems have evolved over time to become more sophisticated in nature and now even help write an entire application from scratch. Through its use in software engineering, AI can help engineers code better, faster, and more productively.

Initially, coding systems had only basic capabilities like syntax highlighting and auto-completion. Advanced AI-based systems offer:

- intelligent coding
- Contextual suggestion
- Debugging support
- Refactoring for multiple files
- Test case creation
- Natural language programming

What are AI coding tools

AI Coding tools are software programs that use technologies like Machine Learning (ML), Natural Language Processing (NLP), and Large Language Models (LLM). These tools assist programmers while programming:

- Provide code suggestions while writing
- Write functions based on prompts
- Check for bugs and errors
- Analyze code logic
- Test case generation
- Code optimization

AI Tools for Coding

GitHub Copilot

GitHub Copilot is an AI assistant for coding that helps programmers code quicker and easier by suggesting snippets, completing code, and even chatting with the programmer while they work in their IDE such as Visual Studio Code. GitHub Copilot uses AI to write functions, create tests, comment on code, and even refactor the code.

Features

- **Code Generation & Completion:** Provides code suggestions while typing anything from single lines to functions using existing code context.
- **AI Pair Programming:** Enables a chat facility for debugging, explanation, and finding other solutions to the code.
- **GitHub Copilot CLI:** Enabling usage of natural language in terminal for command generation and repository management tasks.
- **Context-Aware Development:** Having knowledge of the context in which code is written like the file structure, project structure, etc., and suggesting accordingly.
- **Automation:** Generates test cases, documentation, and even commit messages automatically.
- **Integration:** Directly integrated into popular IDEs

ChatGPT

ChatGPT has become a major component for professionals and amateurs alike, acting as an interactive assistant for anything ranging from scripting to code migration.

Features

- **Code Generation:** ChatGPT is capable of quickly generating functions, boilerplate code, or even a whole project framework using any language ranging from Python to JavaScript to HTML/CSS.
- **Debugging and Optimization:** Simply copy an error message and it will give you a solution immediately, or you can ask for help optimizing your code.
- **Concept Explanation:** It becomes a virtual tutor that helps explain complicated concepts or the workings of a certain library.
- **Code Language Migration:** Refactoring of code from one programming language to another or upgrading old libraries to newer ones.

Amazon CodeWhisperer

The Amazon CodeWhisperer is an AI-assisted programming tool that has now been advanced to Amazon Q Developer. This tool offers suggestions for coding that vary from one-liner to whole functions that can be inserted in your IDE instantly. It has been trained on millions of lines of code, both from Amazon's internal source code and from open-source projects.

Features

- **Code Suggestions in Real Time:** Automatically creates code snippets or entire functions from your natural language and context-based coding.
- **Security Vulnerability Detection:** Detects any possible security vulnerability in both generated and manually written code in order to suggest quick fixes for issues in the OWASP Top 10.
- **Open-Source Attribution Support:** If a code recommendation is similar to any open-source code, it will automatically display its original source along with relevant licensing.

Tabnine

Tabnine is an artificial intelligence-driven coding assistant that aims to improve the efficiency of software developers through real-time code completion, live chat, and workflow

automation features. The application uses machine learning models to deliver suggestions based on open-source codes available under licenses that permit their use. While most artificial intelligence tools are not concerned with data privacy and security, Tabnine ensures privacy and can be deployed in air-gapped systems.

Features

- **Code Completion by AI:** Offers suggestions for entire lines and functions, based on your personal coding style and habits.
- **Tabnine Chat:** A conversation-based platform embedded into your IDE, allowing it to respond to queries, offer explanations for code, create documentation, and even implement Jira tickets.
- **Enterprise Context Engine:** Integrates with your company's internal repository of tools and technologies to give tailored suggestions, fitting your particular infrastructure.
- **Agents:** Consists of agents designed to handle tasks, capable of creating and executing workflows, such as bug fixing and refactoring.

2. Conclusion

AI has made notable contributions to software engineering by offering advanced coding support utilities. Software engineering platforms such as GitHub Copilot, ChatGPT, Tabnine, and CodeWhisperer aid in increasing productivity, minimize efforts required, and enable efficient software creation. Nevertheless, these technologies have limitations such as accuracy, privacy concerns, and security issues. Human monitoring is therefore critical. AI cannot replace developers but only assists them in their work. With time, AI coding utilities will become indispensable in software engineering.

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