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# Omdia Market Radar: AI-Assisted Software Development, 2023–24



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# Summary

## Catalyst

In the space of one year since the launch of ChatGPT in November 2022, the market and appetite for using generative artificial intelligence (GenAI) based on large language models (LLMs) have grown enormously. In this report, Omdia examines the impact of this technology on AI-assisted software development. This field has a history going back to the rise of machine learning (ML) in the last decade with a startup market in-code assistant tools, some open source, and some spinoffs from academia. As GenAI and LLM became available, some of these startups were able to adopt this technology while new players appeared on the market to capture the opportunity. AI is being used in software engineering for code generation, code assistant (pair programmer), testing and debugging, security inspecting, quality checking, and more.

## Omdia view

The explosion of interest in LLMs reflects the high quality of the human-machine interfaces, knowledge, and expertise provided by these models. This step change in quality improvement has also impacted software development, especially when it was realized that ChatGPT could act as a code assistant. Notably, the application of AI to coding has been in the market for some years. For example, GitHub Copilot was first launched in October 2021, and Codex (its LLM) is based on OpenAI GPT-3.

A previous Omdia report, *Generative AI: The impact of AI-based autocoding on software development*, looked at what the technology was capable of and identified the many AI code assistant tools available in the free open-source market, as well as some commercial products. And *Omdia Universe: No Code, Low Code Solutions, 2023–24* examined enterprise development solutions for citizen developers, all of which make use of AI. In this market landscape, Omdia examines in greater depth the AI-assisted coding tools market, a market that is rapidly evolving. The analysis in this report provides a snapshot of what is available today and points to where this market is heading. Omdia believes the trend is for greater capability and higher accuracy, based on reviews of academic research published and analysis of leading products on the market.

The products reviewed in this report have been built with great care in the selection of data used to train the AI models. The vendors can vouch that no license has been violated using the training data. They have also given much attention to ensuring high quality outputs and a reduction in the presence of “hallucinations,” the euphemism used in the industry for errors. Of much interest to enterprises is the capability to augment a vendor product with private data (from code to documents) to enhance the relevancy of the output to the unique needs of the organization. Ultimately, Omdia still recommends a human-in-the-loop: the presence of humans to check generated output.

## Key messages

- AI-assisted software development is a rapidly evolving market, with both startups and established technology vendors involved.
- The impact of OpenAI’s technology has boosted the market for AI-assisted software development.

- The market players today are mostly agnostic to the foundation LLM they use, picking the best models for the given tasks.
- The range of tasks that AI-based code assistants can take on covers the whole software development lifecycle (SDLC).
- Omdia's review of academic research on popular LLMs such as GPT-4 and ChatGPT shows that these can offer useful assistance to developers, but generated outputs need to be carefully evaluated.
- Omdia believes that the use of AI-based code assistants has reached a level of proficiency such that enterprises not using this technology will be at a disadvantage.

## Recommendations

### Recommendations for enterprises

The review of academic research on the foundation models such as GPT-4 and services such as ChatGPT indicates benefits from their use; however, users must evaluate the output and not assume the generated code is always correct. To increase the accuracy of this technology and ensure that developers can use this technology safely and without violating license rules in the data used to train the models, there is a need to add layers on top of the foundation model. For enterprises focused on business, building your own code assistant is not recommended.

Omdia recommends that enterprises explore the tools on the market, such as the ones reviewed here, that remove the necessity and burden of building these safety and enhancement layers. Being able to add your own private corpus to the tool is a differentiator, and it is one that ensures direct relevancy for the development work carried out in your organization.

Omdia has talked to large enterprises that are already into their third generation of using this technology to improve the productivity of their developers. Moreover, Omdia's previous report, *Generative AI: The impact of AI-based autocoding on software development*, showed that most developers are in favor of and enjoy using this technology. Our message for enterprises is not to be left behind; this technology is now a permanent part of the landscape.

### Recommendations for vendors

Omdia sees that every major public cloud provider can now offer AI-assisted code development in one form or another, from no-code development to assisting professional developers. There is competition to bring developers to these clouds, and major differentiators involve the upholding of training data licensing rules, the quality and accuracy of the generated output, and the prevention of insecure code. Omdia's review of academic research showed that ChatGPT is rather poor in stopping simple bugs from being passed on from the training corpus and into generated code. While ChatGPT is not to be compared with the products under review here, ensuring secure code generation is an important differentiator.

For all the players in this market, a key differentiator is not locking in developers to the host platform and enabling generated applications to run anywhere. Some vendors take the view that they will be open to

using the best LLM available on the market and taking advantage of progress in a rapidly evolving field while adding layers to ensure the generated output is compliant with their standards. Other vendors prefer to develop their own LLM, as they are concerned about what data is used to train the model and want full control over that process. There are pros and cons to both approaches. Realistically, building your own state-of-the-art LLM is an option that is only open to vendors with significant resources.

## Market analysis

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### Introduction

The key events leading up to the current wave of foundation LLMs were

- The release of the transformer architecture deep neural network in 2017 by a team from Google
- The release of the first generative pre-trained transformer (GPT) LLM by OpenAI in 2018, which, as the name implies, is based on the transformer architecture.

LLM research in the tech sector subsequently took off. Public awareness went exponential, however, with the release of ChatGPT on November 30, 2022. OpenAI's most recent GPT is version 4, which feeds the ChatGPT Enterprise edition, while free access ChatGPT has been unchanged since its launch and is powered by GPT version 3.5. Since then, the market for LLMs has grown enormously. Hugging Face ([huggingface.co](https://huggingface.co)), the repository of ML models and datasets, has more than 16,000 text generation models, and new LLMs are added each week.

The possibility of using LLM-based AI for code generation was picked up by ChatGPT users who were surprised to find this capability. This has led to a rise in specific code assistance tools based on LLMs. For example, GitHub Copilot became trained on Codex, OpenAI's code generation AI model that uses OpenAI's LLM model GPT.

The application of AI to code assistance has been ongoing for the last decade, with a focus on assisting professional developers. The no-code, low-code (NCLC) tool market, which targets citizen developers, has also been using AI for some years. (See the Omdia Universe on NCLC software development.) Now, LLM-based AI has become a major disrupter in the NCLC tools market and is powering a new generation of code assistance tools aimed at developers of all grades.

### Accuracy, compliance, and security are important

One of the issues affecting LLMs is their accuracy. Although their output is for general public use (e.g., as a source of information), the output should always be inspected carefully by a human. Enterprise use of this technology carries additional risk. Enterprises take great care to ensure a good reputation in the market, and careless use of LLM output could harm and tarnish their brand. Ensuring that output is safe and of high quality requires safeguards and filters and is best carried out by a vendor whose job it is to produce a safe product. It becomes a burden for an enterprise to conduct this task, which is why Omdia recommends looking at the products in the market, such as the ones reviewed in this report.

It is not just accuracy that is a matter of concern, but also ensuring that the code used to train the model has not violated the code's license. Even where code licenses are friendly for code reuse in commercial

products, any direct copy of code, which could emerge in generated code, requires the source to be attributed. Compliance is, therefore, an important matter. There is also the efficacy of the model in preventing security holes and bugs from seeping through into generated code from bad training data. Having control over the model training and vetting training data have clear advantages.

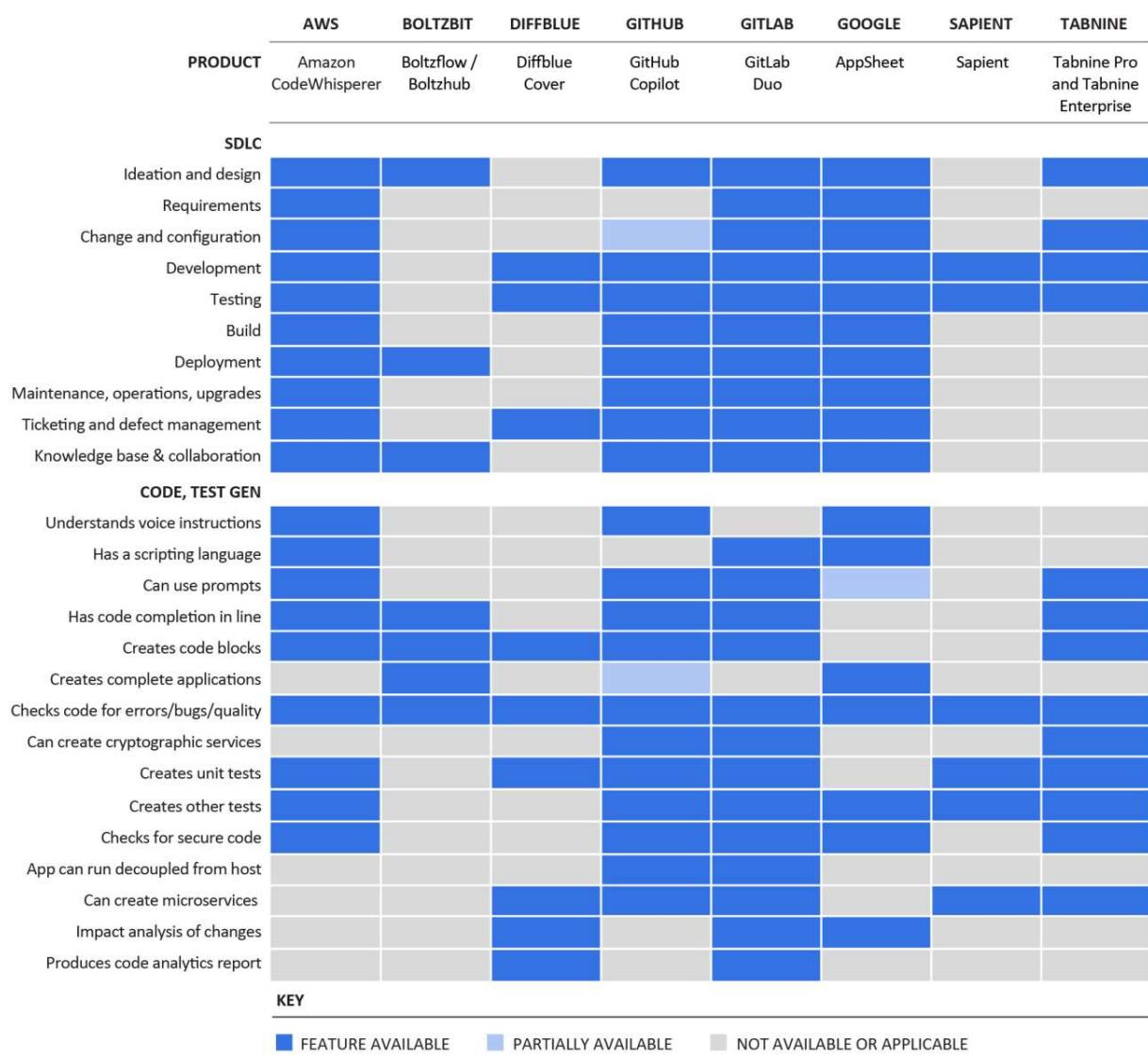
**Figure 1: Feature heatmap of vendor products for AI-assisted software development – part 1**

	AWS	BOLTZBIT	DIFFBLUE	GITHUB	GITLAB	GOOGLE	SAPIENT	TABNINE
PRODUCT	Amazon CodeWhisperer	Boltzflow / Boltzhub	Diffblue Cover	GitHub Copilot	GitLab Duo	AppSheet	Sapient	Tabnine Pro and Tabnine Enterprise
PRINCIPAL PURPOSE	Code assistant	Data science /ML/AI dev	Testing	SDLC assistant	SDLC assistant	No code app dev	Testing	Code assistant
On cloud	■	■	■	■	■	■	■	■
On-premises		■			■			
Offline mode		■				■		
Number of programming languages	15	English	Java, Kotlin	All	17	No code	Java, Kotlin, Scala	33
Available on clouds	■	■	Any cloud	Azure	AWS, GCP	GCP	GCP	GCP, AWS, Azure, IBM
Can product operate offline		■	■			■	■	
Programming language translation	■			■	■			
Certified compliance				■	■	■	■	
<b>TARGET USERS</b>								
For no code development		■			■	■		■
For low code development	■	■			■	■		
For professional development			■	■		■	■	
Individual developer			■	■	■	■	■	
Team dev (accesses code base)			■	■	■			
<b>TARGET APPS</b>								
Progressive web apps	■	■	■	■	■		■	■
Responsive web apps	■	■	■	■	■	■	■	
Mobile iOS			■	■	■			
Mobile Android	■		■	■	■	■	■	
Windows desktop	■		■	■	■	■	■	
Linux desktop	■		■	■	■	■	■	
WebAssembly	■		■	■	■		■	
<b>KEY</b>								
■	FEATURE AVAILABLE	■	PARTIALLY AVAILABLE	■	■	■	■	■

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Source: Omdia

**Figure 2: Feature heatmap of vendor products for AI-assisted software development – part 2**



Source: Omdia

The range of applications in AI-assisted software development spans every aspect of the SDLC. In this report, Omdia highlighted the following when reviewing the products included here:

- Ideation and design
- Requirements
- Change and configuration
- Development
- Testing
- Build
- Deployment
- Maintenance, operations, and upgrades

- Ticketing and defect management
- Knowledge base and collaboration

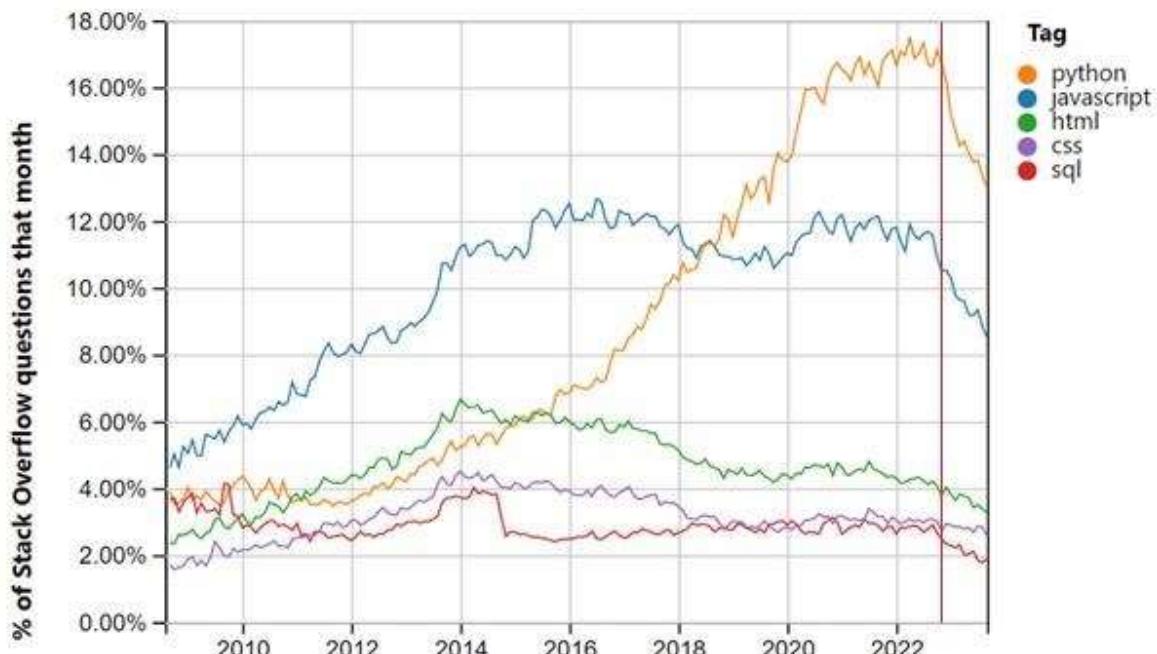
In **Figures 1 and 2**, Omdia reviews products from two cloud hyperscalers, Amazon Web Services (AWS) and Google Cloud Platform (GCP), two products from leading open-source code repositories (that also feature a lot more), and four products from startups in this space. The figure heatmaps are not meant to rank products in any way, but rather, to help identify the features relevant for the user and, on that basis, select the right tool for their needs. In **Figure 1**, Omdia identifies the principal use cases, showing that some tools are specific and only designed for one key task, such as testing.

## GenAI is impacting developer forums

The potential impact of GenAI on productivity gains for software developers was examined in the case of problem-solving by Quentin Gallea in his white paper, *From Mundane to Meaningful: AI's Influence on Work Dynamics - evidence from ChatGPT and Stack Overflow* (see **Further reading** for links to all the papers discussed in this report). Gallea found that from the moment of ChatGPT's first release on November 30, 2022, there was a drop in the number of questions posted on Stack Overflow. Omdia performed its own analysis using Stack Overflow trends to look at several programming languages (see **Figure 3**).

All the languages except Python showed a gentle decline in queries leading up to the launch of ChatGPT; however, the decline accelerated after the launch, and Python queries showed a sharp drop. Gallea also found that the questions posted after the ChatGPT launch were better documented and the nature of the questions more complex.

**Figure 3: Stack Overflow trends – red vertical indicates the launch of ChatGPT**



Source: Omdia

# Vendor product overview

The products reviewed here are suitable for enterprise-grade application development, such as supporting single sign-on, governance, and secure access.

## GitLab Duo

Product website: <https://about.gitlab.com/gitlab-duo/>

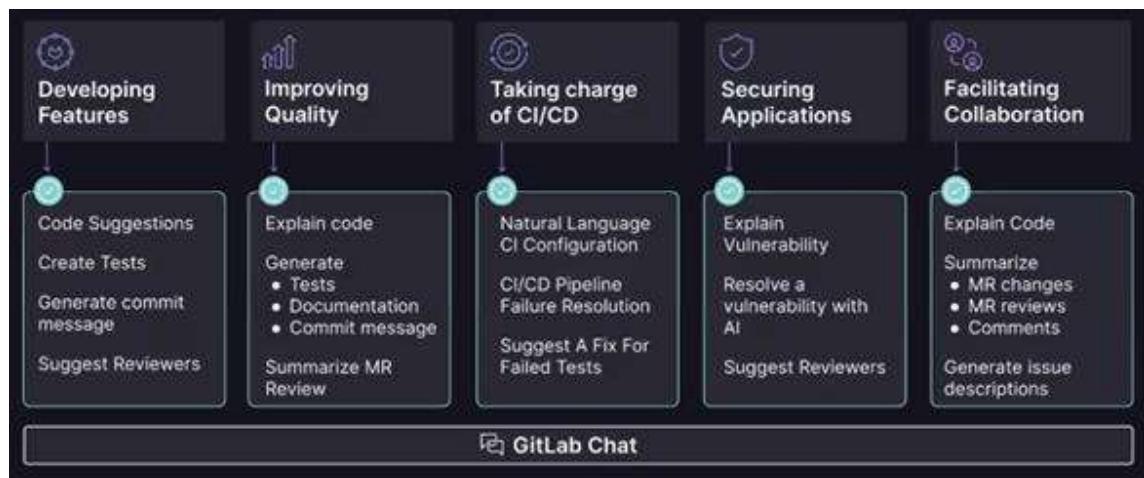
GitLab is one of the leading open software repositories in the market that does a lot more, such as providing DevOps facilities. GitLab Duo is its portfolio of AI-assisted tools that apply throughout the SDLC. GitLab places an emphasis on respecting user privacy and being transparent in how it operates. In its selection of AI technology, it is agnostic to the models adopted and will use what it considers the best model for each use case. The AI assistance is integrated throughout the SDLC pipeline built into GitLab.

Software developers face greater complexity and hurdles today in producing code:

- There is a need to build in application security, including enforcing standards and triaging security vulnerabilities
- The lack of testing results in quality issues
- Context switching across tools reduces productivity

To address these challenges, GitLab is leveraging AI to help companies ship secure software faster and shorten the development lifecycle. GitLab is a comprehensive DevSecOps platform that operates throughout the SDLC and is powered by AI (see **Figure 5**).

**1. Figure 5: GitLab Duo AI-powered DevSecOps workflows**



Source: GitLab

According to GitLab, 95% of C-levels and vice presidents in organizations said that privacy and protection of intellectual property are important when evaluating an AI tool/feature (for the survey, see *2023 Global DevSecOps Report: The State of AI in Software Development*, available from GitLab). To ensure privacy,

GitLab does not let its AI retain user data in any way and does not use client code to train its models. To be fully transparent in how AI is used, GitLab publicly shares documentation describing all AI models used by GitLab Duo and how its codebase is used.

GitLab makes these assurances:

- Anything the customer communicates to and from the AI models is data that remains private.
- For code suggestions, GitLab and its partners never use private or non-private GitLab customer data as training data.

GitLab has an AI gateway that is model agnostic, so users can route to any model in the market. (In the future, users will be able to bring their own models.) GitLab has a model validation team that evaluates models at scale, using different prompts and contexts and measuring similarity scores (i.e., running known tasks to see how a model performs against these standards and measuring performance). It can then assess any new model that emerges in the market against its standard, well-defined use cases to see how well they perform. Any model or product that performs exceptionally well becomes an opportunity for GitLab to use that model. Currently, GitLab uses models from Google and Anthropic to power GitLab Duo. Users cannot currently update or fine-tune those models with their own private data for use internally. This, however, is on the roadmap.

GitLab is a single application where all the components and modules are integrated into one SDLC pipeline, with security guardrails consistently applied throughout. When GitLab looked at where developers were spending their time, it was only 25% on coding, and 75% was taken up by other necessary tasks: planning, onboarding, testing, documentation, and security. Therefore, GitLab applies AI to all these tasks, not just code generation assistance.

The SDLC value stream is supported by a single data store, including the code repository, with AI applied as follows:

- **Plan and create:** In planning GitLab, Duo allows GenAI to populate agile epic and story features. A key benefit is when a long comment thread develops in discussions around features for which it is difficult for product managers to keep up to date with conclusions. Duo GenAI can summarize these threads and provide a concise view. This summary is open to anyone on the team to keep up to date with work.
- **Integrate and verify:**
  - **Code suggestions:** Duo can make code suggestions, generating code as developers type. Duo can autocomplete code as it is typed and also generate whole blocks of code.
  - **Code explanation:** Stakeholders in the organization taking part in the application review can ask Duo Explanation using natural language to explain what the code does.
  - **Suggested reviewers:** When code is merged, Duo has a Suggest Reviewers feature. This is valuable to new developers to help speed up the process and ensure high quality reviews. For large open-source distributed development projects, this is particularly useful, as these developers are typically not co-located and have less direct human contact.
  - **Test generation:** Duo can generate tests and documentation, for example, summarizing what is within a merge request.

- **Deploy and operate:** Duo can perform root-cause analysis to determine causes of failed continuous integration/continuous delivery builds.
- **Security and governance:** AI-powered automation for vulnerability summary, explaining vulnerabilities and recommendations on how to prevent them. There is a code review summary to improve collaborations among developers, security, and operations.

Code Suggestions supports 14 development languages and also infrastructure files, including Google Cloud CLI, Kubernetes resource model (KRM), and Terraform. IDE support includes VS Code, GitLab WebIDE, Microsoft Visual Studio, JetBrains IDEs, Neovim, and Android Studio. This feature will go GA on December 21, 2023.

GitLab also offers Duo Chat, where developers can ask questions directly to Chat rather than perform searches for information. Chat coverage includes how to use GitLab; questions about an issue, a feature, or a merge request; and questions about code and how users can perform a continuous conversation.

## Appendix

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### Methodology

This report draws on the author's extensive knowledge in the field of AI, as well as on expert knowledge from the Omdia AI research team. The vendors assessed in this report were surveyed with a questionnaire, and briefings were conducted with a sample of the vendors.

### Further reading

[Generative AI: The impact of AI-based autocoding on software development](#) (March 2023)

[Omdia Universe: No Code, Low Code Solutions, 2023–24](#) (September 2023)

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Murali, V. et al., [CodeCompose: A Large-Scale Industrial Deployment of AI-assisted Code Authoring](#), (May 2023)

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