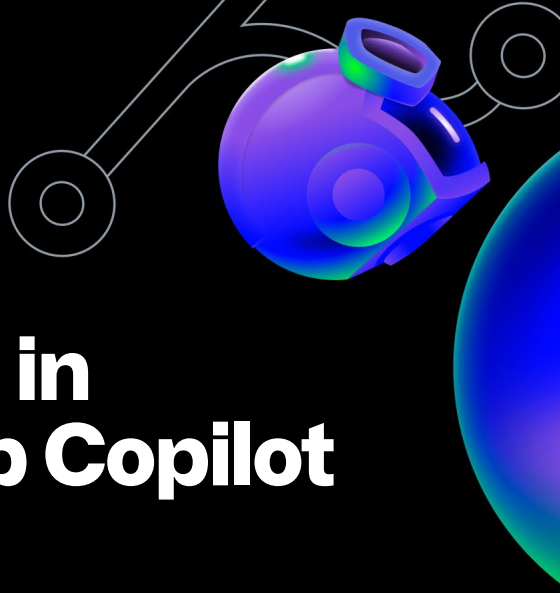

Empowering Developers in Government with GitHub Copilot

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Generative AI has taken the world by storm and has captured the attention of government leaders and change makers. The opportunity to use this technology to transform how agencies and state entities build software, engage with the partner community and academia and more effectively achieve mission objectives is apparent. With GitHub Copilot, developers spend less time with the mundane aspects of writing code and spend more time on innovative solutions that help address the all-too-common issues plaguing government information systems.

Building government software systems is hard

The burden imposed on government agencies to manage application code accumulates in an almost never-ending fashion. While tremendous progress has been made in establishing sound software development processes, many agencies still face challenges that can hinder their efforts.

- Government systems can be complex and some have incurred immense technical debt.
- Onboarding and offboarding of development teams could benefit from efficiency improvements
- Codebases are sometimes not well-understood and accompanying documentation can quickly become outdated

AI in software development

The rapid proliferation of generative AI has resulted in a paradigm shift in the way software is written, reviewed and shipped. By offloading some of the

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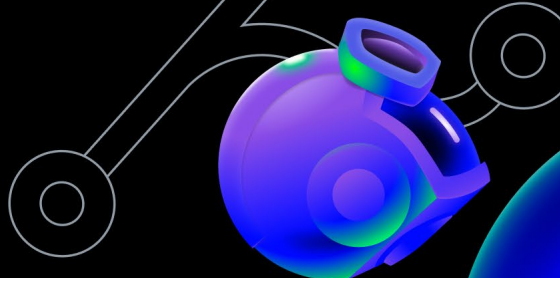

cognitive burdens associated with writing software, developers can focus more on creative problem solving and innovation.[1] AI can assist developers in identifying patterns in code, suggesting idiomatic improvements and automating certain tasks like implementing unit tests.

- **46%** of new code is written by AI.[2]
- **55%** faster task completion rate when using GitHub Copilot.[3]
- **75%** of developers report higher satisfaction in their job when using GitHub Copilot.[4]
- **63%** of developers say they spend at least 30 minutes a day and up to two hours looking for answers and solutions.[5] GitHub Copilot brings those answers right into your editor.

Government is not shying away from AI's potential

The Pacific Northwest National Laboratory (PNNL) is a great example of a government community that is embracing AI to help accelerate scientific discoveries. The lab is using AI for code generation with guardrails and responsible AI strategies in place, including but not limited to code review and security scanning processes.[6]

Generative AI is also helping government change the way it looks at application modernization initiatives. The United States Postal Service (USPS) has been undergoing a massive transformation over the last few years, and AI is only helping to accelerate their efforts. Pritha Mehra, CIO for USPS, touts "developer assist" as being one of the more pressing use cases for generative AI. "We have over 950 applications that we have to modernize, a lot aren't well documented or we lost the first developer on the project. And so we've been looking at generative AI to help us document, explain code and perhaps even write code." - Mehra.[7]

In state and local government, New York State's Office of Information Technology Services (NYS ITS) introduced their Acceptable Use of Artificial

1: https://github.blog/2024-01-17-a-developers-second-brain-reducing-complexity-through-partnership-with-ai/
2: https://github.blog/2023-02-14-github-copilot-for-business-is-now-available/
3: https://github.blog/2022-09-07-research-quantifying-github-copilots-impact-on-developer-productivity-and-happiness/
4: https://github.blog/2024-01-17-a-developers-second-brain-reducing-complexity-through-partnership-with-ai/
5: https://survey.stackoverflow.co/2023/#section-productivity-impacts-daily-time-spent-searching-for-answers-solutions
6: https://fedscoop.com/video/pnnl-and-microsoft-talk-strategies-for-responsible-ai-adoption/
7: https://fedscoop.com/video/how-usps-is-pioneering-ai-integration-in-public-service/

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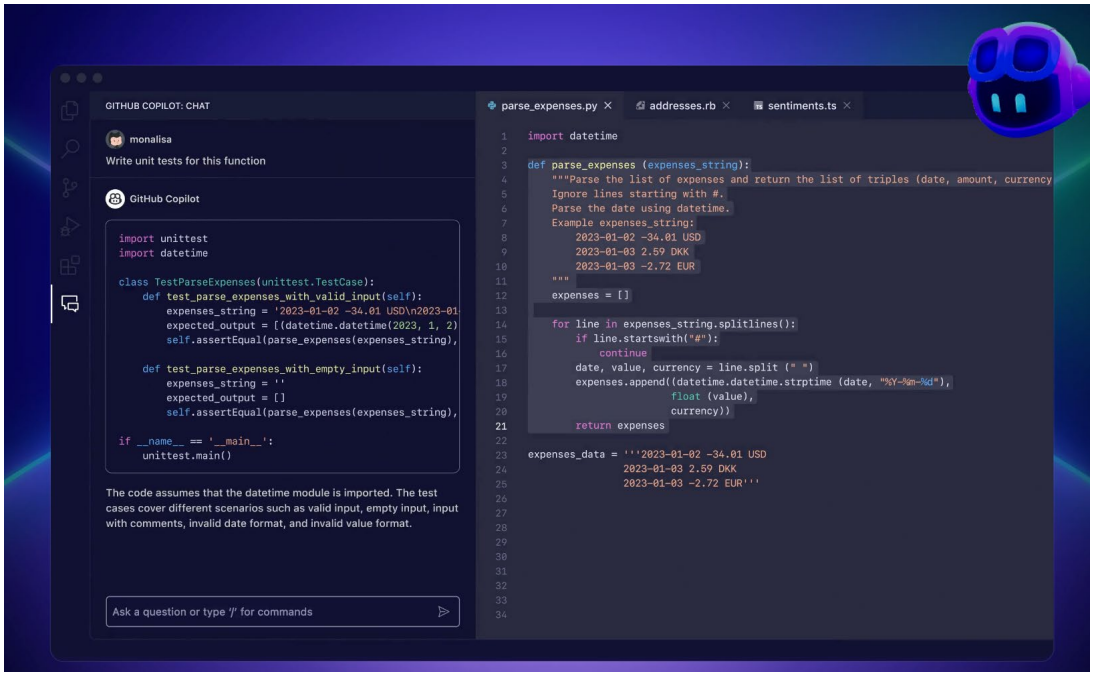
Intelligence Technologies policy that includes “generating code with AI for developers to review and test before use” as a use case but in the same vein as PNNL, requires human oversight from its state entities.[8] And former Colorado deputy CIO Julia Richman recently highlighted how her state was already using AI to help rewrite legacy code in newer programming languages.[9]

GitHub Copilot is leading the way with generative AI coding tools



GitHub pioneered the development of an AI powered pair programmer with the introduction of GitHub Copilot in June 2021. Since its inception, GitHub Copilot has helped numerous developers write better code and complete tasks more quickly and efficiently. In 2023, the GitHub Copilot Business plan was made available to enterprise customers and to date, has already helped more than 20,000 organizations and 1.5 million developers become more productive when building applications. Developers are completing coding tasks in half the time and exerting less mental effort on repetitive tasks.[10]

8: https://its.ny.gov/system/files/documents/2024/01/nys-p24-001-acceptable-use-of-artificial-intelligence-technologies-_1.pdf

9: https://statescoop.com/state-government-generative-ai-uses/

10: https://github.blog/2022-09-07-research-quantifying-github-copilots-impact-on-developer-productivity-and-happiness/

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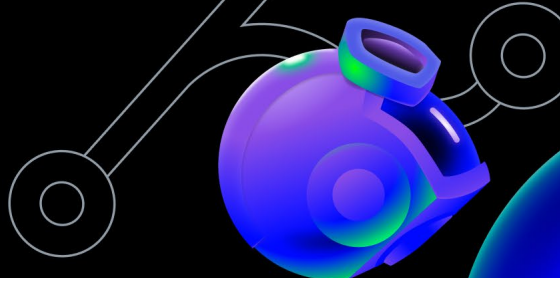

How can GitHub Copilot empower developers in government?

With the advent of the GitHub Copilot Business plan, several agencies and defense programs have already put the technology into the hands of their development teams. The GitHub Copilot Trust Center also gives government leaders a foundational understanding of the security, privacy and IP protections that GitHub employs.

Agencies can use GitHub Copilot to improve their code coverage metrics and write more meaningful unit tests. They can also use the tool to better understand complexities and unmaintained sections of code in their applications. How often does it feel like "This code is a mystery to me, and I don't know how it works or what it does, and the original author is no longer on the project"? With GitHub Copilot's chat capability, agencies can use AI to summarize codebases and make informed decisions about how to improve their software ... ultimately better serving citizens and the mission.

GitHub Copilot as an aid to government deployment models

Legacy app modernization

One of the most desired applications of GitHub Copilot in government is to deal with legacy software systems. Many of these systems still rely on older programming languages like COBOL, and finding developers who can work with them gets harder as time goes by. Historically, application modernization efforts within government involve extraordinary amounts of time and resources. But GitHub Copilot is already helping to change that narrative by helping agencies make sense of their software and more rapidly prototype application rewrites. One of GitHub Copilot's key differentiators within the generative AI coding landscape is that it works with almost every programming language. It can be used to write and explain everything from software written decades ago in COBOL to the latest in modern software written in Rust, and everything in between. GitHub Copilot also works well to rewrite code in different languages.

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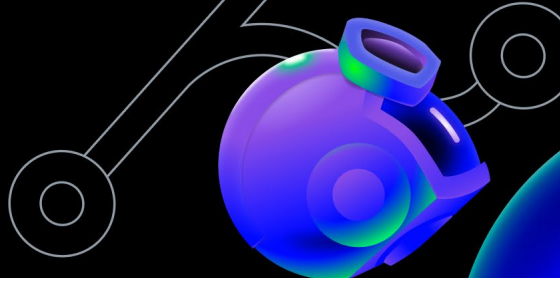

These capabilities alone give the tool almost immediate value for any application modernization initiative. Agencies can more easily document how the original system works and complete their legacy app transition in far less time.

Reduce OpEx by making applications more modular across low and high side networks

Software development within high side and specialized research networks such as the Defense Research and Engineering Network (DREN) often involves duplication of large chunks of code. Teams also face significant overhead when creating and deploying software on the classified side, such as cloud compute and labor costs. GitHub Copilot can address some of these issues by helping developers refactor applications into more modular, reusable code and enable more portable development workflows across information security boundaries. The GitHub Copilot editor context menu also gives users various one-click code optimizations and when used with the Azure Data Transfer cross-domain solution, customers can more efficiently ship their AI-optimized code to high side networks.

Elevating developer workflows with GitHub Copilot Enterprise

Following on the heels of the GitHub Copilot Business plan launch, organizations have been looking to harness even more from GitHub's AI capabilities. In February 2024 the GitHub Copilot Enterprise plan was released to further cement AI's role in multiple facets of the software development lifecycle. Customers that upgrade to the GitHub Copilot Enterprise plan can personalize the Copilot Chat experience to their codebase, fill knowledge gaps caused by missing and outdated documentation and automatically generate pull request summaries from code changes. With Copilot Enterprise, customers also have the ability to fine-tune the models to show more relevant and tailored code suggestions and increase their AI-generated code acceptance rates.[11]

11: Fine-tuned models will be introduced in a future iteration of the Copilot Enterprise plan

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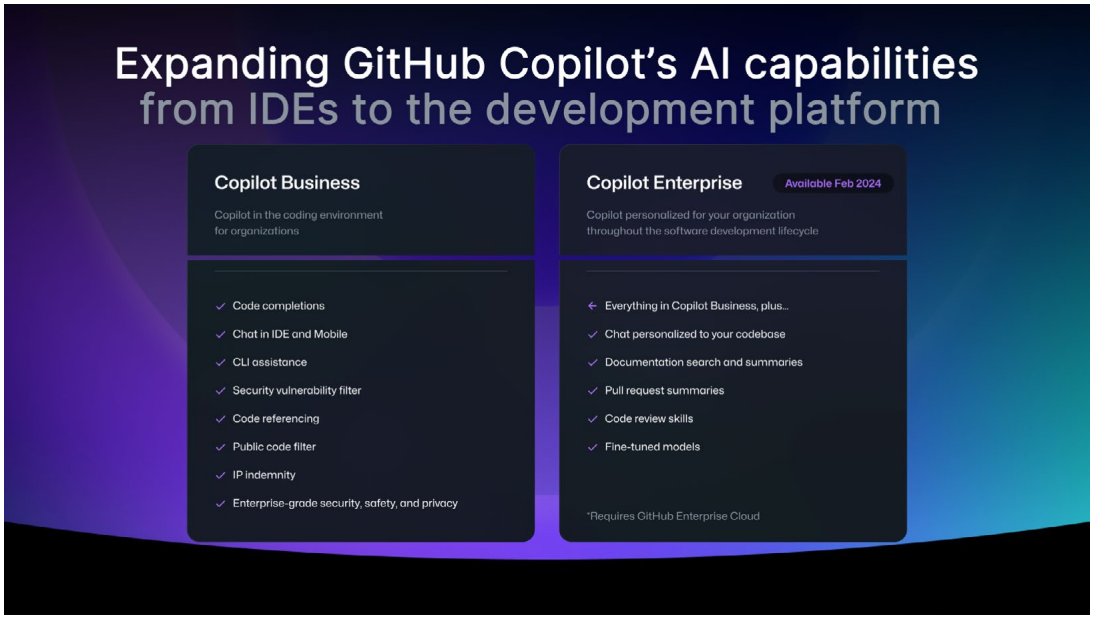
Secure development with GitHub Copilot



GitHub Copilot applies an AI-based vulnerability prevention system that blocks insecure coding patterns in real-time.[12] This additional model, developed jointly by GitHub and Microsoft, targets the most common vulnerable coding patterns, including, but not limited to, hardcoded credentials, SQL injections, path injections and weak cryptographic algorithms. The system also leverages large language models (LLMs) to approximate the behavior of static analysis tools, and can even detect vulnerable patterns in incomplete fragments of code.

Combined with GitHub Advanced Security, GitHub Copilot can help reinforce the principles of software supply chain security and improve the security posture of government software. Announced at the GitHub Universe 2023 event is a new AI-powered application security testing capability which has since been released in beta. With this new GitHub Advanced Security feature, referred to as code scanning autofix, developers receive AI-generated fixes for detected code vulnerabilities and can remediate these issues in less time. AI is not only giving developers a leg up, but reinforcing software security fundamentals that are a critical part of every system.

12: https://resources.github.com/copilot-trust-center/

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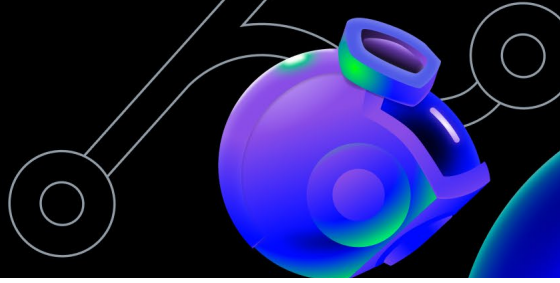

The models and optimizations that power GitHub Copilot

GitHub Copilot represents a culmination of over two years of GitHub engineering exposure to LLMs. Unlike other consumer-based generative AI tools, such as ChatGPT, GitHub Copilot is designed specifically for software development teams. GitHub Copilot uses a version of Azure OpenAI's GPT series of LLMs optimized for developer scenarios and captures context applicable to the task at hand. The GitHub team also continually refines the model and regularly publishes information about the improvements it makes.

Instilling confidence in our GitHub Copilot customers

GitHub Copilot is a feature of the GitHub software-as-a-service (SaaS) platform that includes code completion and chat capabilities. End-users can interact with GitHub Copilot by way of an integrated development environment (IDE) extension/plugin or directly within GitHub.com via a web browser.

The Azure OpenAI instances that back GitHub Copilot are managed by GitHub and are separate from any Azure OpenAI instances that customers have the option of deploying into their own Azure subscriptions for other use cases. As outlined in the GitHub Copilot Trust Center, GitHub and Microsoft never retain any model prompts nor responses for GitHub Enterprise customers, and thus cannot and do not train LLMs using agency data. Prompts and suggestions are transmitted in real-time and in-memory, and once a suggestion is returned, it is discarded. GitHub and Microsoft also don't share GitHub Copilot data with OpenAI – meaning agencies can use GitHub Copilot with confidence that their data and source code stays private.

With these things in mind, customers should consider taking into account that their data (and the security level at which it's categorized) remains isolated from the LLMs used to generate code suggestions.

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Getting started with GitHub Copilot

Learn more about the ways GitHub Copilot can accelerate your mission-oriented software development initiatives.