

DevOps with GitHub

The world's most widely adopted **AI-powered developer platform**



Paula Silva

Developer Productivity
Global Black Belt



Paula Silva

Director Specialist,
Developer Productivity
Microsoft



Frustrações de pessoas desenvolvedoras

Manter o foco.



Pressão para o tempo de
lançamento no mercado.



Impostos operacionais.

Alegria dos
desenvolvedores.

Estar no fluxo

Aprender e Inovar

Seguindo caminhos
pavimentados.

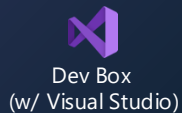
Foque apenas no código que *só você* pode
escrever.



Microsoft developer platform

Artificial Intelligence

Dev Compute



Engineering Platform



Deployment Environments



Security



Unleash creativity
with the power of AI



Optimize workflows and
boost collaboration



Secure what
matters



Unlock a complete
toolchain

GitHub Platform

A Plataforma de Desenvolvimento
Empoderada por IA
para Criar, Escalar e Entregar
Software Seguro



Empoderado por IA



Colaboração



Produtividade



Segurança



Escalabilidade





Collaboration

Seamlessly connecting teams to build their best together.



GitHub Flow

Collaborate on projects by following GitHub flow, a lightweight, branch-based workflow. GitHub flow is useful for everyone, not just developers.

Break down silos through innersource

Bring the best of open source culture to your organization through innersource practices. Simplified collaboration across teams, sharing of knowledge, improved code reuse, and secured workflows.

Issues and Projects

Create issues, break them into tasks, track relationships, add custom fields, and have conversations. View projects as spreadsheets or boards. Link issues to code changes.



Productivity

Enabling every developer to focus all their creativity on the big picture.



Faster onboarding

Reduce developer onboarding training time by 80%. New developers make their 1st contribution in minutes not, days.

Code search & code view

Our powerful code search and code view enables developers to rapidly search, navigate, and understand code.

Automate with GitHub Actions

Automate, customize, and execute your software development workflows right in your repository. Discover, create, and share actions to perform any job you'd like.



Security

Native, first party security by design to fix issues in minutes, not months.



Platform security

- Centrally manage identity and access for your enterprise members from your identity provider.
- Require 2FA and choose from TOTP apps, security keys, and more.

Private repos

- Host code that you don't want to share with the world in private repos only accessible to you and people you share them with.
- Ensure that all required CI tests are passing before collaborators can make changes to a protected branch.

Developer focused security tools

- Embed security in your developer workflow.
- Automatically review every code change to detect and remediate vulnerabilities before new code is introduced to the main branch.



Scale

The scale of the platform
tells us GitHub is the
most trusted developer
platform on earth



More developers than any other

100+ million developers trust
our platform

The home of open source

90% of companies use
open source

Usage of GitHub

90% of Fortune 100
companies use GitHub



GitHub Copilot

Your AI pair programmer

**Offers code suggestions,
contextualized to your project**

Convert comments to code

Autofill for repetitive code

Autosuggest tests

Show alternatives



```
sentiment.ts  write_sql.go  parse_expense

1  #!/usr/bin/env ts-node
2
3  import { fetch } from "fetch-h2";
4
5  // Determine whether the sentiment of
6  // Use a web service
7  async function isPositive(text: string) {
8      const response = await fetch(`http://
9          method: "POST",
10         body: `text=${text}`,
11         headers: {
12             "Content-Type": "application/x-w
13         },
14     });
15     const json = await response.json();
16     return json.label === "pos";
17 }
```

Copilot



96%

say they are faster
with repetitive tasks

88%

say they are more
productive

74%

focus on more
satisfying work

```
1 #!/usr/bin/env ts-node
2
3 import { fetch } from "fetch-h2";
4
5 // Determine whether the sentiment of
6 // Use a web service
7 async function isPositive(text: string) {
8   const response = await fetch(`http://
9     method: "POST",
10    body: `text=${text}`,
11    headers: {
12      "Content-Type": "application/x-www
13    },
14  });
15   const json = await response.json();
16   return json.label === "pos";
17 }
```

GitHub Copilot



John Skoubourdis
@scoubourdis

GitHub Copilot is like giving a programmer a super power 🦸

11:41 PM · Jun 2, 2022

1,579 Retweets 137 Quote Tweets 22.6K Likes



Alex MacCaw
@maccaw

One of the best uses of GitHub CoPilot is autocompleting your tests.

At this point it's writing the majority of my tests.

5:55 PM · Oct 29, 2022

20 Retweets 3 Quote Tweets 307 Likes



swyx
@swyx

By far the greatest benefit of using @Github Copilot so far is I now don't have to be forced to document my code.

I actively *want* to write great comments, because when I do, I get the dopamine hit of a good Copilot suggestion.

7:51 PM · Oct 12, 2022 from Puerto Vallarta, Jalisco

21 Retweets 3 Quote Tweets 338 Likes



willman@xoxo.zone
@willmanduffy

You win this round Copilot

```
updateMyselfMutationVari  
Name: 'Bob',  
ame: 'Builder',
```

5:01 PM · Jun 14, 2022

50 Retweets 3 Quote Tweets 780 Likes



Danny Postma
@dannypostmas

AI is doing 80% of my coding – the future looks brighter than ever! 😄

```
98 methods: {  
99   async fetch () {  
100     // |  
101     this.test = await this.saxios.get('/admin/analytics', {  
102       params: {  
103         startDate: this.date.start,  
104         endDate: this.date.end  
105       }  
106     })  
107     this.isLoading = false  
108   }  
109 }  
0:17 493.5K views
```

4:37 PM · Dec 1, 2022

1,161 Retweets 187 Quote Tweets 9,969 Likes



JD Ross
@justindross

Some of our engineers just told me they'd estimate 40% of the lines of code they produce are now written by the Github CoPilot AI

6:13 PM · Oct 19, 2022

386 Retweets 159 Quote Tweets 5,220 Likes



Keep flying with your favorite editor



VS Code



GitHub Codespaces



Visual Studio (Windows)



JetBrains IDEs



Neovim

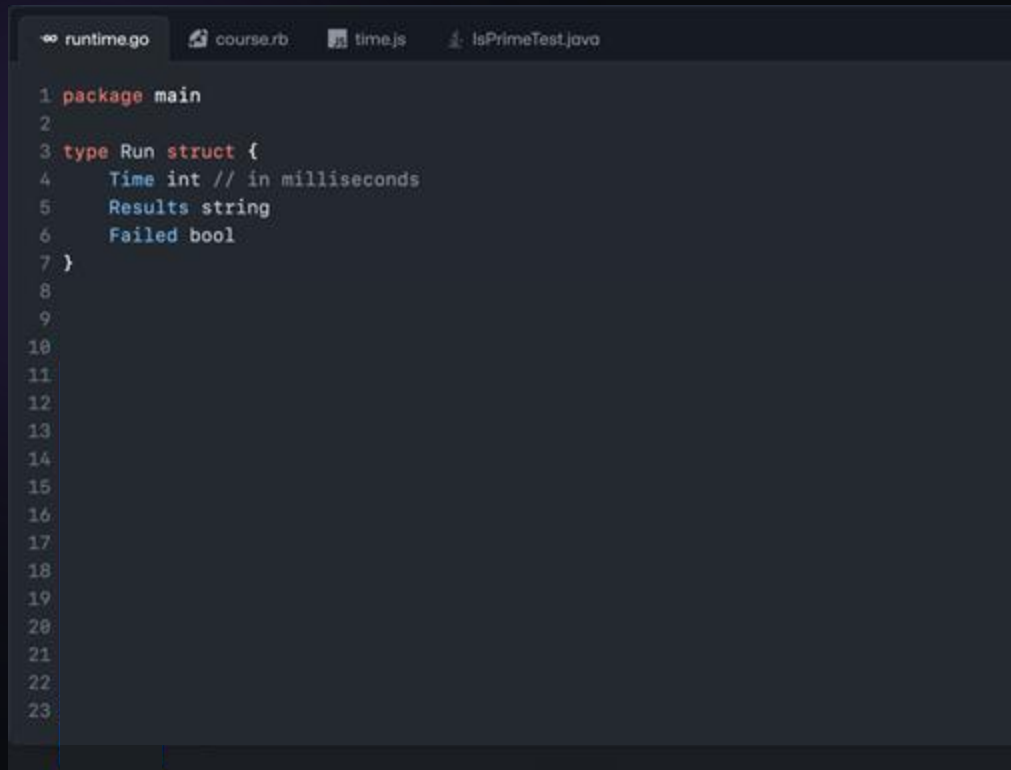


GitHub Copilot

Once enabled...



OpenAI LLM

A screenshot of a code editor interface with a dark theme. The top of the editor shows several tabs: 'runtime.go', 'course.rb', 'time.js', and 'IsPrimeTest.java'. The active tab is 'runtime.go', which contains Go code. The code is as follows:

```
1 package main
2
3 type Run struct {
4     Time int // in milliseconds
5     Results string
6     Failed bool
7 }
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
```



Copilot vs Copilot Chat

Copilot

Direct Code Writing

Seamless IDE Integration

Solo Development

Copilot Chat

In-Depth Assistance

Learning & Teaching

Collaborative Scenarios



Using Copilot Chat

GitHub Copilot Chat



Refactor Code



Generate Tests



Debug



Create Workspace



Documentation

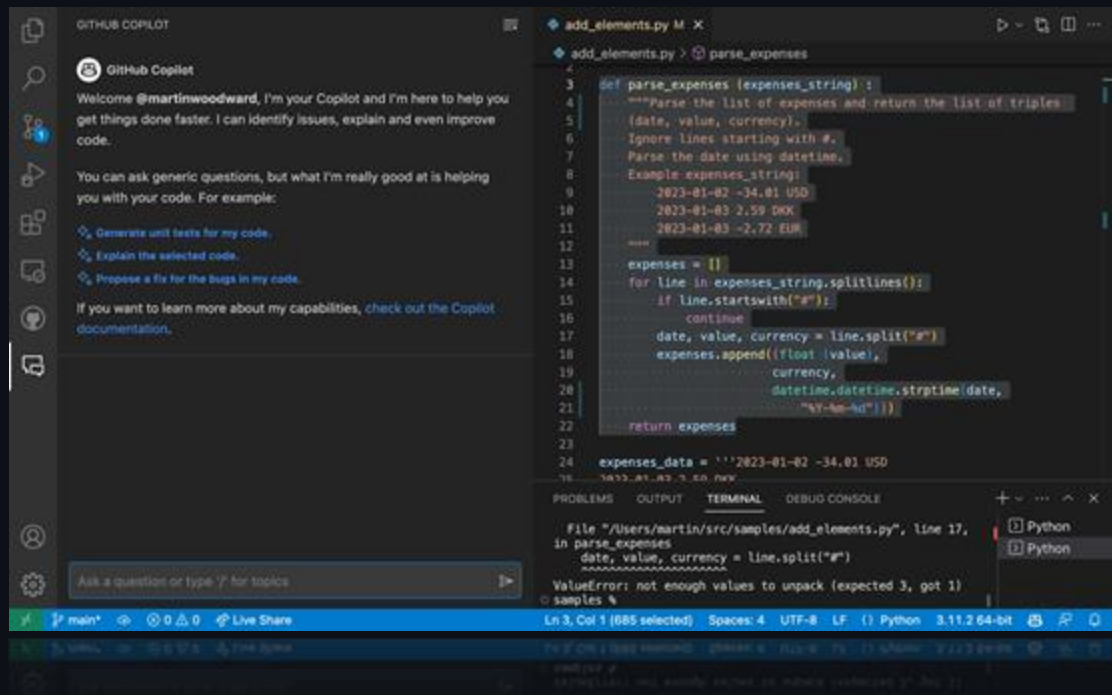


GitHub Copilot Chat

Chat experience in the IDE

Interactive experience in editor

- Get an overview of the solution
- Explain selected code
- Generate unit tests
- Propose a fix for bug
- Make code robust / secure
- Ask generic software development questions



Supports VS Code, Visual Studio and JetBrains.



Copilot Chat in the Repository

- Analyze and explain code and other repository contents
- Refine by selecting which repo files to focus on



The screenshot displays the GitHub Copilot Chat interface. On the left, a code editor shows a Ruby method named `detect` within the `Linguist` module. The method takes a `blob` and an optional `allow_empty` argument. It iterates through a list of strategies to detect the language of the blob. The code is highlighted with a red border.

On the right, the Copilot chat window shows a user query: "What does this method do?". The Copilot response explains the `detect` method, its purpose, and its behavior. The response is also highlighted with a red border.

Code Snippet:

```
# Returns language or nil.
def detect(blob, allow_empty: false)
  # Bail early if the blob is binary or empty.
  return nil if blob.binary? || blob.empty? || (allow_empty && blob.empty?)

  Linguist.instrument("linguist.detection", :blob => blob) do
    # Call each strategy until one candidate is returned.
    languages = []
    returning_strategy = nil

    STRATEGIES.each do |strategy|
      returning_strategy = strategy
      candidates = Linguist.instrument("linguist.strategies", :blob => blob, :strategy => strategy) do
        strategy.call(blob, languages)
      end

      if candidates.size == 1
        languages = candidates
        break
      elsif candidates.size > 1
        # More than one candidate was found, pass them to the next strategy.
        languages = candidates
      else
        # No candidates, try the next strategy.
      end

      Linguist.instrument("linguist.detected", :blob => blob, :strategy => returning_strategy,
        languages: languages)
    end
  end
end
```

Chat Interaction:

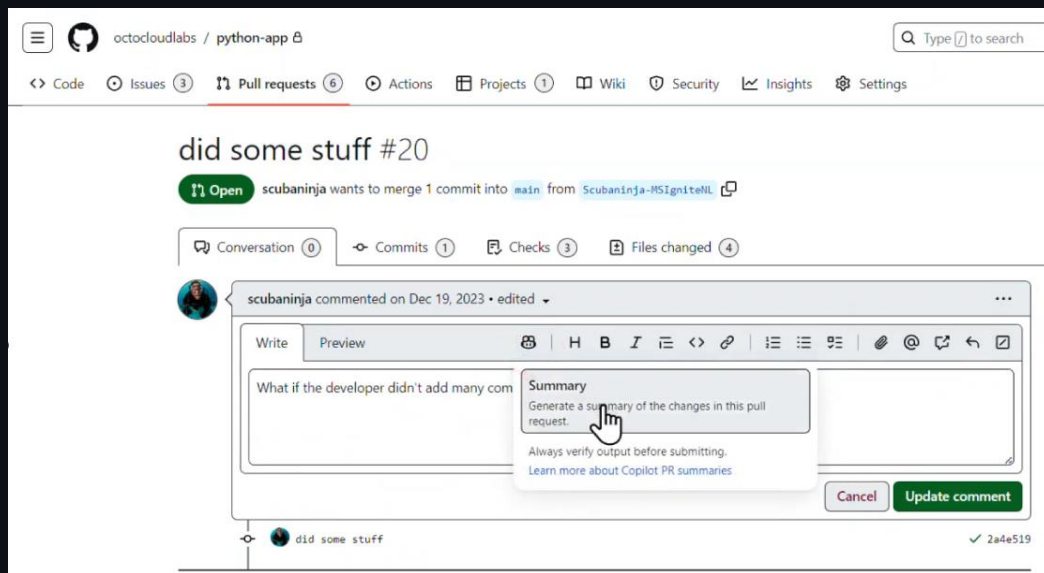
User: What does this method do?

Copilot: This is the `detect` method in the Ruby file `linguist.rb`. The method is used to detect the language of the given blob of text. The `blob` object is an instance of a class that includes the `Linguist::BlobInterface` interface. It returns a `Language` object or `nil` if the blob is binary, empty, or if no language is detected. The method works by first checking whether the blob is binary or empty. Next, it runs a set of language detection strategies with the given blob and the candidate languages returned by the previous strategy, until one candidate is returned. Finally, it returns the first language candidate, or `nil` if none are detected. This method has an optional argument called `allow_empty` which defaults to `false`. If it's set to `true` it will allow detection of languages from empty BLOBs.



Pull request summaries

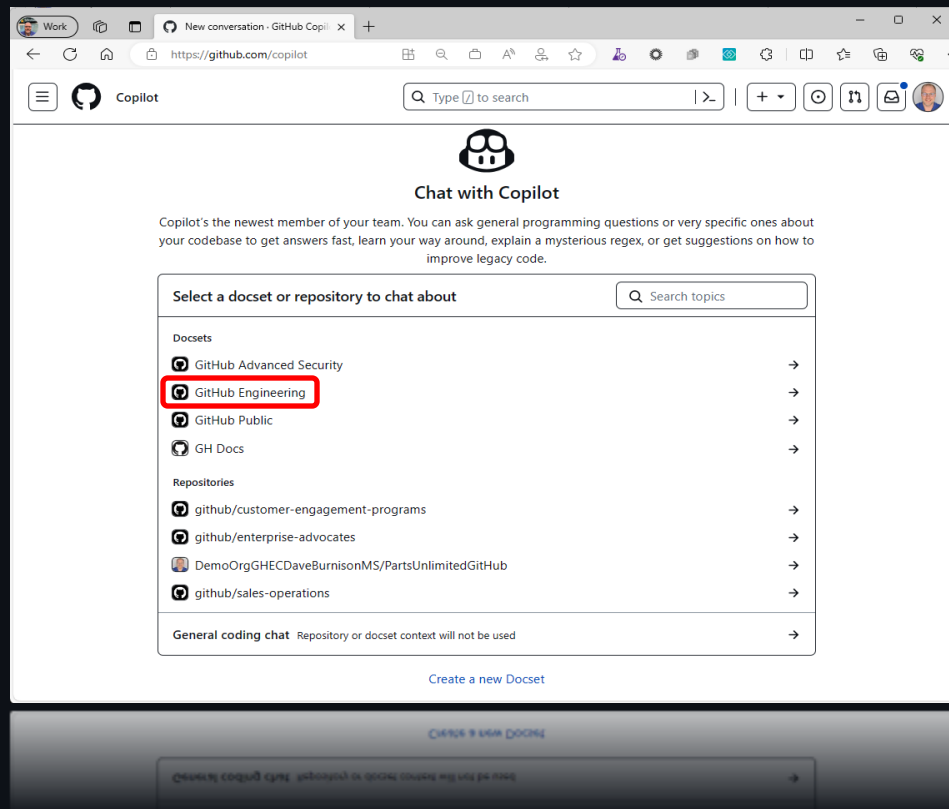
- Suggest natural-language descriptions within PRs based on the code changes
- Automated code reviews
- Explanations on changes and comments



Search effortlessly with Copilot Knowledge Bases

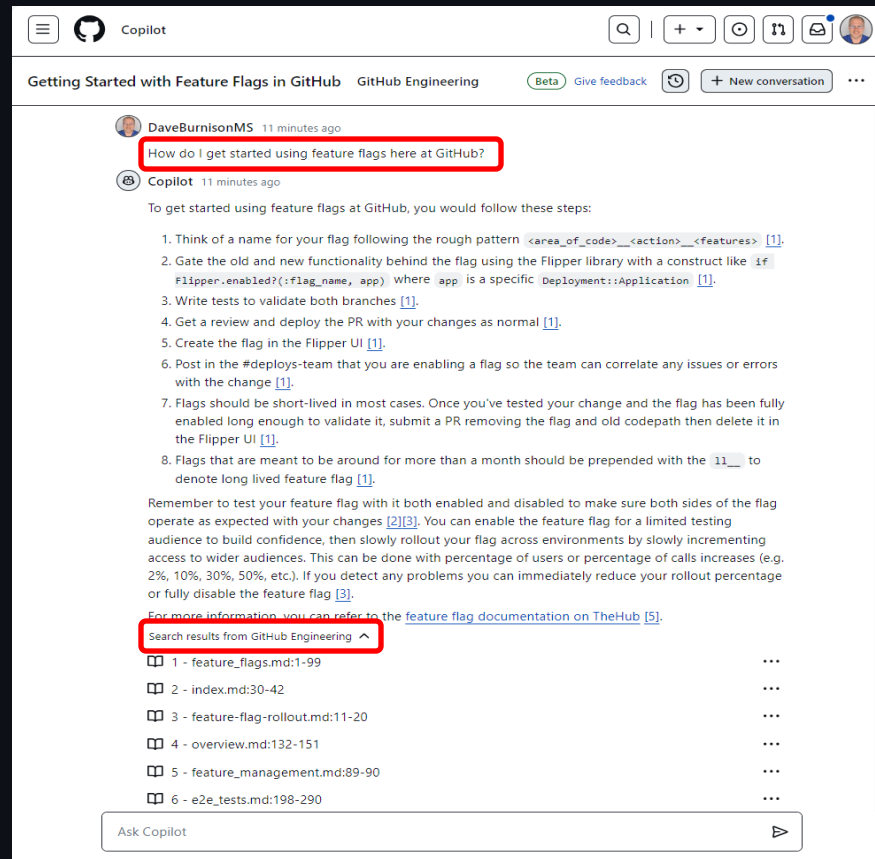
- Conversational documentation search
- Customized to your internal documentation
- Summaries and references to source documents

10:30 AM



Search effortlessly with Copilot Knowledge Bases

- Conversational documentation search
- Customized to your internal documentation
- Summaries and references to source documents



The screenshot shows the GitHub Copilot interface. At the top, there's a navigation bar with the Copilot logo and a search icon. Below it, a header bar reads "Getting Started with Feature Flags in GitHub" and "GitHub Engineering". A "Beta" badge and a "Give feedback" link are also present. A "New conversation" button is on the right.

The main chat area shows a conversation between a user and Copilot. The user's message is "How do I get started using feature flags here at GitHub?". Copilot's response is a list of 8 steps for getting started with feature flags at GitHub, including thinking of a name, gating functionality, writing tests, and deploying. The response also includes a reminder to test the feature flag and a link to "feature flag documentation on TheHub [5]".

Below the main response, there's a section titled "Search results from GitHub Engineering" with a dropdown arrow. It lists six search results with file names and line ranges:

- 1 - feature_flags.md:1-99
- 2 - index.md:30-42
- 3 - feature-flag-rollout.md:11-20
- 4 - overview.md:132-151
- 5 - feature_management.md:89-90
- 6 - e2e_tests.md:198-290

At the bottom of the chat area, there's an "Ask Copilot" input field with a send button.





Custom, fine-tuned models



Show more relevant and tailored code suggestions



Developers can write code faster with fewer errors



Code referencing, modeling, hosting, & inferencing are private



Code suggestions based on proprietary and less relevant languages



Requires GitHub Copilot Enterprise

Custom models

Mona Lisa

Created on 14 Jul

Status

Training

Training data

5 repositories

Training time

0s

Training steps

Estimated time to finish: 36h 21m



Preprocessing repositories

Completed in 5h 32m



Building training data

Started 10 minutes ago · Estimated time to finish: 3h 05m



Model fine-tuning

Waiting for building training data to finish



Model evaluation

Waiting for model finetuning to finish



Deploying

Waiting for model evaluation to finish

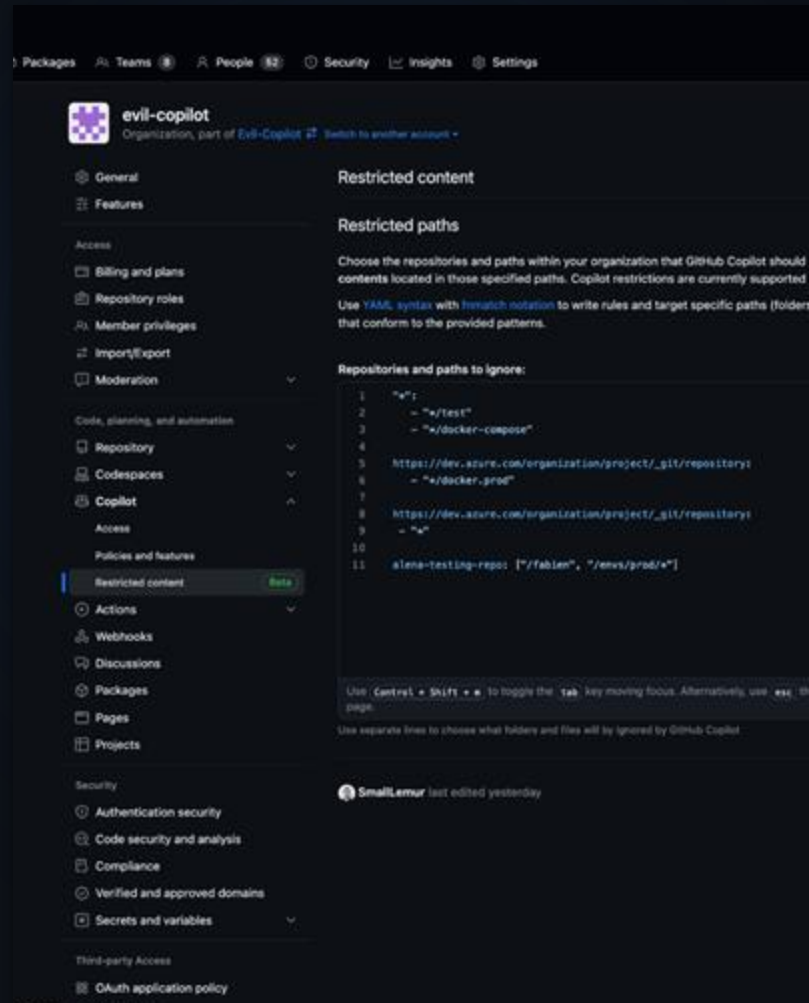


Narrow Copilot's reach

- ✓ Specify files, folders, or entire repositories
- ✓ Code completion will respect the Copilot Ignore policy
- ✓ Provides more scalability



Available in GitHub Copilot Business




The screenshot shows the GitHub Copilot settings interface for an organization named 'evil-copilot'. The left sidebar contains a navigation menu with options like General, Features, Access, Billing and plans, Repository roles, Member privileges, Import/Export, Moderation, Code, planning, and automation, Repository, Codespaces, Copilot, Access, Policies and features, Restricted content (highlighted), Actions, Webhooks, Discussions, Packages, Pages, Projects, Security, Authentication security, Code security and analysis, Compliance, Verified and approved domains, Secrets and variables, Third-party Access, and OAuth application policy. The main content area is titled 'Restricted content' and includes a section for 'Restricted paths' with instructions on using YAML syntax with `!match` notation. Below this, there is a 'Repositories and paths to ignore' section with a list of paths to ignore, including `*/test`, `*/docker-compose`, `https://dev.azure.com/organization/project/_git/repository`, `*/docker.prod`, `https://dev.azure.com/organization/project/_git/repository`, `*/a`, and `alpha-testing-repos ["/fabien", "/envs/prod/*"]`. At the bottom, there is a note about using `Ctrl + Shift + Tab` to toggle the `Tab` key moving focus, and a footer note about using separate lines to choose what folders and files will be ignored by GitHub Copilot.

GitHub Copilot for Azure

Simplify the adoption of Azure

- › Enables elite developers to use skills from any cloud to quickly deploy to Azure
- › Application code specific assistance for adopting Azure
- › Troubleshoot and optimize apps on Azure quickly and easily
- › Apply best practices for scalability, security and cost



 GitHub Copilot

Welcome @oliviadev, I'm your Copilot and I'm here to help you get things done faster.

I'm powered by AI, so surprises and mistakes are possible. Make sure to verify any generated code or suggestions, and [share feedback](#) so that we can learn and improve. Check out the [Copilot docs](#) to learn more.

 oliviadev

[@azure](#) what's the best way to deploy this app?

  GitHub Copilot using @azure...

✓ Analyzing project

↻ Deciding which project information to collect

↻ Creating specifications

/fix the problems in my code

/tests write unit tests for my code

/explain how the selected code works



@azure What Azure OpenAI resources are deployed?



main

⊗ 0 ⚠ 0

30

31

app =

32

33

34

Endp

35

@app.g

36

async

37

try

38

c

39

40

41

42

43

44

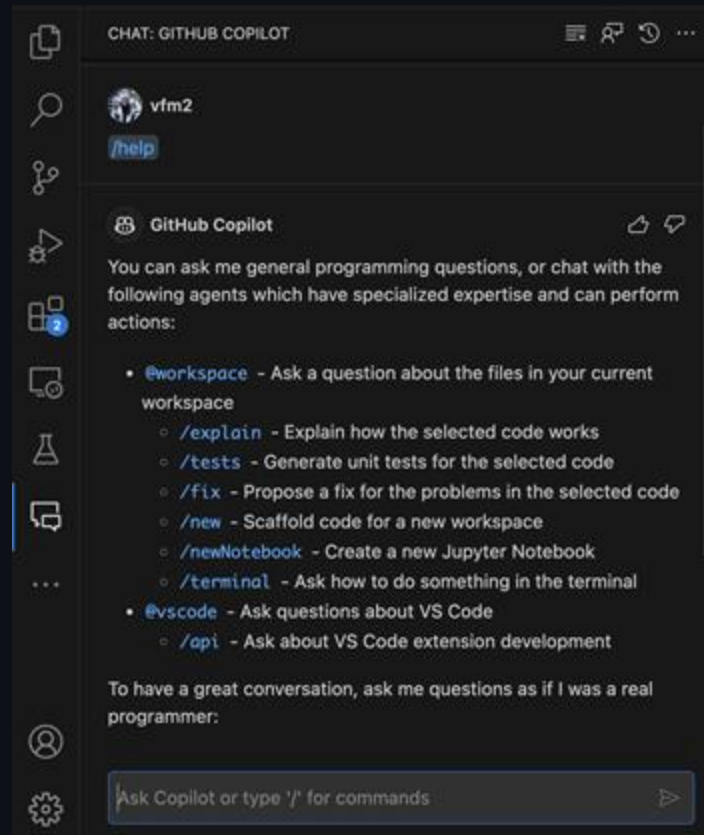
45

ex



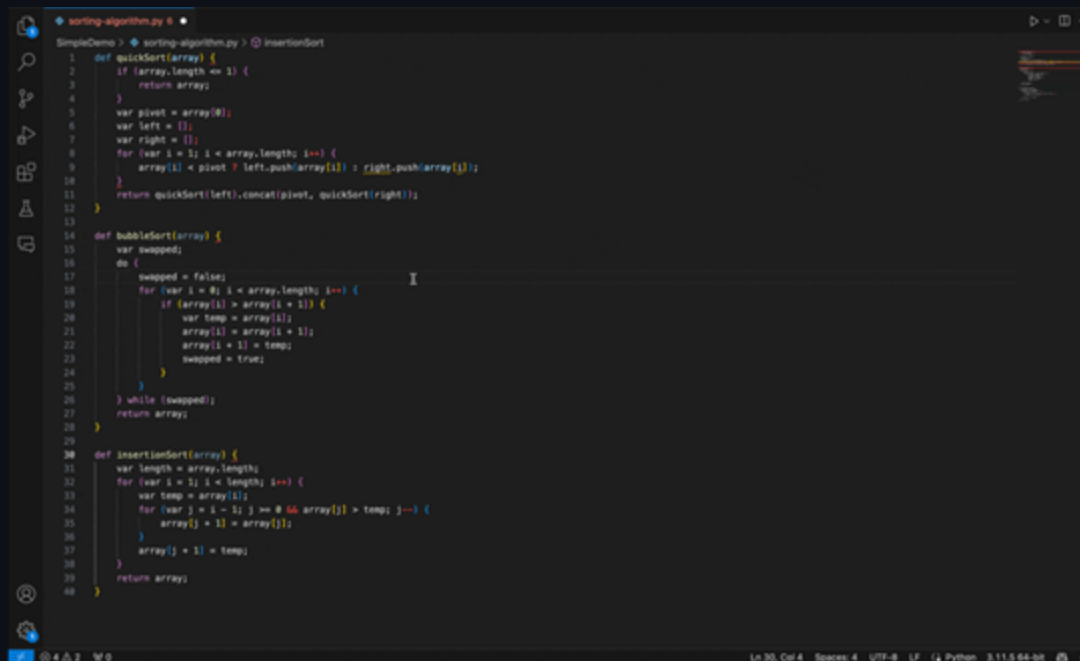
Copilot Chat: Slash Commands

`/help` to find
available
commands in your
IDE



In-file Copilot Chat

Copilot offers **in-file Copilot** feature to selectively improve



The screenshot shows a code editor with three Python sorting functions: quickSort, bubbleSort, and insertionSort. The bubbleSort function is currently selected, and a Copilot chat suggestion is visible on the right side of the editor, indicating a potential improvement or correction to the code.

```

1 def quickSort(array) {
2   if (array.length <= 1) {
3     return array;
4   }
5   var pivot = array[0];
6   var left = [];
7   var right = [];
8   for (var i = 1; i < array.length; i++) {
9     array[i] < pivot ? left.push(array[i]) : right.push(array[i]);
10  }
11  return quickSort(left).concat(pivot, quickSort(right));
12 }

13
14 def bubbleSort(array) {
15   var swapped;
16   do {
17     swapped = false;
18     for (var i = 0; i < array.length; i++) {
19       if (array[i] > array[i + 1]) {
20         var temp = array[i];
21         array[i] = array[i + 1];
22         array[i + 1] = temp;
23         swapped = true;
24       }
25     }
26   } while (swapped);
27   return array;
28 }

29
30 def insertionSort(array) {
31   var length = array.length;
32   for (var i = 1; i < length; i++) {
33     var temp = array[i];
34     for (var j = i - 1; j >= 0 && array[j] > temp; j--) {
35       array[j + 1] = array[j];
36     }
37     array[j + 1] = temp;
38   }
39   return array;
40 }

```

Copilot Prompt Engineering

What

Prompt engineering is the process of designing and creating high-quality prompts that can be used to generate accurate and useful code suggestions with Copilot.

Why

- Maximizes utility of Copilot
- Minimizes repeated iterations
- Determines code suggestion quality
- Skill prompts guide Copilot to understand context & nuances
- Refined interactions reduces misunderstandings

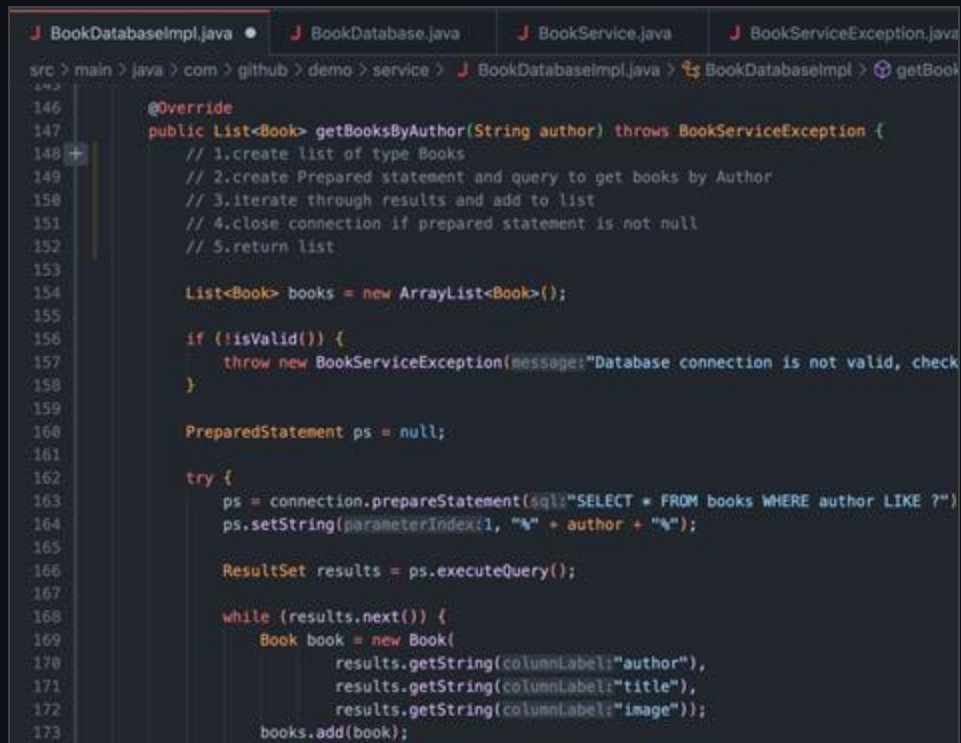
How

- Neighboring Tabs
- Zero-Shot Prompting
- One-Shot Prompting
- Few-Shot Prompting
- Let's Think Step by Step



Neighboring Tabs

Keep relevant files open, things related to your current code



```

146  @Override
147  public List<Book> getBooksByAuthor(String author) throws BookServiceException {
148      // 1.create list of type Books
149      // 2.create Prepared statement and query to get books by Author
150      // 3.iterate through results and add to list
151      // 4.close connection if prepared statement is not null
152      // 5.return list
153
154      List<Book> books = new ArrayList<Book>();
155
156      if (!isValid()) {
157          throw new BookServiceException(message:"Database connection is not valid, check
158      }
159
160      PreparedStatement ps = null;
161
162      try {
163          ps = connection.prepareStatement(sql:"SELECT * FROM books WHERE author LIKE ?");
164          ps.setString(parameterIndex:1, "%" + author + "%");
165
166          ResultSet results = ps.executeQuery();
167
168          while (results.next()) {
169              Book book = new Book(
170                  results.getString(columnLabel:"author"),
171                  results.getString(columnLabel:"title"),
172                  results.getString(columnLabel:"image"));
173              books.add(book);

```

If at first you
don't succeed,
iterate!

Zero Shot Prompt

```
1 //Write a JavaScript function that finds
2 //the maximum value in an array.
3 function max(array) {
4     return Math.max.apply(null, array);
5 }
```

One-Shot Prompt

```
1 ✓ //Create a JavaScript function, `findMax`, that takes an array of
2 //and returns the string with the maximum length.
3 //Ensure that the function works correctly for arrays that are em
4 //as well as arrays that contain both strings and numbers.
5 ✓ function findMax(array) {
6     var max = array[0].length;
7     array.map(v => max = Math.max(max, v.length));
8     result = array.filter(v => v.length == max);
9     return result;
10 }
```



Provide a high level
description to
clarify expectations

```
calculations.py > ...
1  """
2  Create a Python function, `sum_array_values`, that finds
3  and returns the sum of integers in an array.
4
5  1. Verify if the array is empty and exit if it is.
6  2. Throw error if the array contains non-integer values.
7  3. Return the sum of the array values if the array is valid.
8
9  Please consider the following example data:
10 Example 1: [5, 10, 15, 20, 8]
11 Example 2: [2, 4, 6, 1, 9, 12]
12 The generated code should work correctly for arrays like above
13 """
14 #define sum_array_values function
15 def sum_array_values(array):
16     # 1. Verify if the array is empty and exit if it is.
17     if len(array) == 0:
18         return 0
19     # 2. Throw error if the array contains non-integer values.
20     for i in array:
21         if type(i) != int:
22             raise TypeError("The array contains non-integer values.")
23     # 3. Return the sum of the array values if the array is valid.
24     return sum(array)
```



DEMOS



C:\Source\Repos>g

Get the advantages of AI today



Increase developer productivity

And satisfaction by focusing on real problems



Accelerate innovation

Prototype & innovate more rapidly



Bridge skill gaps

Learn new languages and techniques





Resources to Learn More

GitHub Learning Pathways

We've partnered with engineering leaders at some of the most influential companies in the world to create a new expert-guided GitHub Learning Pathway:

- What can your business achieve using GitHub Copilot?
- How does GitHub Copilot handle data?
- What are the best practices for creating an AI governance policy?
- How can my team successfully roll out GitHub Copilot to our developers?

You'll also get tips & insights from engineering leaders at ASOS, Lyft, Cisco, CARIAD (a Volkswagen Group company), and more who have used GitHub Copilot to increase operational efficiency, deliver innovative products faster, and improve developer happiness!



<https://resources.github.com/learn/pathways>

The screenshot shows the GitHub Learning Pathways website. At the top is a navigation bar with links for Resources, Why GitHub, Topics, Learn, Events & Webinars, and Contact Sales. There is also an 'Enterprise trial' button. The main header features the title 'GitHub Learning Pathways' and a sub-header: 'Unlock the power of GitHub for your business with expert-guided learning pathways, accompanied by insights from industry leaders. Each pathway offers prescriptive tutorials to grow expertise and optimize GitHub for your organization.' To the right of the text is a large, stylized illustration of a blue robot head with large eyes. Below the header is a section titled 'Pick your pathway' which contains four cards. Each card has a small image, a title, a brief description, and a link to explore the pathway.

Resources Why GitHub Topics Learn Events & Webinars [Enterprise trial](#) [Contact Sales](#)

GitHub Learning Pathways

Unlock the power of GitHub for your business with expert-guided learning pathways, accompanied by insights from industry leaders. Each pathway offers prescriptive tutorials to grow expertise and optimize GitHub for your organization.

Pick your pathway

AI-powered development with GitHub Copilot

Transform your engineering organization with GitHub Copilot. Get started by understanding how GitHub Copilot enhances productivity, how GitHub handles your company's data, and how to streamline AI governance for a successful deployment.

[Explore your GitHub Copilot learning pathway](#)

CI/CD with GitHub Actions

From building your first custom workflow to automating advanced testing strategies, this pathway will teach you how (and why) the most innovative companies in the world automate CI/CD with GitHub Actions.

[Explore your automation learning pathway](#)

Shift left with GitHub Advanced Security

How can you protect your codebase without blocking developer productivity? You'll learn how to easily enable and customize GitHub Advanced Security's security tools.

[Explore your security learning pathway](#)

Administration and Governance with GitHub Enterprise

Building the right foundation is critical for long-term success. As your developer population grows, learn best-practices for administration and governance with GitHub Enterprise.

[Explore your administration learning pathway](#)

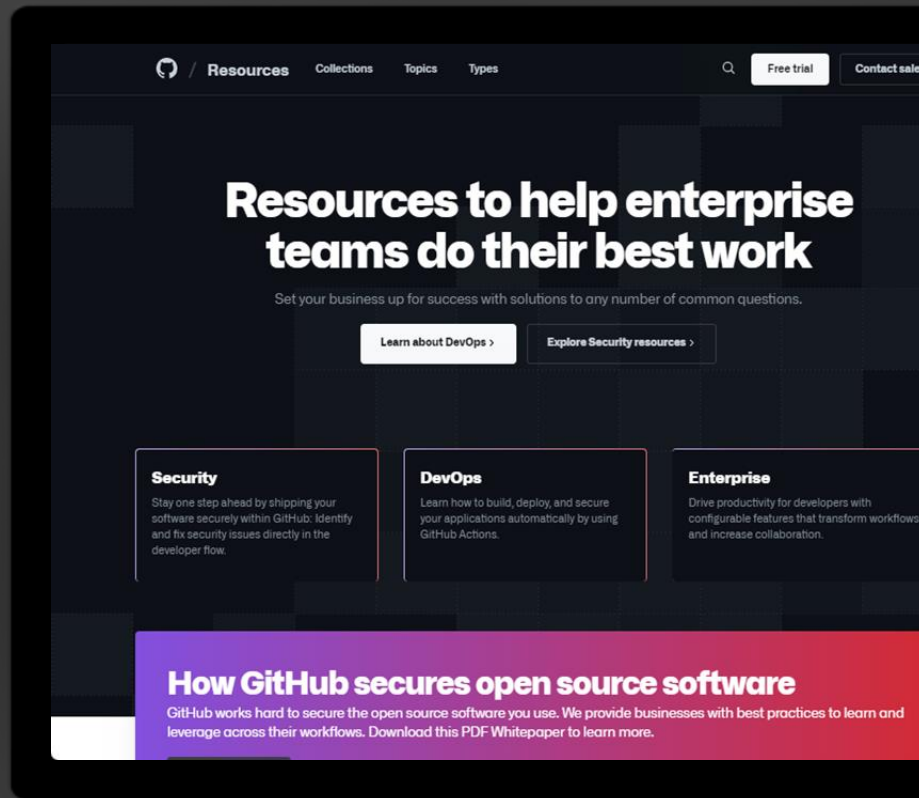
GitHub Resources

Resources to help enterprise teams do their best work.

- Articles, eBooks, events and videos empowering you to set your business up for success with GitHub.
- Find resources on today's hottest software development topics such as DevOps, Security, Open Source Development, Innersource, etc.



<https://resources.github.com>

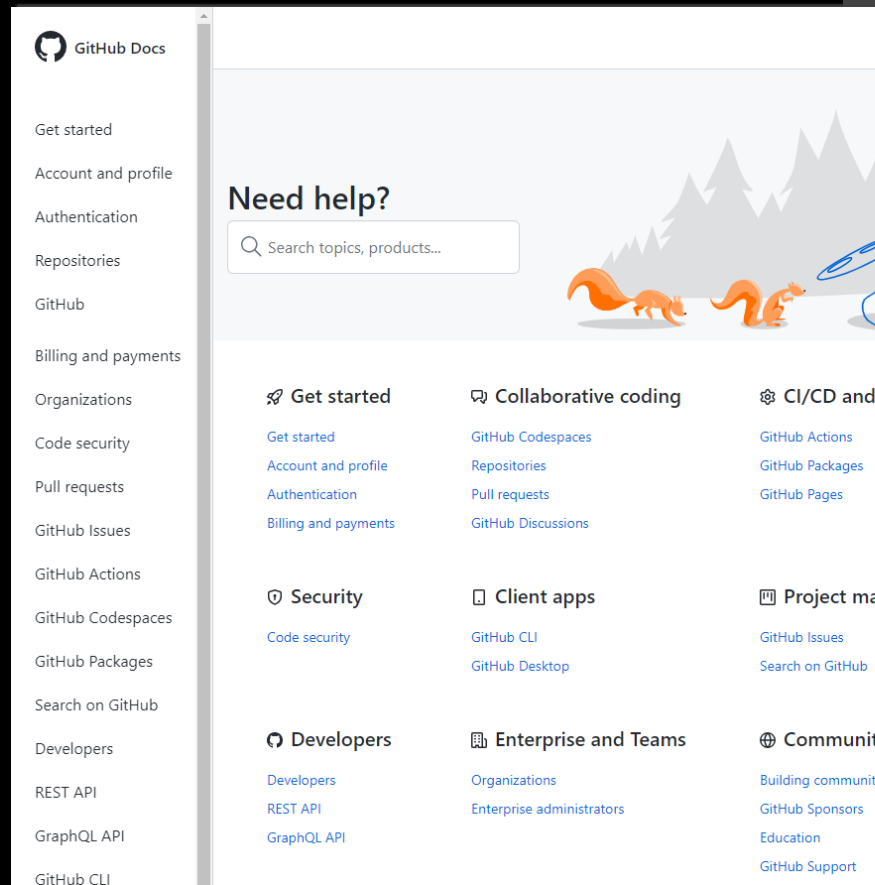


GitHub Documentation

- Discover all of GitHub's product documentation!
- If you only save one Favorite in your browser related to GitHub, this is the link to save as a favorite!



<https://docs.github.com>



Microsoft Learn

Build your skills fast with free, interactive tutorials at Microsoft Learn, a new training experience for technical users.

Discover your path

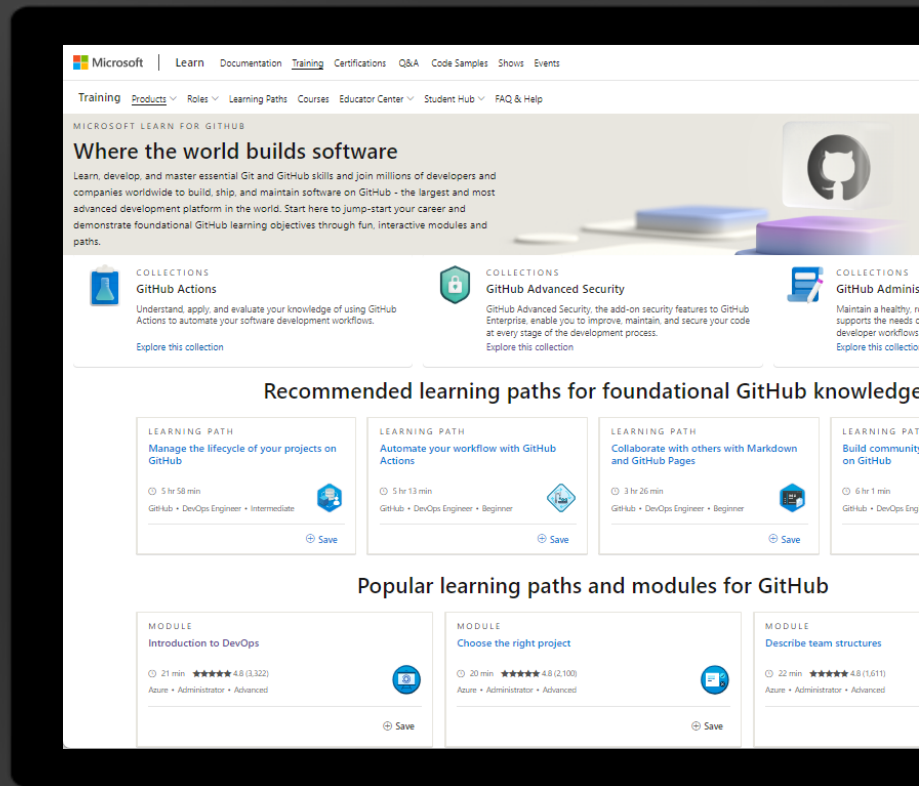
Step-by-step training to fit your schedule with interactive coding environments for hands-on experience.

Earn achievements and recognition for your Azure skills.

For many modules we provide free Azure sandboxes, free virtual machines, etc. so there is nothing to setup ahead of time.



<https://learn.microsoft.com/training/github>
<https://learn.microsoft.com/en-us/training/github>



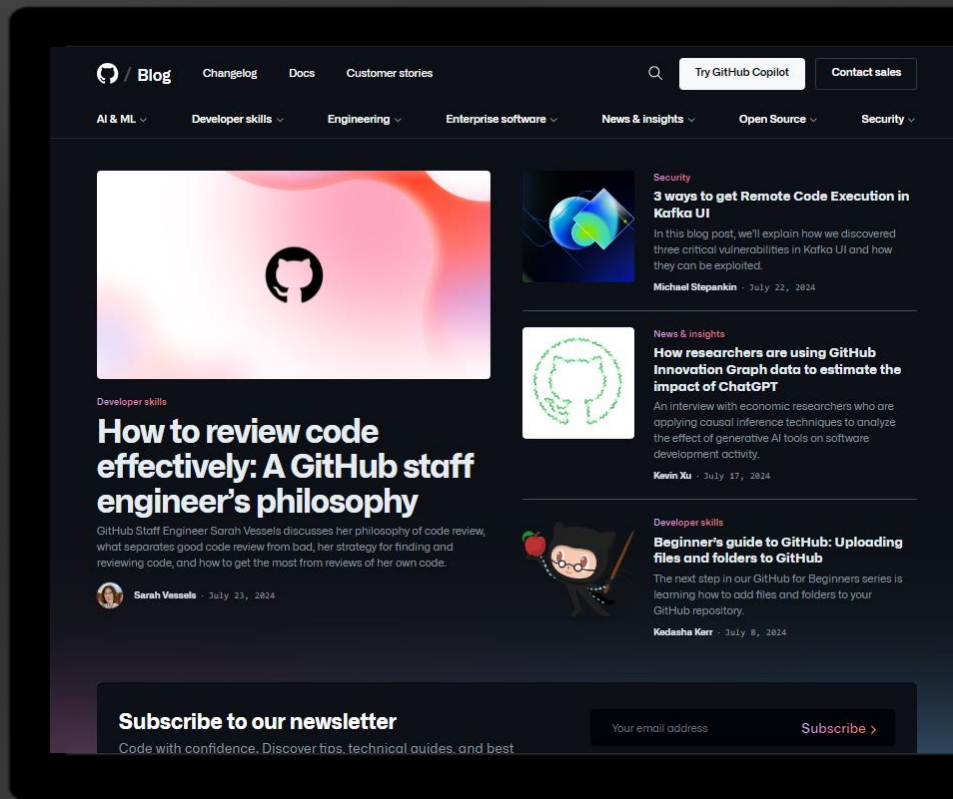
GitHub Blog

Learn about everything GitHub such as...

- **Product** - New Features, Upcoming Features, Security, Editor tools
- **Company** - Policy, Remote work, Updates
- **Open Source** - Education, Events, Insights, Open source
- **Find posts by category e.g. Copilot, Security, Enterprise, Open Source, Product News, Engineering (i.e. News from the team that builds GitHub)**



<https://github.blog>





Resources

GitHub Copilot

- [Feature Summary & FAQ](#)
- [Essentials of GitHub Copilot](#)
- [GitHub Copilot Trust Center](#)
- [GitHub Copilot Blog Posts](#)
- [GitHub Copilot product updates](#)
- [GitHub Copilot Playlist on YouTube](#)
- [GitHub Resources – Copilot & AI](#)
- **Independent References:**
 - [Is GitHub Copilot Worth It? Real-World Data Reveals the Answer \(faros.ai\)](#)
 - [Stack Overflow Developer Survey 2023 - AI Developer Tools](#)
 - [The promise – and the perils – of GitHub Copilot \(red-gate.com\)](#)
- [Take GitHub Copilot on a test-flight. - GitHub Resources](#)
- [Documentation](#)
- [Quickstart for Copilot](#)
- [A Beginner's Guide to Prompt Engineering with GitHub Copilot](#)

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