

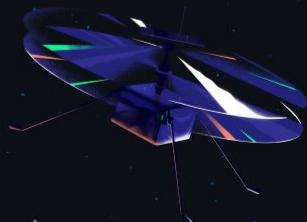


Triangle Tech Talk

GitHub Copilot

Feb 29th 2024

Let's build from here





@andyfeller

Services Engineer

Expert Services

- Transform culture**
We improve your visibility and attractiveness to developer communities by leveraging the best practices of InnerSource and open source.
- Streamline processes**
Our automations, workflow implementations, and API integrations make your day-to-day workflow seamless.
- Empower people**
We provide developers and team
- Improve technology**
We build and develop tools to

GitHub CLI

```
$ gh pr status  
Relevant pull requests in cli/cli  
  
Current branch  
There is no pull request associated with  
  
Created by you  
You have no open pull requests  
  
Requesting a code review from you  
#100 Fix footer on homepage [fix-homepage]  
✓ Checks passing - Review pending
```

Copilot in the CLI

```
$ gh copilot --help  
Your AI command line copilot.  
  
Usage:  
  copilot [command]  
  
Available Commands:  
  config      Configure options  
  explain     Explain a command  
  suggest     Suggest a command  
  
Flags:  
  -h, --help      help for copilot  
  -v, --version   version for copilot  
  
Use "copilot [command] --help" for more information
```

TAKEAWAYS

Why everyone can use a copilot

How you might develop AI for your product

How you get the most from GitHub Copilot

Opportunity to ask questions, get answers

Disclaimer

Topic too vast for a single talk
Happy to carry on after and connect
with other Hubbers.

A lot of information spread out
Stay tuned at the end for a resource to
capture this discussion.

Show of hands



Underprepared first job
Felt overwhelmed by how
much is not taught.



Diverse responsibilities
Multiple technology stacks,
frequent context switching.



Difficult getting help
Small teams, too much
information, new technology,
lack of psychological safety.

Building products is complex

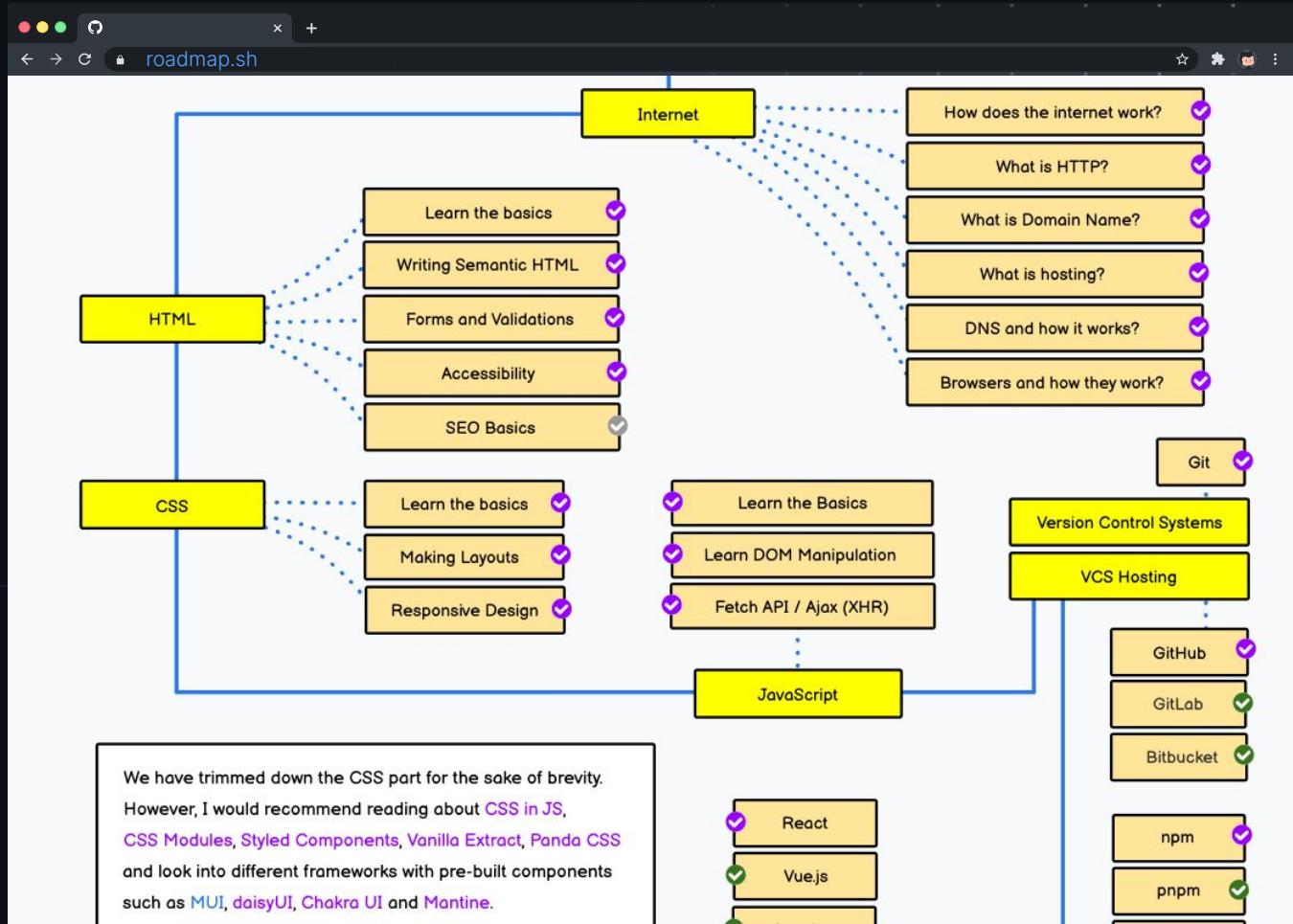
Breadth and depth
Problem domain
knowledge, languages,
frameworks, tools.

Disrupting flow
Missing information,
solving new problem,
hard to follow logic.

The screenshot shows a dark-themed web page titled "Developer Roadmap" at the URL "roadmap.sh". At the top right, there's a button labeled "Role based Roadmaps". Below it is a grid of cards representing various developer roles:

- Frontend
- Backend
- Full Stack
- Android
- AI and Data Scientist New
- Blockchain
- Software Architect
- ASP.NET Core
- Flutter
- Cyber Security
- React Native
- Game Developer New
- MLOps New

At the bottom right of the grid, there's a button labeled "+ Create your own Roadmap".





Built on OpenAI models



Powered by Microsoft services



Integrate throughout GitHub

A screenshot of the GitHub Copilot interface, showing a browser window and a code editor side-by-side.

The browser window at the top shows the URL <https://github.com/features/copilot>.

The code editor on the right has three tabs: `parse_expenses.py`, `addresses.rb`, and `sentiments.ts`. The `parse_expenses.py` tab is active, displaying the following Python code:

```
1 import datetime
2
3 def parse_expenses(expenses_string):
4     """Parse the list of expenses and return the list of triples (date,
5     Ignore lines starting with #.
6     Parse the date using datetime.
7     Example expenses_string:
8         2023-01-02 -34.01 USD
9         2023-01-03 2.59 DKK
10        2023-01-03 -2.72 EUR
11    """
12    expenses = []
13
14    for line in expenses_string.splitlines():
15        if line.startswith("#"):
16            continue
17        date, value, currency = line.split(" ")
18        expenses.append((datetime.datetime.strptime(date, "%Y-%m-%d"),
19                         float(value),
20                         currency))
21    return expenses
22
23 expenses_data = '''2023-01-02 -34.01 USD
24                     2023-01-03 2.59 DKK
25                     2023-01-03 -2.72 EUR'''
```

The code editor has line numbers from 1 to 34 on the left.

The browser window on the left contains a chat interface:

- GITHUB COPILOT: CHAT:
 - Hi @monalisa, how can I help you?
 - 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.
- monalisa: Write unit tests for this function
- GitHub Copilot:

```
import unittest
import datetime

class TestParseExpenses(unittest.TestCase):
    def test_parse_expenses_with_valid_input(self):
        expenses_string = '2023-01-02 -34.01 USD\n2023-01-03 2.59 DKK
        expected_output = [(datetime.datetime(2023, 1, 2),
                           float(-34.01),
                           "USD")]
        self.assertEqual(parse_expenses(expenses_string),
                        expected_output)

    def test_parse_expenses_with_empty_input(self):
        expenses_string = ''
```

At the bottom of the browser window is a command bar with the placeholder "Ask a question or type '/' for commands".

GitHub Copilot Goals



Ubiquitous
IDE, mobile, browser,
terminal, Codespaces.



Skillful
Code completion, chat,
integrations, knowledge
bases.



Responsible
Fair, reliable & safe, private &
secure, inclusive,
transparent, accountable.

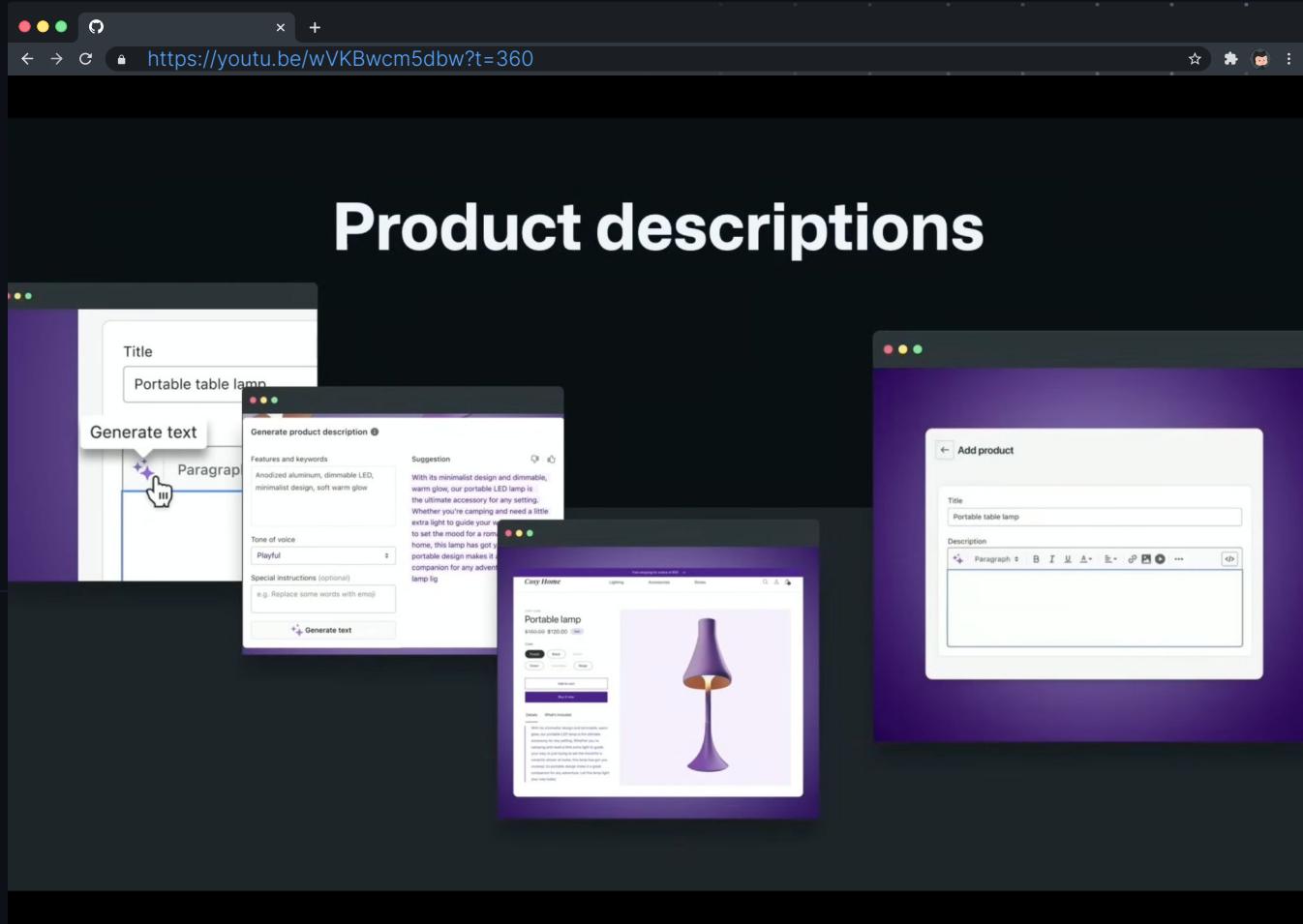
“

Don't even think about Copilot
until you thought about AI for your company.

Don't think about AI as a replacement for jobs,
think about it as a replacement for tasks.



Farhan Thawar
VP and Head of Engineering, Shopify



Building with AI cultural shift

Overcome fear, uncertainty, doubt
Not justification to reduce workforce,
ask vendors how they prioritize
responsible AI.

Communication, knowledge mgmt
Importance on context, intent, clarity,
and specificity.

Making information and knowledge
available for AI to identify and collate to
get the most out of it.

Responsible AI



Fairness



Reliability
& Safety



Privacy &
Security



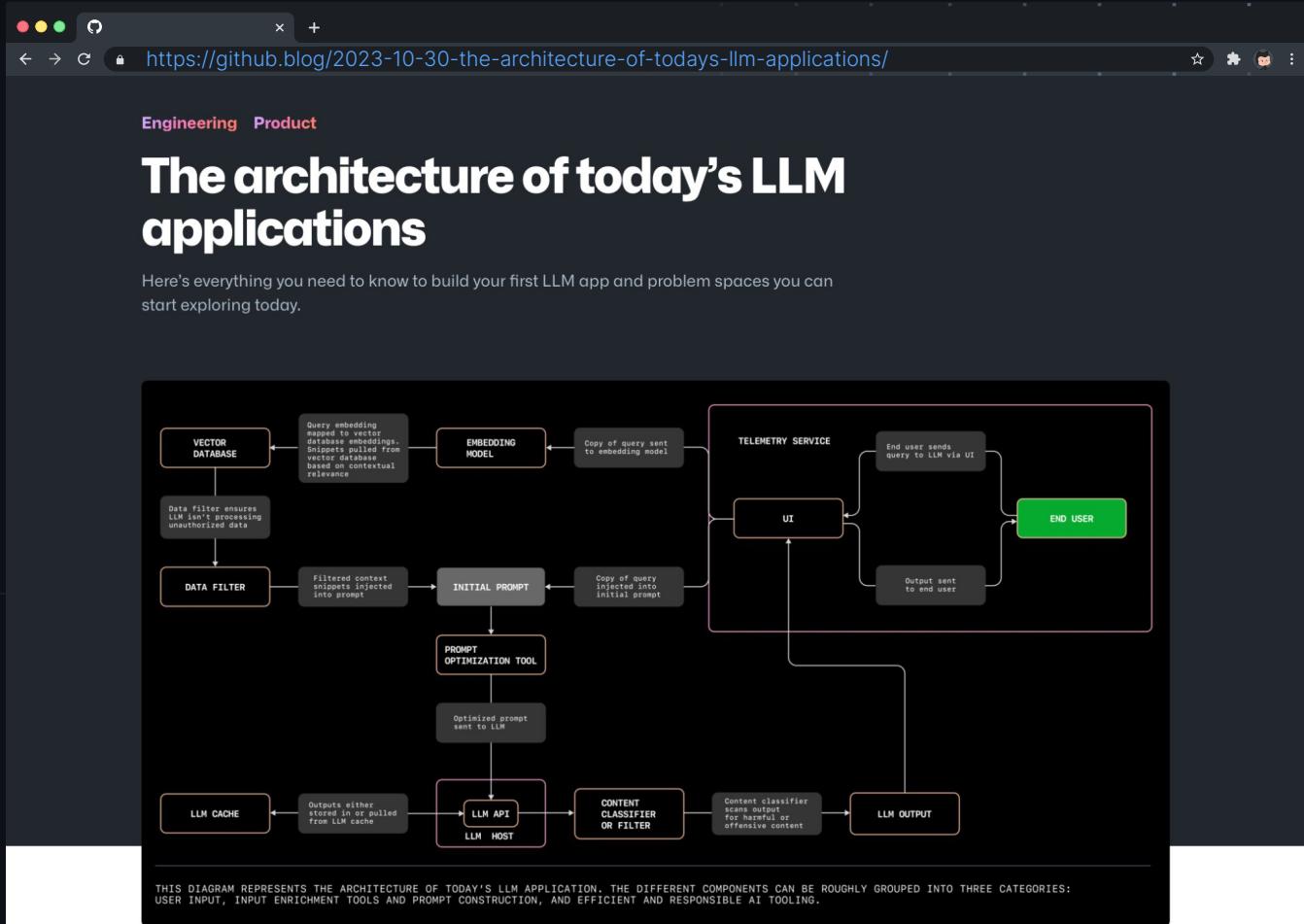
Inclusiveness



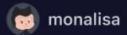
Transparency



Accountability



Prompt



monalisa

Write unit tests for this function

Context

```
parse_expenses.py x addresses.rb x sentiments.ts x

1 import datetime
2
3 def parse_expenses (expenses_string):
4     """Parse the list of expenses and return the list of triples (date, amount, currency
5     Ignore lines starting with #.
6     Parse the date using datetime.
7     Example expenses_string:
8         2023-01-02 -34.01 USD
9         2023-01-03 2.59 DKK
10        2023-01-03 -2.72 EUR
11
12    expenses = []
13
14    for line in expenses_string.splitlines():
15        if line.startswith("#"):
16            continue
17        date, value, currency = line.split (" ")
18        expenses.append((datetime.datetime.strptime (date, "%Y-%m-%d"),
19                         float (value),
20                         currency))
21
22    return expenses
```

Suggestion



Github Copilot

```
import unittest
import datetime

class TestParseExpenses(unittest.TestCase):
    def test_parse_expenses_with_valid_input(self):
        expenses_string = '2023-01-02 -34.01 USD\n2023-01-03 2.59 DKK\n2023-01-03 -2.72 EUR'
        expected_output = [(datetime.datetime(2023, 1, 2),
                           -34.01,
                           'USD'),
                           (datetime.datetime(2023, 1, 3),
                           2.59,
                           'DKK'),
                           (datetime.datetime(2023, 1, 3),
                           -2.72,
                           'EUR')]
        self.assertEqual(parse_expenses(expenses_string),
                        expected_output)

    def test_parse_expenses_with_empty_input(self):
        expenses_string = ''
```

Enrichment

Embeddings, Content exclusion, Access, Retrieval Augmented Generation, Skills



Safeguarding

Content classification & filtering

Learning more

The image displays three side-by-side screenshots of web pages related to AI learning:

- GitHub blog (github.blog):** A post titled "How we're experimenting with LLMs to evolve GitHub Copilot" by Sara Verdi. It features a large image of the GitHub logo and several smaller images illustrating AI concepts like neural networks and code generation.
- Azure OpenAI Service documentation (learn.microsoft.com):** A detailed page for "Azure OpenAI Service documentation". It includes sections for "OVERVIEW", "WHAT'S NEW", "QUICKSTART", and "RESPONSIBLE AI". A sidebar on the right lists various Azure OpenAI services.
- Prompt Engineering Guide (promptengineering.ai):** A guide titled "Retrieval Augmented Generation". It provides an overview of RAG, its components, and how it works. It also includes sections on "Techniques" like Zero-shot Prompting and Few-shot Prompting.

github.blog
GitHub contribution to
the emerging field

[learn.microsoft.com](https://github.blog)
[/azureservice](https://github.blog/azureservice)
Learn about services
powering GitHub Copilot

promptengineering.ai
Comprehensive prompt
engineering guide

Getting the most out of GitHub Copilot

Copilot Individual

IDE extension + chat support
GitHub Copilot in the CLI
GitHub Copilot in Mobile (Q2)

Copilot Business

Additional IDE features
Mgmt and security controls

Copilot Enterprise

Repository indexing
Knowledge bases
PR and commit summarization
Chat on GitHub.com
and much more

The screenshot shows the Visual Studio Code interface with the GitHub Copilot extension open. The left sidebar displays a file tree with various Go files and directories like `.devcontainer`, `.github`, `.vscode`, `api`, `bin`, `build`, `cmd`, `context`, `dist`, `docs`, `git`, `internal`, `pkg`, `script`, `share`, `site`, `test`, and `utils`. Below the tree are `.gitattributes`, `.gitignore`, `.golangci.yml`, `.goreleaser.yml`, `go.mod`, `go.sum`, `LICENSE`, `Makefile`, and `README.md`.

The main editor area has a large 'X' watermark. The bottom status bar shows tabs for `trunk`, `Live Share`, and `Watch`, along with a search bar and other UI elements.

The GitHub Copilot panel on the right contains the following content:

- GitHub Copilot**
- You can ask me general programming questions, or chat with the following agents which have specialized expertise and can perform actions:

 - `@workspace` - Ask about your workspace
 - `/explain` - Explain how the selected code works
 - `/tests` - Generate unit tests for the selected code
 - `/fix` - Propose a fix for the problems in the selected code
 - `/new` - Scaffold code for a new workspace
 - `/newNotebook` - Create a new Jupyter Notebook
 - `@vscode` - Ask about VS Code
 - `/api` - Ask about VS Code extension development
 - `@terminal` - Ask how to do something in the terminal

You can also help me understand your question by using the following variables to give me extra context:

 - `#editor` - The visible source code in the active editor
 - `#selection` - The current selection in the active editor
 - `#terminalLastCommand` - The active terminal's last run command
 - `#terminalSelection` - The active terminal's selection

To have a great conversation, ask me questions as if I was a real programmer:

 - Show me the code you want to talk about by having the files open and selecting the most important lines.
 - Make refinements by asking me follow-up questions, adding clarifications, providing errors, etc.
 - Review my suggested code and tell me about issues or improvements, so I can iterate on it.

You can also ask me questions about your editor selection by starting an inline chat session (`⌘I`).

Learn more about [GitHub Copilot in Visual Studio Code](#).

Ask Copilot or type / for commands



Visual Studio Code



Visual Studio



JetBrains IDEs



Neovim

Code completion

IDE chat

Slash commands

Code references

Commit & PR summarize

Voice support ²

Custom client skills

Code completion

IDE Chat

Slash commands

Code references

Code completion

IDE Chat ¹

Code completion

IDE Chat ³

¹ Private beta as of [Jan 11th 2024 GitHub Blog post](#), late Q1 plans to open up

² [VS Code Speech extension](#)

³ Unofficially 3rd party supported

GitHub Copilot in the CLI

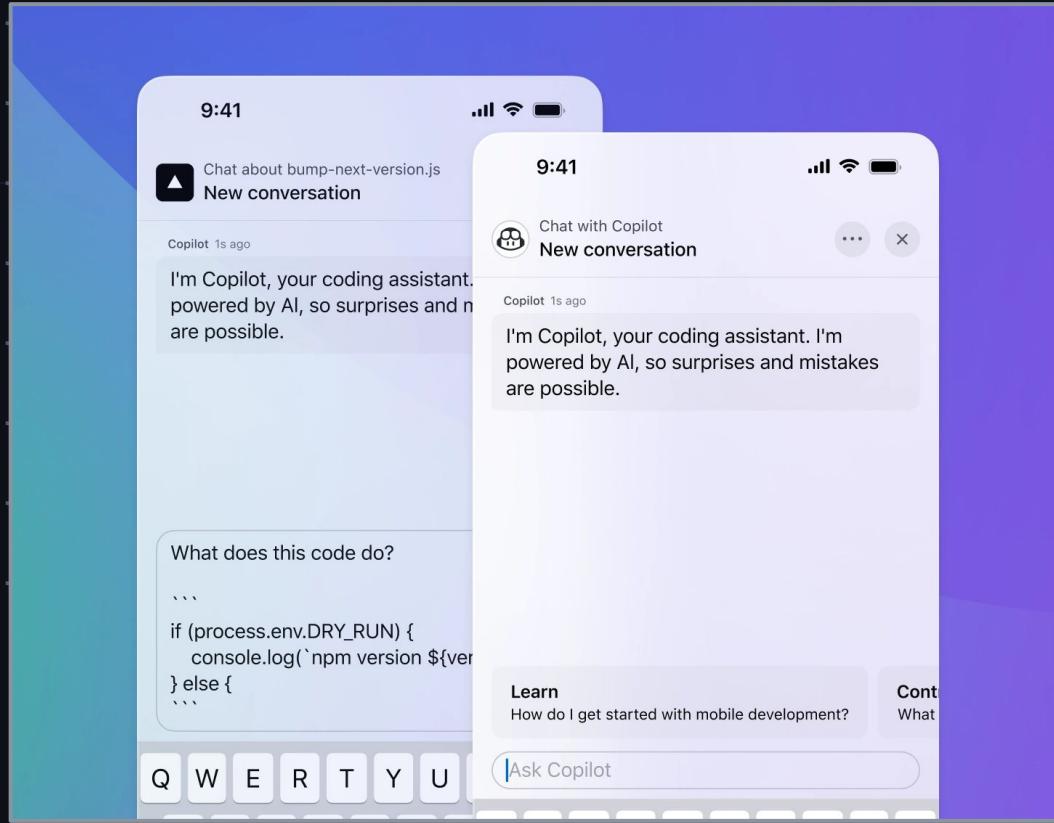
```
$ gh copilot suggest -t shell "How do I find all the files bigger than 128k?"
```

Welcome to Copilot in the CLI!
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.

Suggestion:

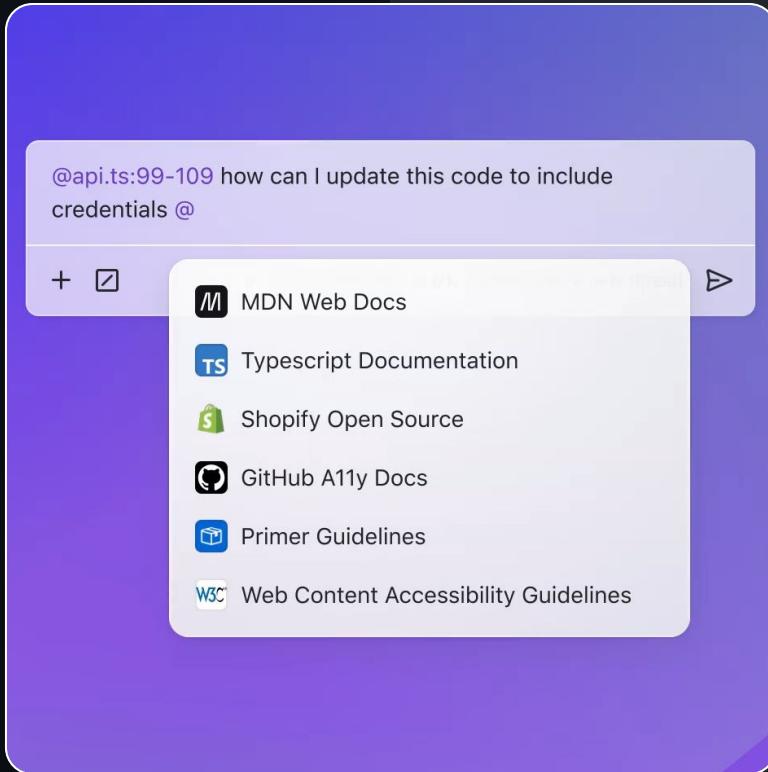
```
find . -size +128k
```

? Select an option [Use arrows to move, type to filter]
> **Copy command to clipboard**
Explain command
Execute command
Revise command
Rate response
Exit



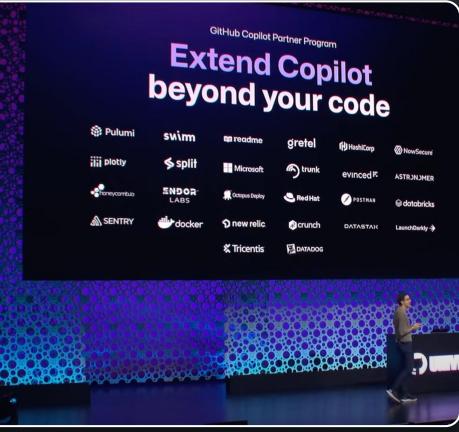
Knowledge Bases

Augmenting Chat on GitHub.com
using your repositories and
Markdown to find relevant
content.



GitHub Copilot Partner

Helping customers and users do more with the tools and services you rely upon.



Industry-wide

A screenshot of the GitHub Copilot interface. At the top, it says "Chatting about music_app Private repository". Below that, there is a text input field with placeholder text "Chat with your code using simple natural language questions like 'What does this file do' or 'Where is this functionality defined?'". The main area shows a snippet of Python code for a "music_app":

```
st, year, genre, cover_image_url);  
  
image_url  
  
album_id);  
  
se, given its ID. Return an Album object.  
  
ry("SELECT * FROM albums WHERE id = ? ", [album_id])  
  
album_row["title"], album_row["artist"], album_row["year"]  
  
ed, update the album cover image URL before returning it.  
album_cover_update", self.get_user_context(current_user),  
self.get_latest_album(album)
```

At the bottom of the interface, there is a sidebar with icons for Azure Monitor, DataStax, Microsoft Teams, LaunchDarkly, and Postman, along with a link to "album.py:22".

End-to-end AI

[42Crunch](#)

[Astronomer](#)

[Databricks](#)

[DataDog](#)

[DataStax](#)

[Docker](#)

[Endor Labs](#)

[Evinced](#)

[Honeycomb](#)

[Gretel](#)

[HashiCorp](#)

[LaunchDarkly](#)

[Microsoft](#)

[New Relic](#)

[NowSecure](#)

[Octopus Deploy](#)

[Plotly](#)

[Postman](#)

[Pulumi](#)

[Readme](#)

[Red Hat](#)

[Sentry](#)

[Split](#)

[Swimm](#)

[Tricentis](#)

[Trunk](#)

Copilot Individual

For individual developers, freelancers, students, and educators that want to code faster and happier.

\$ 10 USD

per month / \$100 USD per year

[Start a free trial >](#)

Free for verified students, teachers, and maintainers of popular open source projects.

What's included

Chat

- ✓ Unlimited messages, interactions, and history
- ✓ Context-aware coding support and explanations
- ✓ Debugging and security remediation assistance
- ✗ Conversations tailored to your organization's repositories
- ✗ Answers based on your organization's knowledge base
- ✗ Access to knowledge from top open source repositories
- ✗ Pull request diff analysis
- ✗ Web search powered by Bing (beta)

Code completion

- ✓ Real time code suggestions
- ✓ Comments to code
- ✗ Fine-tuned models (coming soon)

Most popular

Copilot Business

For organizations ready to improve engineering velocity, code quality, and developer experience.

\$ 19 USD

per user / month

[Buy now >](#)

[Contact sales >](#)

What's included

Chat

- ✓ Unlimited messages, interactions, and history
- ✓ Context-aware coding support and explanations
- ✓ Debugging and security remediation assistance
- ✗ Conversations tailored to your organization's repositories
- ✗ Answers based on your organization's knowledge base
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- ✗ Web search powered by Bing (beta)

Code completion

- ✓ Real time code suggestions
- ✓ Comments to code
- ✗ Fine-tuned models (coming soon)

New

Copilot Enterprise

For companies looking to customize GitHub Copilot to their organization and infuse AI across the developer workflow.

\$ 39 USD

per user / month

[Contact sales >](#)

What's included

Chat

- ✓ Unlimited messages, interactions, and history
- ✓ Context-aware coding support and explanations
- ✓ Debugging and security remediation assistance
- ✓ Conversations tailored to your organization's repositories
- ✓ Answers based on your organization's knowledge base
- ✓ Access to knowledge from top open source repositories
- ✓ Pull request diff analysis
- ✓ Web search powered by Bing (beta)

Code completion

- ✓ Real time code suggestions
- ✓ Comments to code
- ✓ Fine-tuned models (coming soon)



Presentation and notes



Q&A



@robfreud

Enterprise Account Executive



@lawdevnull

Senior Commercial Counsel



Thank you

