

Highlights ▾

# The State of Developer Ecosystem 2023

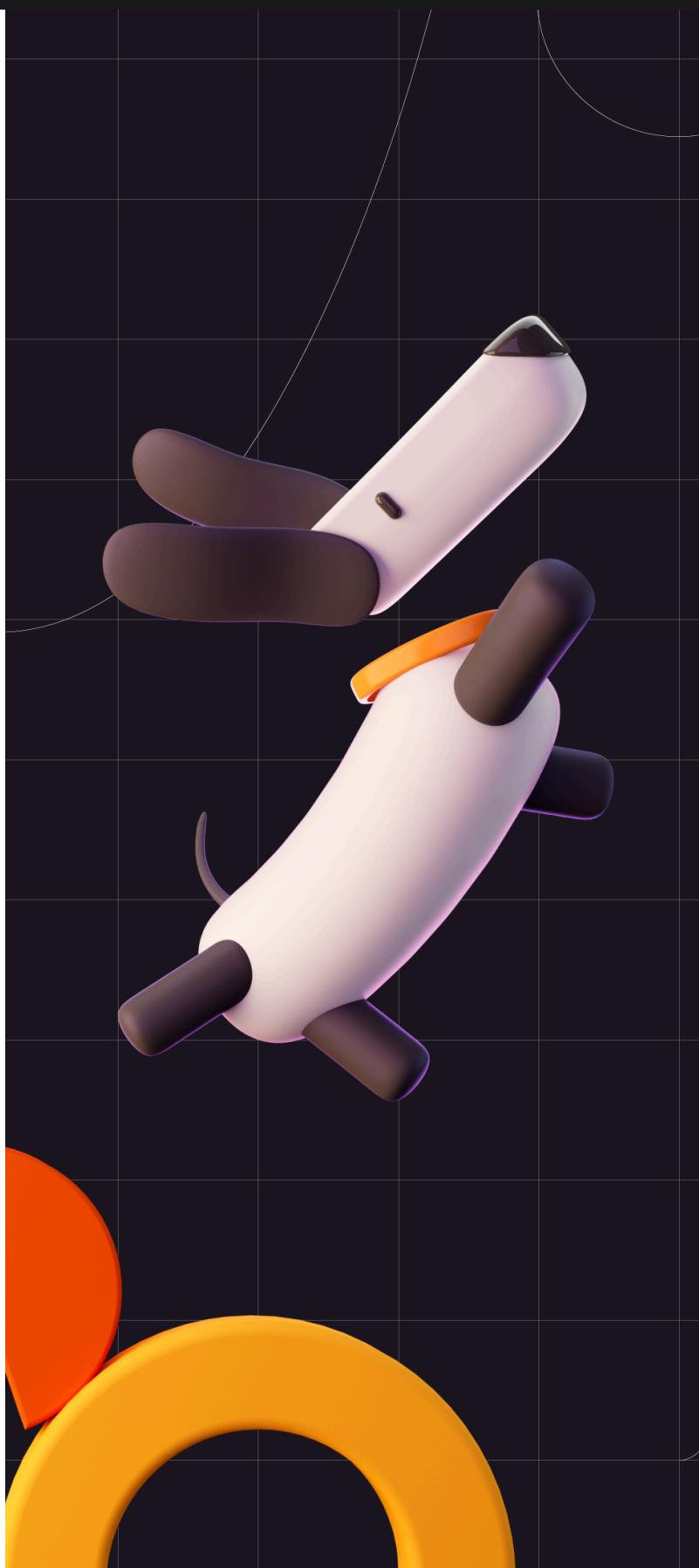
This report is the culmination of insights gathered from 26,348 developers from all around the globe. The world of developers is vast and diverse, making it an endlessly fascinating realm for exploration and learning. Through yearly research initiatives like this one, our goal is to explore this captivating world, uncover valuable insights about developers and their craft, and then share these facts with the community.

Within the State of Developer Ecosystem Report, you'll find information covering a wide range of topics, from programming languages, tools, and technologies to demographics and fun facts. We'll also take a look at the unique lifestyle of developers, shedding light on their passions and interests.

This year, we've also extended our inquiry to AI. We've examined developers' views on AI, their concerns, the commonly used features of AI assistants, and the current adoption of AI-enhanced tools.

 This is a public report, and its contents may be used as long as the source is appropriately credited.

Share: [X](#) [f](#) [g](#) [in](#) [e](#)



The raw data from our DevEco 2023 survey is now available. Download, explore, and glean your own insights →

AI <span>New</span>	Data Science	DevOps and Cloud	Team Tools
Big Data	Demographics	Embedded	Tech Writing
Databases	Development <span>New</span>	Remote Dev	Testing
C	Java	Python	Scala
C#	JavaScript	R	Swift and Objective-C
C++	Kotlin	Ruby	
Go	PHP	Rust	

## Highlights

Most used programming languages over the last 7 years and adoption potential for 2024

Which programming, scripting, and markup languages have you used in the last 12 months?





## JavaScript's subtle dip in popularity

Over the last three years, the three top languages have stayed the same, but the JavaScript share has been decreasing consistently. It's plausible to assume that it will continue to decline slightly, as JavaScript programmers report a higher likelihood of learning another language than other programmers.



## Trust in Rust: A story of growth

Rust is the only commonly used language to set a new popularity record this year. Aspiring to replace C++ with its strict safety and memory ownership mechanisms, Rust might initially edge out Go, as every sixth Go user is thinking about adopting Rust. Along with Scala, Rust stands out as the language that the fewest programmers want to migrate from.



## Objective-C is objectively retired

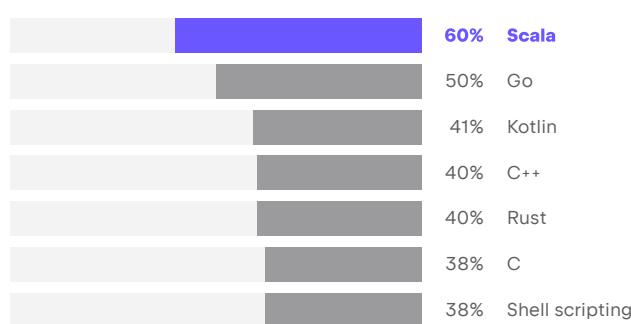
Having lost two-thirds of its users in recent years, Objective-C appears to be reaching its end of life. The language had a good run from its introduction in 1984 until Apple released its successor, Swift, in 2014. With other cross-platform languages, such as Kotlin, Dart, and more, iOS developers are spoiled for choice and have few reasons to hang on to Objective-C.

For more detailed insights, please see the Languages section.

## Software developer salary trends

### Share of top-paid employees by primary language

Top-paid employees are those whose salaries are in the top quartile in their country or region.



In 2023, Scala, Go, and Kotlin developers rank as the top three highest-paid categories. Employers are recognizing the value of specialists who can navigate the complexities of these languages, resulting in a competitive landscape where developers in Scala, Go, and Kotlin stand out as the top earners.

Show more

### Gender distribution in tech over the last 3 years

2021      2022      2023

Male	Female	Non-binary, genderqueer, or gender non-conforming	Prefer not to say
93%	91%	1%	1%
5%	5%	1%	2%
1%	1%	1%	2%
93%	1%		

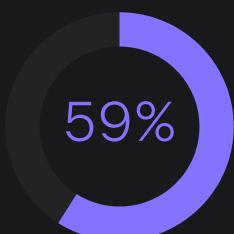
Since 2021, our survey data has consistently shown no improvement in the share of female developers. That only 5% of developers are women indicates an enormous gender gap in the industry. To ensure equal opportunities and representation for all, we as a community should come up with new approaches to address gender diversity issues.

Notably, in 2023, South Korea is showing a promising trend with 14% of female programmers under the age of 30. It is likely a result of strategic, long-term government policies in place since the mid-1990s aimed at promoting gender equality and encouraging women to pursue careers in IT.

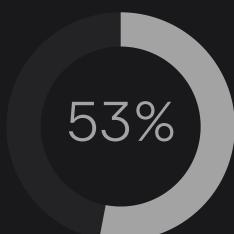
Read more about gender balance, salaries, geography, and other developer trends in the [Demographics section](#).

## The complex landscape of generative AI services

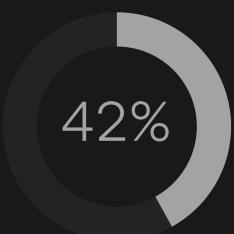
Do you agree with the following statements?



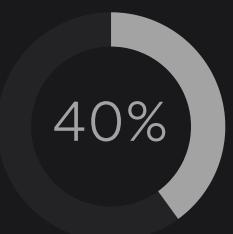
I have security concerns about using AI generation services



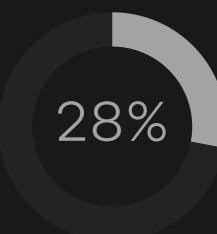
I am ready to use cloud-based AI generation services for work tasks



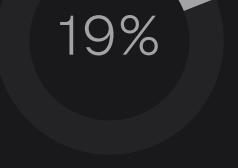
I have ethical concerns about using AI generation services



Local or offline AI tools are unlikely to reach the quality and performance of cloud-based solutions



My company's policy limits the use of cloud-based AI tools



19%

I am worried that AGI  
(artificial general  
intelligence) will be  
hostile to humans

**77%**

of developers use  
ChatGPT.

**46%**

of developers use  
GitHub Copilot.

### How frequently do you use the following features of the existing AI assistants for coding?

Quite often	From time to time	Rarely	Never	
26%	33%	17%	24%	Asking general questions about software development in natural languages
24%	37%	24%	15%	Generating code
19%	26%	22%	33%	Generating code comments or code documentation
18%	26%	21%	36%	Explaining bugs and offering fixes for them
14%	27%	22%	37%	Explaining the code
12%	21%	24%	42%	Generating tests
11%	21%	19%	48%	Search in natural language queries for code fragments
9%	17%	21%	53%	Performing code review
9%	16%	19%	55%	Summarizing recent code changes to understand what happened more quickly
9%	20%	23%	47%	Refactoring code
9%	17%	20%	54%	Generating CLI commands by natural language description
6%	12%	20%	62%	Generating commit messages

6%      62%

The most common way developers use an AI  
assistant is to ask general questions about  
software development using natural language.

### How likely is it that you would delegate the following activities to an AI assistant (in an ideal world where the performance of an AI assistant is humanlike)?

I would delegate it    I am not sure yet    I would still do it myself

NEW

56%	23%	21%	Writing code comments or code documentation
56%	26%	18%	Writing tests
55%	26%	19%	Searching for code fragments inside the codebase
50%	23%	27%	Writing commit messages
46%	23%	31%	Internet searches
35%	34%	31%	Performing actions in CLI
34%	31%	35%	Performing code reviews
34%	31%	35%	Refactoring
31%	28%	41%	Understanding recent code changes
30%	30%	40%	Debugging
23%	26%	51%	Understanding the code
17%	28%	54%	Writing code

17% 56%



## JetBrains AI Assistant

AI Assistant provides AI-powered features for software development. The JetBrains AI service transparently connects IDE users to different large language models (LLMs). AI Assistant is context-aware and helps developers complete their tasks faster, boosting productivity.

[Try for free](#)

For more about artificial intelligence usage in software development in 2023, see our brand new [AI section](#).

## Mental health in the developer community

In 2023, developers who are no strangers to burnout show a stronger interest in their mental health, with a 7 percentage points higher engagement compared to those who haven't experienced burnout. They are also 6 percentage points more likely to use self-monitoring apps or devices to track their physical activity and sleep quality.

Interestingly, burnout-affected developers find that factors related to mental health, such as self-organization and time management, significantly impact their coding productivity. Conversely, developers who haven't faced burnout link their productivity boosts to factors less connected to mental health, such as learning new IDEs and upgrading IDE functionality.

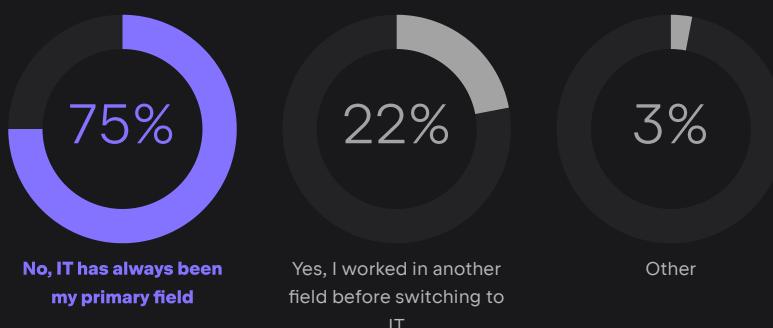
73%

of developers have experienced burnout in their career.

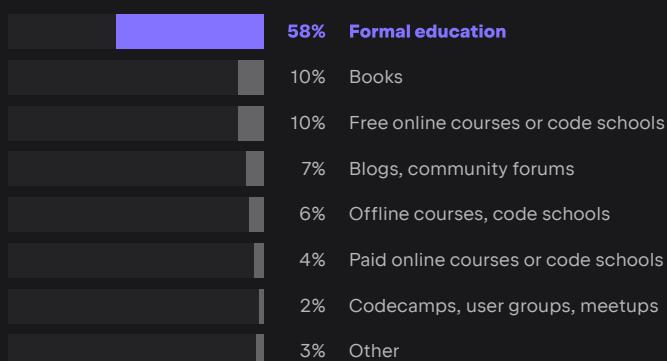
For more in-depth information on mental health in the developer community, go to the Developers' Lifestyles section.

## Learning and development

Have you ever switched your career field to IT?



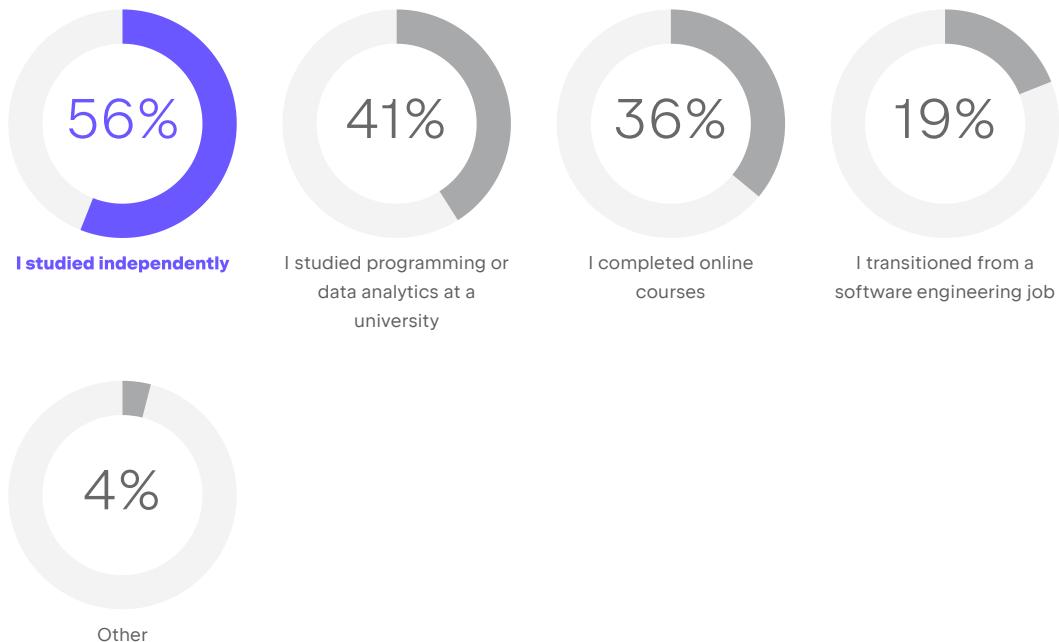
Which of the following educational institutions or resources allowed you to take your first step toward becoming a developer?



Our Developers' Lifestyles section has more on the latest trends in developer education and training.

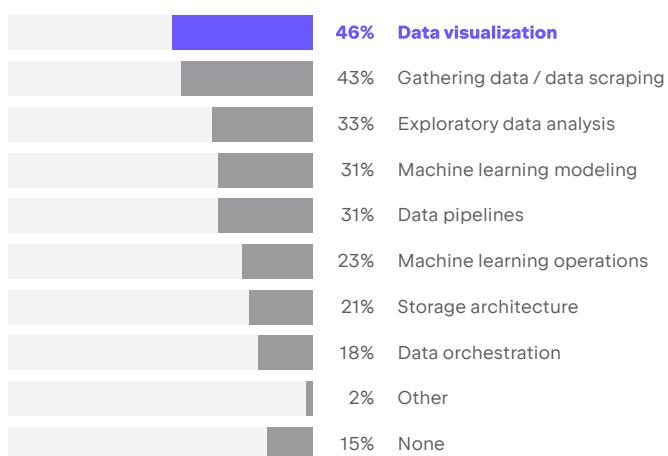
# Data science and machine learning

How did you learn data science, machine learning, or data engineering?



As you can see from the two charts above, in 2023, most developers reported that they primarily learned programming in universities and other formal educational institutions. On the other hand, in the fields of data science, machine learning, or data engineering, more than half of respondents reported being self-taught.

In which of the following data-related activities are you involved?



Check out the [Data Science](#) section for more insights into data science, data analytics, and machine learning.

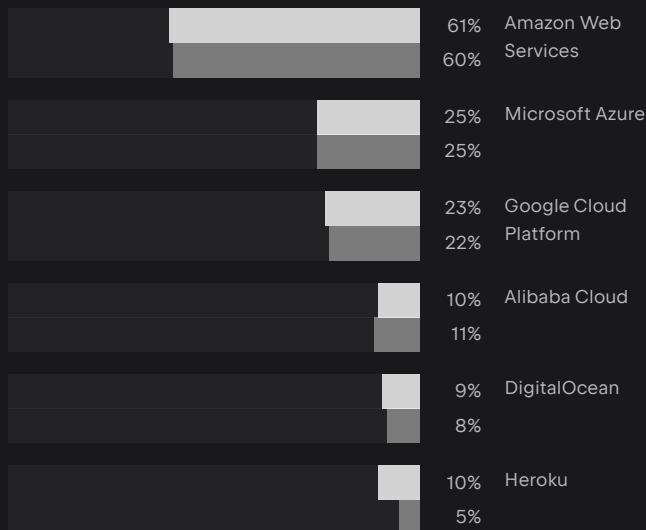
# DevOps and cloud development trends

## What cloud services do you use?

This question was shown only to those respondents who reported hosting in cloud services.

■ 2022

■ 2023



**63%**

of developers use Docker.

Show more

Explore infrastructure development, hosting, containers, configuration management tools, and infrastructure provisioning insights in our [DevOps section](#).

## Software testing

**58%**

of respondents

**46%**

of respondents use test automation tools

involved in testing activities report that they develop automated tests.

case design as part of their testing process.

What types of tests do you have in your projects?



You can learn more about the testing practices used by developers and QA engineers in the [Testing](#) section.

## Open-source projects

41%

of respondents have contributed to open-source projects; 20% do it more or less regularly.

See the [Development](#) section for additional facts on open-source, cross-platform, static analysis, and other topics.

## Remote and collaborative development

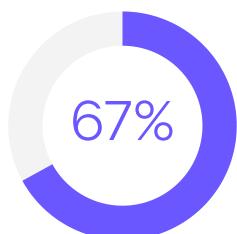
**49%**

of respondents engage in remote development.

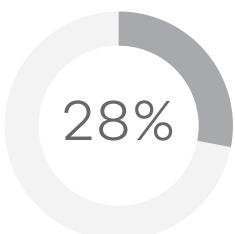
**61%**

report to have practiced collaborative development, with 45% having done so online and 30% face to face.

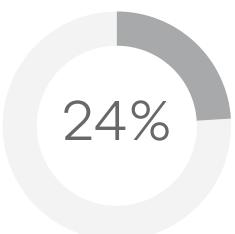
**What tools do you use for remote simultaneous collaborative development?**



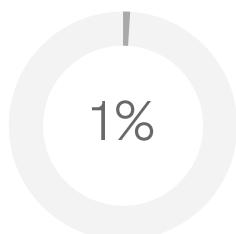
Video call with screen sharing



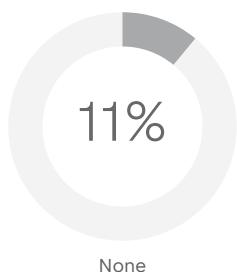
Editor / IDE with collaboration feature



Remote desktop



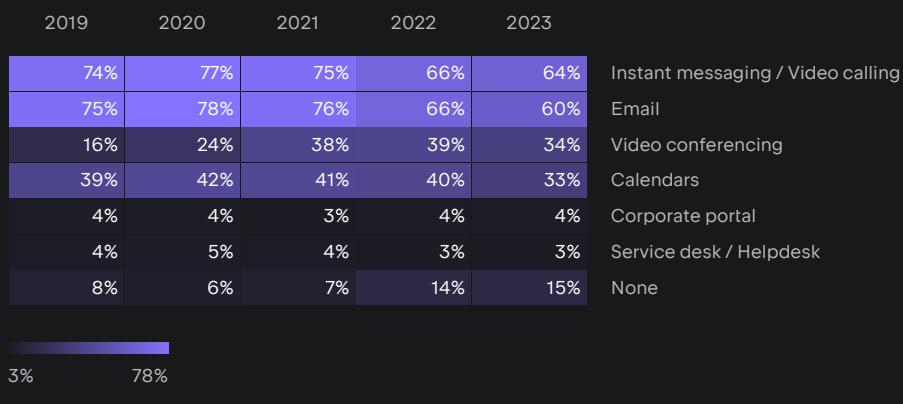
Other



None

Learn more in the [Remote Development](#) section.

## For which of the following types of tools do you use the mobile app version?



Mobile app usage for communication tools has clearly been taking a dive after peaking in 2020 and 2021. The probable reason is that more employees are returning to the office, which many companies seem to be encouraging.

Visit the [Team Tools](#) section for more on issue-tracking tools, version control systems, CI/CD tools, and communication tools.

Next

[Languages](#)

Highlights: 2024 2023 2022 2021 2020 2019 2018 2017

Highlights

Languages [New](#)

Developers' Lifestyles

Methodology

AI [New](#)

Data Science

DevOps and Cloud

Team Tools

Big Data

Demographics

Embedded

Tech Writing

Databases

Development [New](#)

Remote Dev

Testing

C

Java

Python

Scala

C#

JavaScript

R

Swift and Objective-C

[C++](#)[Kotlin](#)[Ruby](#)[Go](#)[PHP](#)[Rust](#)

## Find the right tool

[See all tools](#)[JavaScript](#)[.NET](#)[Java](#)[Kotlin](#)[C/C++](#)[Python](#)[PHP](#)[Ruby](#)[Go](#)[SQL](#)[Team Tools](#)**WebStorm**

The smartest JavaScript IDE

[Try it for free](#)**IntelliJ IDEA**

The Leading Java and Kotlin IDE

[Try it for free](#)**PyCharm Professional**

The Python IDE for data science and web development

[Try it for free](#)**PhpStorm**

The Lightning-Smart PHP IDE

[Try it for free](#)[Show more](#)

## Thank you for your time!

We hope you found our report useful.

Share this report with your friends and colleagues.

**Join JetBrains Tech Insights Lab**

Take part in surveys and UX studies to make JetBrains products easier to use yet even more powerful. For participating in our research, you'll also get the chance to earn rewards.

**Raw data**

The raw data from our DevEco 2023 survey is now available. Download, explore, and glean your own insights!

[Sign Up](#)[Learn more](#)[Download](#)

If you have any questions or suggestions, please contact us at  
[surveys@jetbrains.com](mailto:surveys@jetbrains.com).



English

[Privacy & Security](#) [Terms of Use](#) [Trademarks](#) [Legal](#) [Genuine Tools](#)

Copyright © 2000-2025 JetBrains s.r.o.

Developed with and