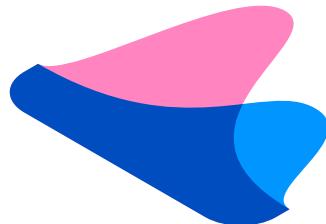
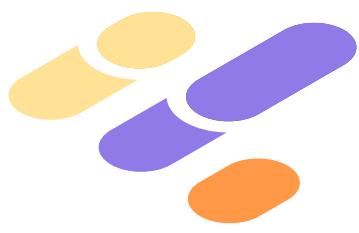




Dark mode



2023 Developer Survey

In May 2023 over 90,000 developers responded to our annual survey about how they learn and level up, which tools they're using, and which ones they want.

[Read the overview →](#)[Methodology →](#)

Overview

Welcome to the 2023 Developer Survey! For 13 years, we've delivered industry-leading insights regarding the developer community.

This is the voice of the developer. Analysts, IT leaders, reporters, and other developers turn to this report to stay up to date with the evolving developer experience, technologies that are rising or falling in favor, and to understand where tech might be going next.

This year, we went deep into AI/ML to capture how developers are thinking about it and using it in their workflows. Stack Overflow is investing heavily in enhancing the developer experience across our products, using AI and other technology, to get people to solutions faster. **Stack Overflow Labs** is where we're sharing all we're doing - check it out for a deep dive on AI/ML insights as well as see what we're experimenting with so far.

Happy reading!





Developer Profile

Learning to code



Learning to code from online resources increased from 70% to 80% since the 2022 survey.

Respondents 18 and under are those most frequently selecting online resources (e.g., videos, blogs, forums) to learn from. Respondents 25 - 34 were the top age cohort to have learned from online courses or certifications (52%) but still learn more from traditional school (55%).

Learning how to code →



Technology

Most popular technologies

This year, Docker is the top-used other tool amongst all respondents (53%) rising from its second place spot last year.

People learning to code are more likely to be using npm or Pip than Docker (50% and 37% respectively vs. 26%). Both are used alongside languages that are popular with students (JavaScript and Python respectively).

Other tools →



Technology

Most popular technologies

Why complicate it? Jira and Confluence are the top two async tools amongst all developers similar to last year, but this year a new addition to the list broke top three: 27% of respondents use markdown files as an async tool.

People who are learning to code are using GitHub Discussions more than markdown files (31% vs. 29%) and turn to Notion (26%) and Trello (23%) more

than professional developers.



Asynchronous tools →



Technology

Admired and Desired

Rust is the most admired language, more than 80% of developers that use it want to use it again next year. Compare this to the least admired language: MATLAB. Less than 20% of developers who used this language want to use it again next year.

Programming, scripting, and markup languages →



Technology

Admired and Desired

Phoenix is the most admired web framework and technology; more developers would choose to work with Phoenix again than those who have used the three most common: React, Node.js, and Next.js.

Web frameworks and technologies →



Technology Admired and Desired



More respondents want to continue using Cargo next year than the top competitors (top 6 tools that respondents want to use next year), however, Docker has almost double the proportion of respondents that want to use it next year compared to all other options.

Other tools →



Technology Worked with vs. want to work with

42% of ChatGPT users want to use Google Bard or Bing AI next year. These users are enjoying their experience: 79% want to use ChatGPT again next year.

AI Search Tools →



Technology Top paying technologies

Zig is the highest-paid language to know this year (a new addition), while Clojure gets knocked from the top spot with a 10% decrease from 2022.

Dart and SAS saw the highest increase in median pay during 2023, growing more than 20% year-over-year.

Top paying technologies →



AI

Sentiment and usage



70% of all respondents are using or are planning to use AI tools in their development process this year. Those learning to code are more likely than professional developers to be using or use AI tools (82% vs. 70%).

AI tools in the development process →



Work

Employment

For all respondents this year we see a slight increase in “Independent contractor, freelancer, or self-employed” and equal-sized decrease in full-time students (1 percentage point) compared to last year and other employment status' changing less than that.

The costs of investing in oneself has risen with inflation in 2023 but not enough to sway many from the opportunity to level up their developer skills.

Employment status →



Work Employment



Hybrid is here to stay for larger organizations; over half of employees in 5,000+ organizations are hybrid. The smaller organizations are most likely to be in-person, with one out of five organizations with fewer than 20 people report being in-person.

More developers this year are working in-person this year than last year (+2%). Return to office initiatives aside, coding easily lends itself to fully remote work and one third or more of all organization sizes are still fully remote.

Work environment →



Professional Developers Productivity impacts

63% of all respondents spend more than 30 minutes a day searching for answers or solutions to problems. People managers are more likely to spend less time searching than individual contributors (42% vs. 36% spend 30 minutes or less).

Daily time spent searching for answers/solutions →

Developer Profile

What we know about the global community of developers

Education →

Learning to code →

Experience →

Developer roles →

Key territories →

Demographics →



Education

Share



Most developers (84%) have a post-secondary education, having some college or more.

Educational attainment



Most professional developers have attained a Bachelor's degree (47%) with a quarter attaining a Master's degree (26%).

For the developers who are learning to code, more than half are between 18-24 years old, so it makes sense that they are more likely to not have a Bachelor's degree. They are likely still in school.

All Respondents

Professional Developers

89,184 responses

Learning to Code

Other Coders

Primary/elementary school

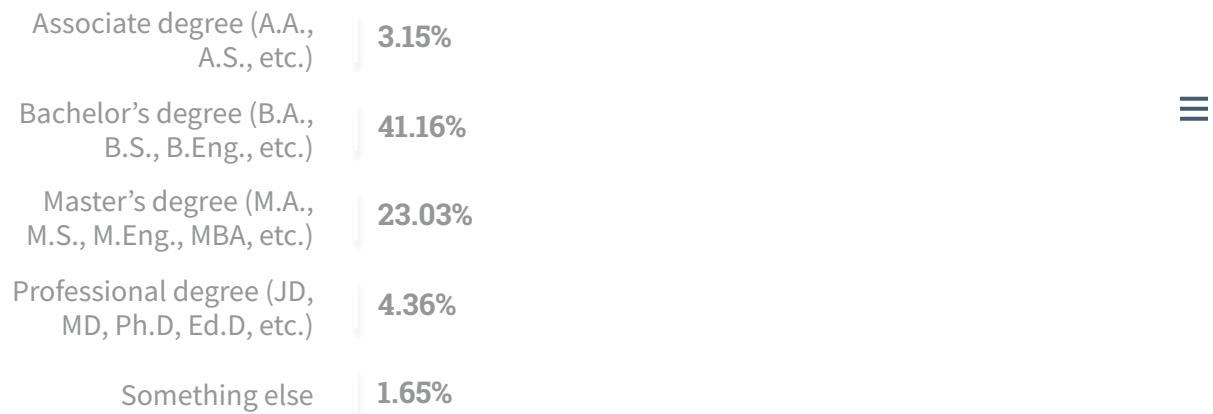
2.14%

Secondary school (e.g. American high school, German Realschule or Gymnasium, etc.)

9.98%

Some college/university study without earning a degree

13.18%



❓ Which of the following best describes the highest level of formal education that you've completed? *

Developer Profile

Share

Learning to code

There are as many ways to learn to code as there are coders. Developers use a variety of tools and resources to build their skills.

Learning how to code



Learning to code from online resources increased from 70% to 80% since the 2022 survey.



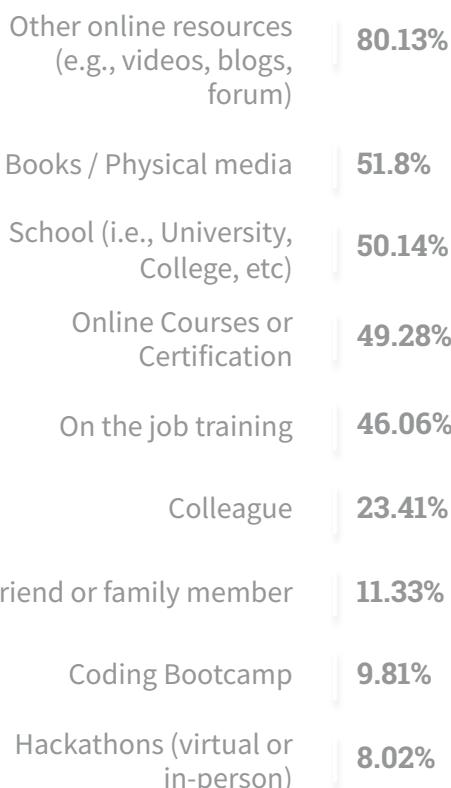
Respondents 18 and under are those most frequently selecting online resources (e.g., videos, blogs, forums) to learn from. Respondents 25 - 34 were the top age cohort to have learned from online courses or certifications (52%) but still learn more from traditional school (55%).

All Respondents

Learning to Code

By Age

87,663 responses



?

How do you learn to code? Select all that apply.

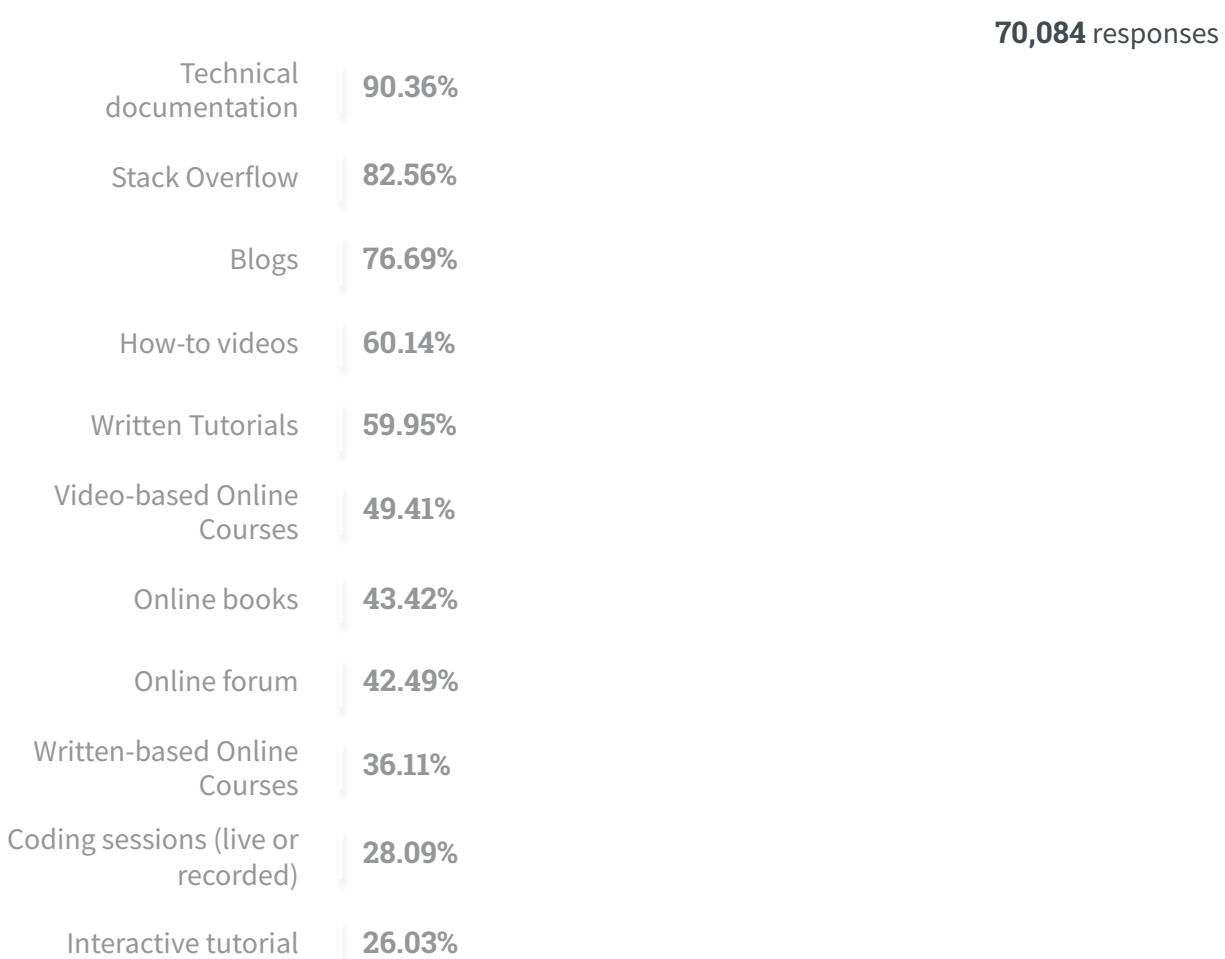
% Percentages # Responses

Online resources to learn how to code



Like previous years, technical documentation and Stack Overflow are the top online resources people use when learning to code, with blogs rounding out the top three. Well-written documentation, an active community providing solutions, and regular posts are the trifecta of enabling people to teach themselves about a technology.

Developers see value in a variety of other resources like how-to videos, written tutorials, books, forums—they piece together the resources and formats that work best for their learning style.





Online challenges (e.g., daily or weekly coding challenges)	22.18%
Certification videos	13.31%
Auditory material (e.g., podcasts)	7.95%
Games that teach programming	5.89%

?

What online resources do you use to learn to code? Select all that apply.

% Percentages

Responses

Online course platforms to learn how to code



Udemy maintains its place as the most popular online course or certification program for learning how to code.

37,076 responses

Udemy	65.53%
Coursera	34.62%
Codecademy	24.31%
Pluralsight	22.83%
edX	14.93%
Udacity	10.77%
Skillsoft	2.03%

% Percentages

Responses

?

What online courses or certifications do you use to learn to code? Select all that apply.

Experience

The majority of developers are in their early to mid-career stage.

Years coding



48% of respondents have been coding for less than ten years.

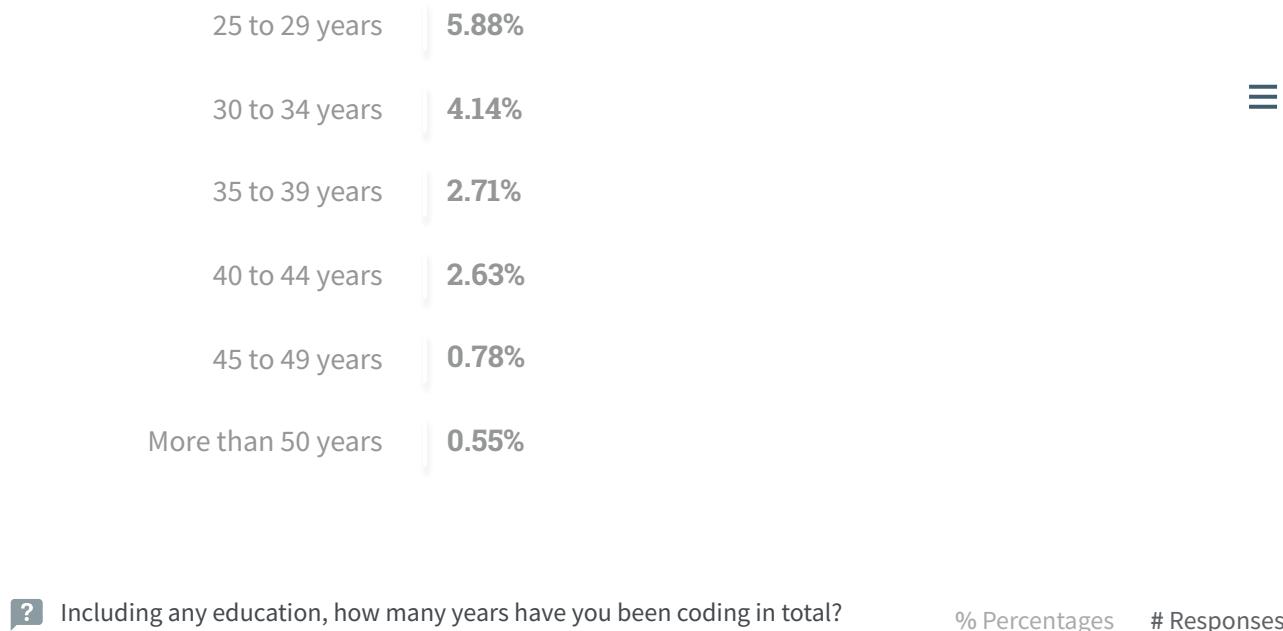
Australia and the United Kingdom respondents are the most experienced, with an average of 17.5 and 17 years of experience coding respectively.

All Respondents

Average by Top 10 Countries

87,435 responses





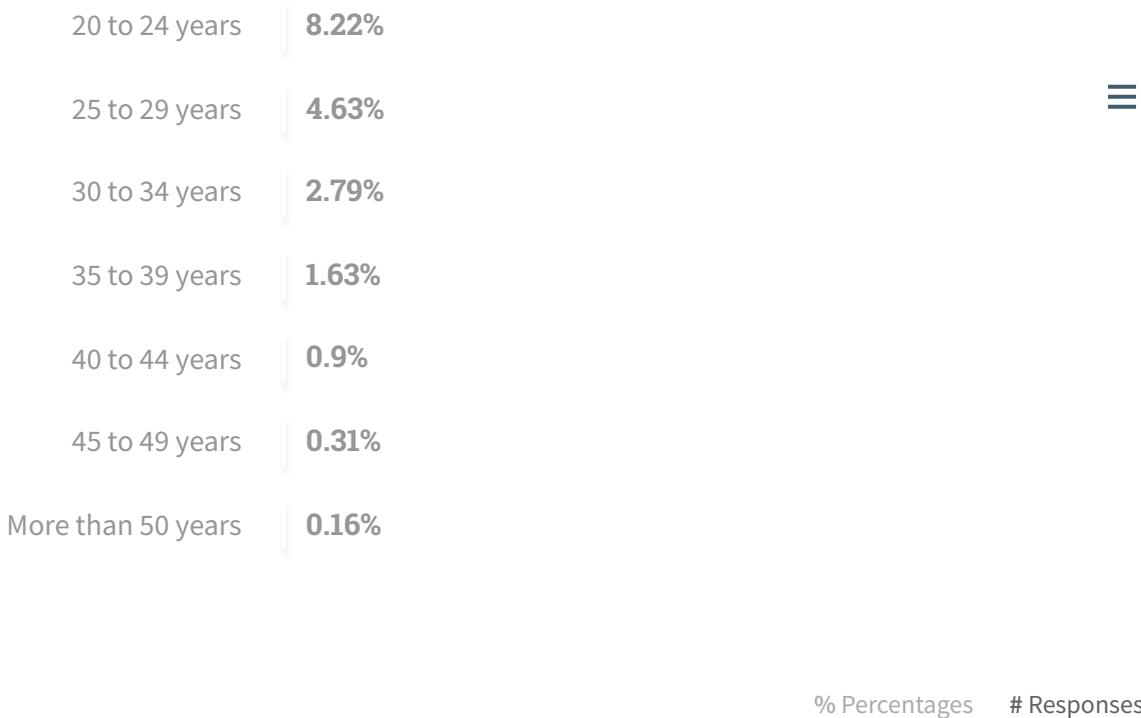
Years coding professionally



A majority of respondents (71%) have been working for 14 or fewer years as professional developers, and 24% have worked 15 to 29 years. This shows developers in the survey have started to skew more experienced compared to last year where 75% worked 14 or less years and 20% 15-29 years.

66,136 responses





?

NOT including education, how many years have you coded professionally (as a part of your work)?

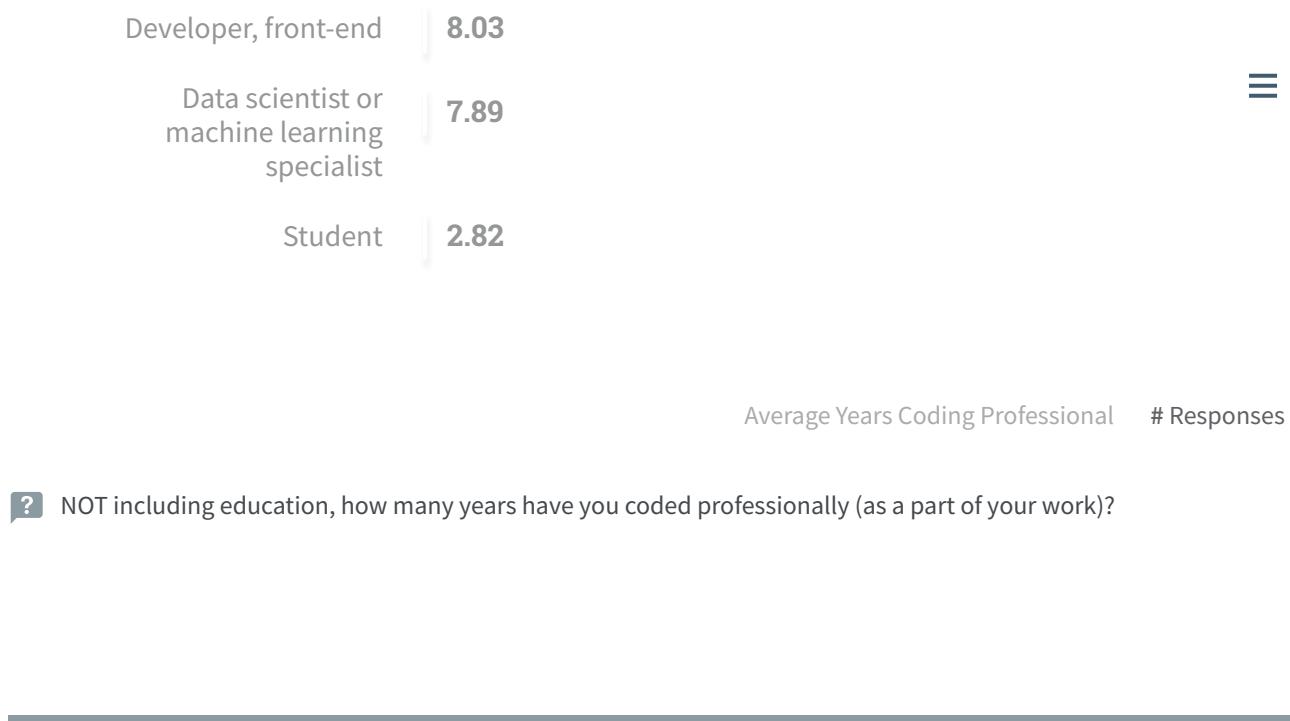
Years of professional coding experience by developer type

Senior executives have the highest average years of professional coding experience (17.4), followed by desktop or enterprise applications developers (16.4) and educators (15.8).

66,136 responses

Senior Executive (C-Suite, VP, etc.)	17.43
Developer, desktop or enterprise applications	16.4
Educator	15.78
Database administrator	15.6

Developer Advocate	15.35	
Engineering manager	15.14	≡
Product manager	14.94	
Project manager	14.6	
Research & Development role	14.3	
Designer	14.23	
Scientist	12.77	
Developer Experience	12.7	
Developer, embedded applications or devices	12.69	
System administrator	12.27	
Marketing or sales professional	12.04	
DevOps specialist	11.04	
Security professional	11.03	
Cloud infrastructure engineer	10.97	
Engineer, site reliability	10.97	
Hardware Engineer	10.92	
Developer, full-stack	10.84	
Developer, back-end	10.77	
Developer, game or graphics	10.38	
Academic researcher	10.36	
Data or business analyst	10.02	
Engineer, data	9.67	
Developer, mobile	9.6	
Blockchain	9.01	
Developer, QA or test	8.78	



Developer Profile

Share

Developer roles

Few developers consider themselves to be a single developer type and instead showcase a diversity of skills.

Developer type

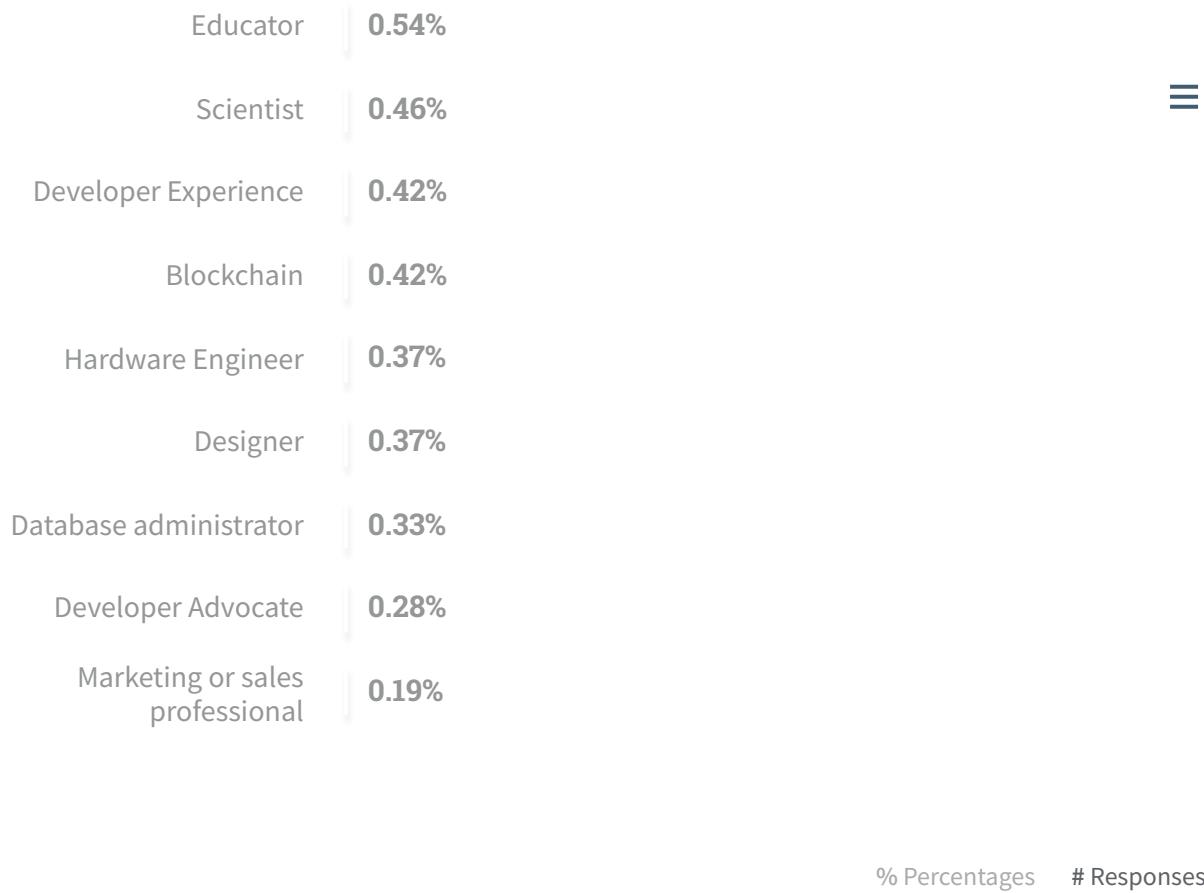


Full-stack, back-end, front-end, and desktop/enterprise app developers continue to account for the majority of all respondents. We asked about developer advocates for the first time this year—almost .3% classify themselves as this type of developer.

76,872 resp



Developer, full-stack	33.48%
Developer, back-end	17.88%
Developer, front-end	6.6%
Developer, desktop or enterprise applications	5.08%
Developer, mobile	3.38%
Engineering manager	2.64%
Student	2.6%
Developer, embedded applications or devices	2.4%
Data scientist or machine learning specialist	2.07%
DevOps specialist	1.8%
Academic researcher	1.76%
Research & Development role	1.76%
Senior Executive (C-Suite, VP, etc.)	1.73%
Engineer, data	1.62%
Cloud infrastructure engineer	1.35%
Developer, game or graphics	1.13%
Data or business analyst	1.09%
System administrator	0.97%
Project manager	0.77%
Developer, QA or test	0.76%
Security professional	0.62%
Product manager	0.58%
Engineer, site reliability	0.56%



❓ Which of the following describes your current job, the one you do most of the time? Please select only one.

Developer Profile

Share

Key territories

Across the world, developers and technologists turn to Stack Overflow to gain and share knowledge. Our survey received responses from almost every country on Earth.

Geography



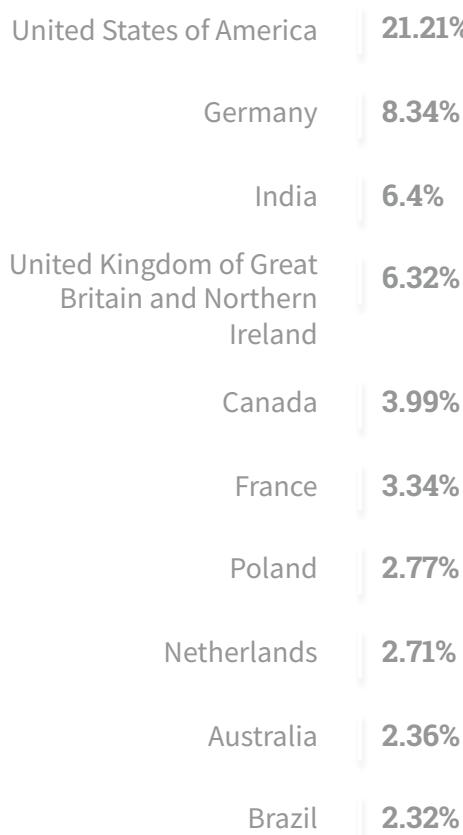
The United States and Germany provided the highest volume of survey responses (30% combined), followed by India and UKI (UK and Northern Ireland).

The top ten countries account for 60% of all respondents. Germany overtook India to move into second place this year, a reverse of 2022's placement. Australia broke into the top ten, coming in at ninth and displacing Spain this year.

Top 10 Countries

All Countries

52,530 responses



Demographics

We reduced the number of demographic questions this year, only asking about age.

Age



43% of Professional Developers are 25-34 years old. But we see that more than half of the respondents learning to code are 18-24 years old.

All Respondents

Professional Developers

89,184 responses

Learning to Code

Other Coders

Under 18 years old	4.63%
18-24 years old	20.11%
25-34 years old	37.28%
35-44 years old	23.02%
45-54 years old	9.34%
55-64 years old	3.8%

65 years or older **1.31%**

Prefer not to say **0.5%**



What is your age? *

% Percentages # Responses

Technology

Each year we explore the tools and technologies developers are currently using and the ones they want to use.

This year, we included new questions about AI tools.

We also introduce a new way to look at the relationship between Worked With vs. Want to Work With, calling this Admired and Desired.

Most popular technologies →

Admired and Desired →

Worked with vs. want to work with →

Top paying technologies →



Most popular technologies

This year, we're comparing the popular technologies across three different groups: All respondents, Professional Developers, and those that are learning to code.

Programming, scripting, and markup languages



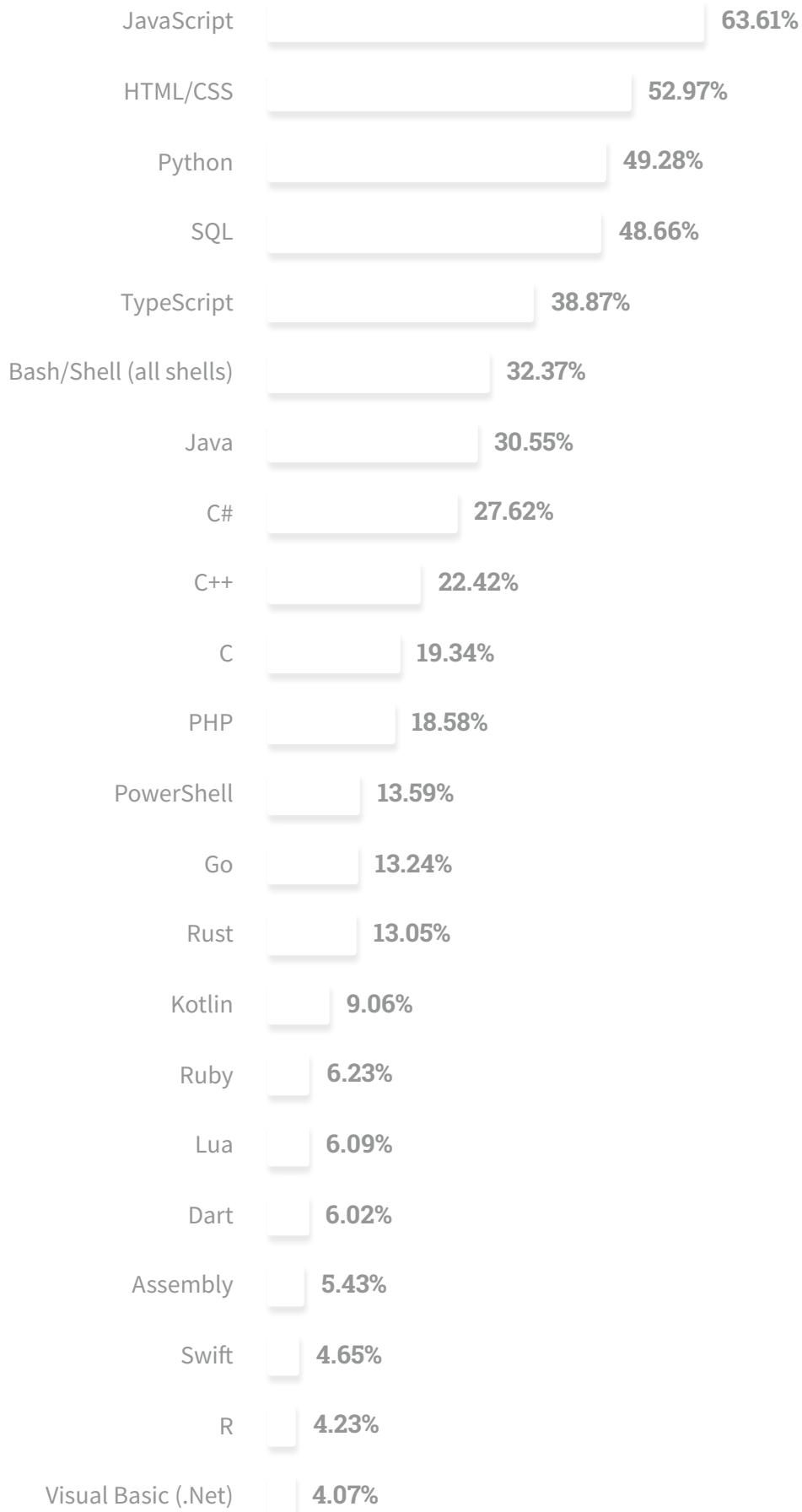
2023 continues JavaScript's streak as its eleventh year in a row as the most commonly-used programming language. Python has overtaken SQL as the third most commonly-used language, but placing first for those who are not professional developers or learning to code (Other Coders).

A few technologies moved up a spot this year (Bash/Shell, C, Ruby, Perl, and Erlang) with two moving up two spots (Elixir and Lisp). The big mover, gaining seven spots since 2022 was Lua, an embeddable scripting language.

Professional developers top three technologies are the same as last year—JavaScript, HTML/CSS, and SQL.

But it's a different picture for those learning to code. HTML/CSS and JavaScript are almost tied as the most popular languages for people learning to code. Student developers use Python more than SQL (59% vs. 37%), while professional developers report using SQL more than Python (52% vs 45%).

Compared to Professional Developers, those learning to code are more likely to report using Java (37% vs 31%), C++ (32% vs 20%), and C (32% vs 17%).







- ?
- Which **programming, scripting, and markup languages** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the language and want to continue to do so, please check both boxes in that row.)
-

Databases



This year, PostgreSQL took over the first place spot from MySQL. Professional Developers are more likely than those learning to code to use PostgreSQL (50%) and those learning are more likely to use MySQL (54%).

MongoDB is used by a similar percentage of both Professional Developers and those learning to code and it's the second most popular database for those learning to code (behind MySQL).

All Respondents

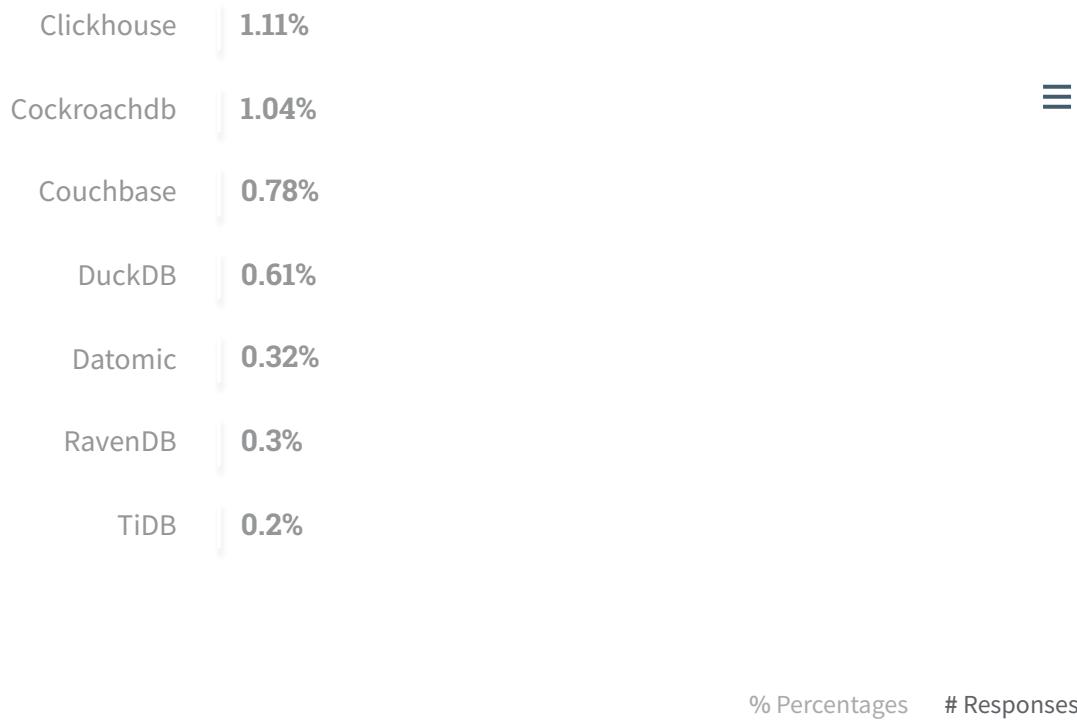
Professional Developers

76,634 responses

Learning to Code

Other Coders

PostgreSQL	45.55%	≡
MySQL	41.09%	
SQLite	30.9%	
MongoDB	25.52%	
Microsoft SQL Server	25.45%	
Redis	20.41%	
MariaDB	17.61%	
Elasticsearch	13.39%	
Oracle	9.8%	
Dynamodb	8.87%	
Firebase Realtime Database	6.44%	
Cloud Firestore	6.4%	
BigQuery	4.51%	
Microsoft Access	4.25%	
H2	3.66%	
Cosmos DB	3.49%	
Supabase	2.77%	
InfluxDB	2.73%	
Cassandra	2.51%	
Snowflake	2.37%	
Neo4J	1.87%	
IBM DB2	1.85%	
Solr	1.55%	
Firebird	1.5%	
Couch DB	1.16%	



❓ Which **database environments** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the database and want to continue to do so, please check both boxes in that row.)

Cloud platforms



AWS remains the most used cloud platform for all respondents. AWS handily makes it to the top spot, almost doubling the percentage of the second most used cloud platform for all respondents, Azure.

People learning to code are using AWS (19%) at parity with two other cloud platforms (19% Google Cloud and 19% Firebase) but use Azure much less than all respondents (11% vs. 26%).

Interestingly, Heroku was the most used cloud platform last year by those learning to code but it dropped to fifth most used this year.

You can see the inroads that Azure has with organizations—almost three times as many professional developers are using Azure compared to people who are learning to code (28% vs. 11%).

All Respondents

Professional Developers

69,549 resp



Learning to Code

Other Coders

Amazon Web Services (AWS)	48.62%
Microsoft Azure	26.03%
Google Cloud	23.86%
Firebase	15.47%
Cloudflare	15.24%
Digital Ocean	13.37%
Heroku	12.02%
Vercel	10.68%
Netlify	8.95%
VMware	7.14%
Hetzner	4.41%
Linode, now Akamai	3.96%
Managed Hosting	3.42%
OVH	3.42%
Oracle Cloud Infrastructure (OCI)	2.6%
OpenShift	2.4%
Fly.io	2.37%
Vultr	1.95%
Render	1.85%
OpenStack	1.55%
IBM Cloud Or Watson	1.15%



% Percentages # Responses

- ❓ Which **cloud platforms** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the platform and want to continue to do so, please check both boxes in that row.)

Web frameworks and technologies



Node.js and React.js are the two most common web technologies used by all respondents.

Next.js moved from 11th place in 2022 to 6th this year, likely driven by its popularity with those learning to code.

Professional Developers use both fairly equally and those learning to code use Node.js more than React (52% vs. 48%).

jQuery and Express are the next two popular web technologies for all respondents, and jQuery is used more by Professional Developers than those learning to code (24% vs 18%), whereas Express is used more by those learning than professionals (25% vs. 20%).

All Respondents

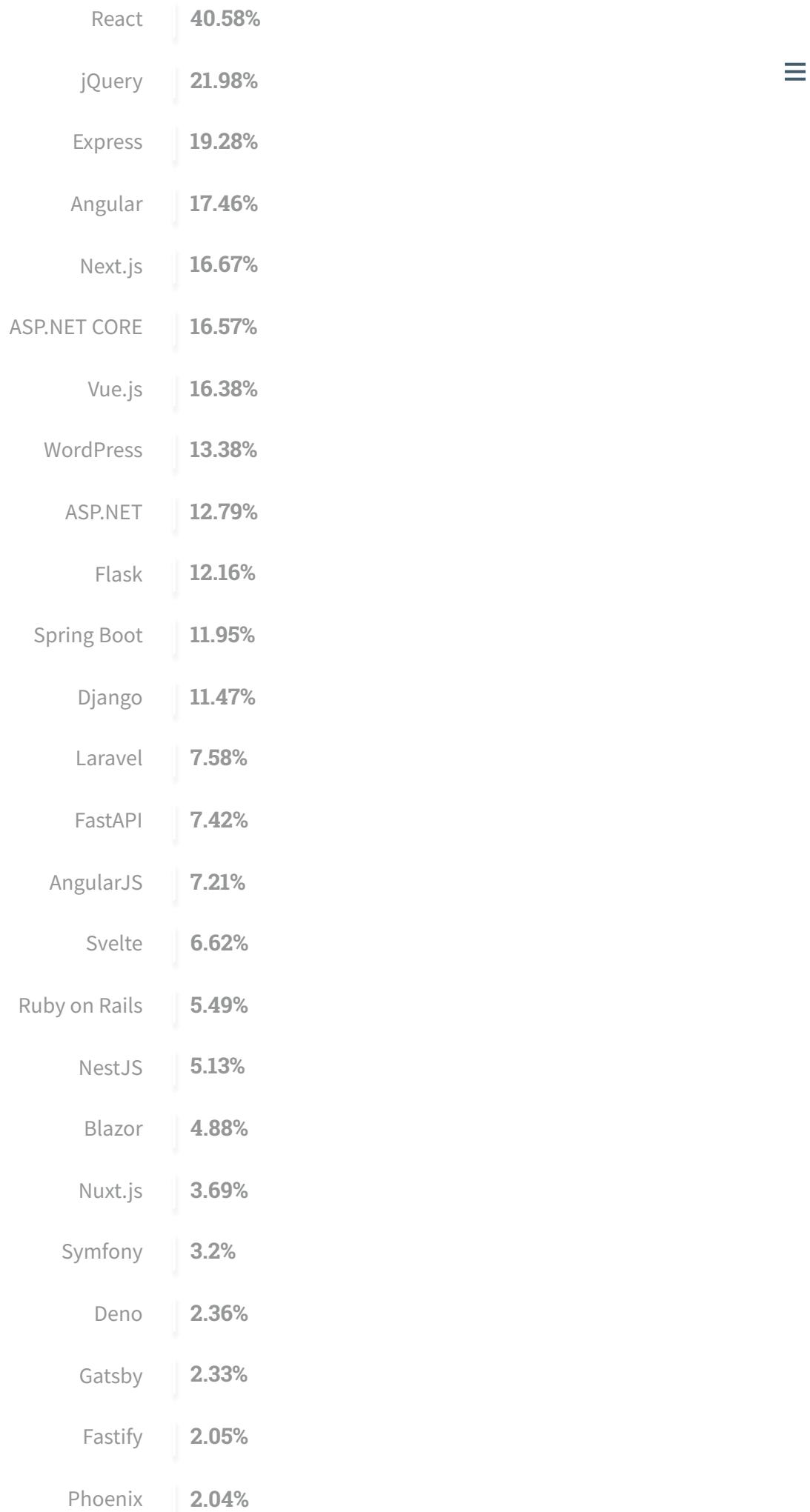
Professional Developers

71,802 responses

Learning to Code

Other Coders

Node.js 42.65%





❓ Which **web frameworks and web technologies** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)

Other frameworks and libraries



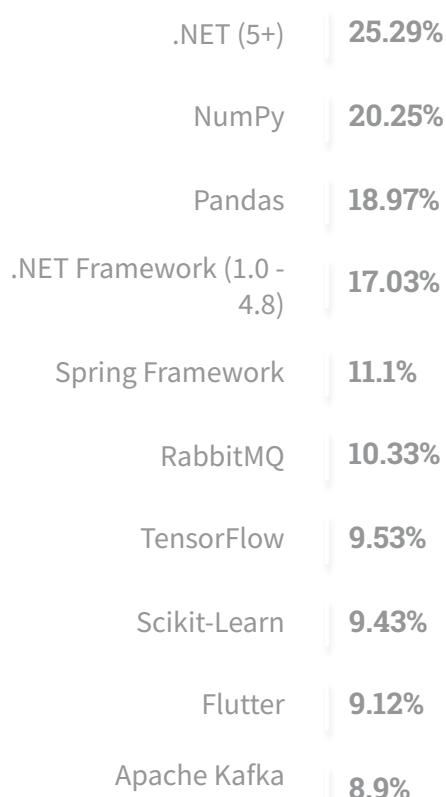
This year we disaggregated .NET to be more specific, and specifically .NET (5+) is top of the list again this year for other frameworks and libraries. Those learning to code are using NumPy and Pandas more than .NET (5+).

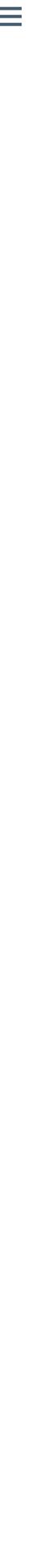


We added a few new options this year as well, and see RabbitMQ is fairly popular with professionals (14%). Python-compatible libraries continue the trend of scoring higher in this category amongst those learning to code, like last year, but interspersed amongst old favorites and new options, we see OpenCV and OpenGL rise up into the top 10 list (13% and 11% respectively).

All Respondents Professional Developers **67,231** responses

Learning to Code Other Coders





Torch/PyTorch	8.75%
React Native	8.43%
Opencv	8.11%
Electron	6.97%
OpenGL	6.94%
Qt	6.55%
CUDA	4.52%
Keras	4.22%
Apache Spark	4.09%
SwiftUI	3.93%
Xamarin	3.32%
Ionic	2.9%
Hugging Face Transformers	2.75%
GTK	2.51%
Cordova	2.4%
.NET MAUI	2.34%
Hadoop	2.29%
Tauri	2.25%
Capacitor	1.68%
Tidyverse	1.55%
Quarkus	1.13%
Ktor	1.1%
MFC	1%
JAX	0.95%
Micronaut	0.66%

Uno Platform

0.53%

% Percentages # Responses

- ?
- Which **other frameworks and libraries** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)

Other tools



This year, Docker is the top-used other tool amongst all respondents (53%) rising from its second place spot last year.

People learning to code are more likely to be using npm or Pip than Docker (50% and 37% respectively vs. 26%). Both are used alongside languages that are popular with students (JavaScript and Python respectively).

All Respondents

Professional Developers

80,249 responses

Learning to Code

Other Coders

Docker | **51.55%**npm | **49.36%**Pip | **29.01%**Homebrew | **21.99%**

Yarn	21.86%
Webpack	20.77%
Make	20.14%
Kubernetes	19.02%
NuGet	15.25%
Maven (build tool)	15.09%
Gradle	14.9%
Vite	14.71%
Visual Studio Solution	14.64%
CMake	14.34%
Cargo	12.97%
GNU GCC	12.51%
Terraform	11.3%
MSBuild	10.62%
Ansible	8.62%
Chocolatey	8.11%
Composer	7.81%
LLVM's Clang	7.43%
APT	7.2%
Unity 3D	6.93%
Pacman	6.58%
pnpm	6.28%
MSVC	4.57%
Podman	3.9%
Ninja	3.65%

Unreal Engine	3.09%	
Godot	3.09%	≡
Ant	2.95%	
Google Test	2.67%	
Nix	2.05%	
Meson	1.31%	
QMake	1.22%	
Puppet	1.12%	
Dagger	1.08%	
Chef	0.94%	
Catch2	0.83%	
Pulumi	0.82%	
Bun	0.77%	
Wasmer	0.54%	
doctest	0.49%	
SCons	0.47%	
bandit	0.45%	
cppunit	0.43%	
Boost.Test	0.43%	
build2	0.2%	
tunit	0.09%	
lest	0.07%	
snitch	0.07%	
CUTE	0.07%	
ELFspy	0.06%	

liblittletest | **0.05%**



% Percentages # Responses

- ? Which developer tools for compiling, building and testing have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the technology and want to continue to do so, please check both boxes in that row.)

Integrated development environment



Visual Studio Code remains the preferred IDE across all developers, increasing its use among those learning to code compared to professional developers (78% vs. 74%).

All Respondents

Professional Developers

86,544 responses

Learning to Code

Other Coders

Visual Studio Code | **73.71%**

Visual Studio | **28.43%**

IntelliJ IDEA | **26.82%**

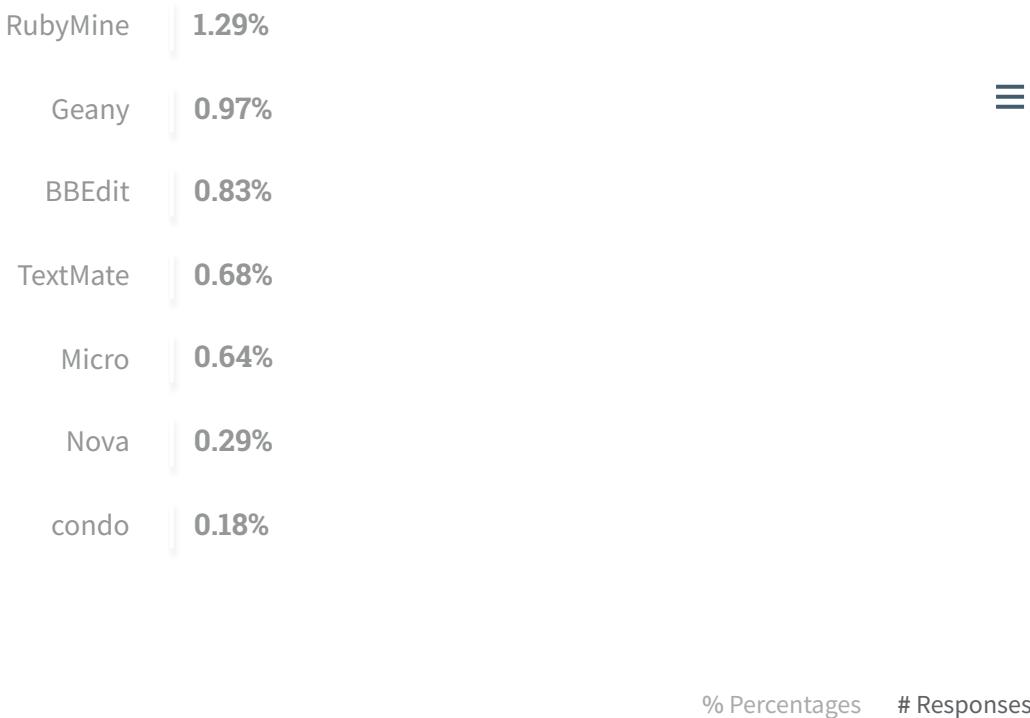
Notepad++ | **24.54%**

Vim | **22.29%**

Android Studio | **16.82%**

PyCharm | **14.63%**

Jupyter Notebook/JupyterLab	12.74%	≡
Sublime Text	12.61%	
Neovim	11.88%	
Eclipse	9.9%	
Xcode	9.45%	
Nano	8.98%	
WebStorm	7.38%	
PhpStorm	6.09%	
Atom	5.63%	
Rider	5.57%	
DataGrip	5.08%	
CLion	4.9%	
IPython	4.88%	
Emacs	4.69%	
VSCodium	4.19%	
Goland	3.23%	
Netbeans	3.19%	
RStudio	2.71%	
Code::Blocks	2.4%	
Qt Creator	2.35%	
Rad Studio (Delphi, C++ Builder)	2.27%	
Fleet	1.9%	
Helix	1.61%	
Kate	1.58%	
Spyder	1.47%	



- ❓ Which **development environments** did you use regularly over the past year, and which do you want to work with over the next year? Please check all that apply.
-

Asynchronous tools



Why complicate it? Jira and Confluence are the top two async tools amongst all developers similar to last year, but this year a new addition to the list broke top three: 27% of respondents use markdown files as an async tool.

People who are learning to code are using GitHub Discussions more than markdown files (31% vs. 29%) and turn to Notion (26%) and Trello (23%) more than professional developers.

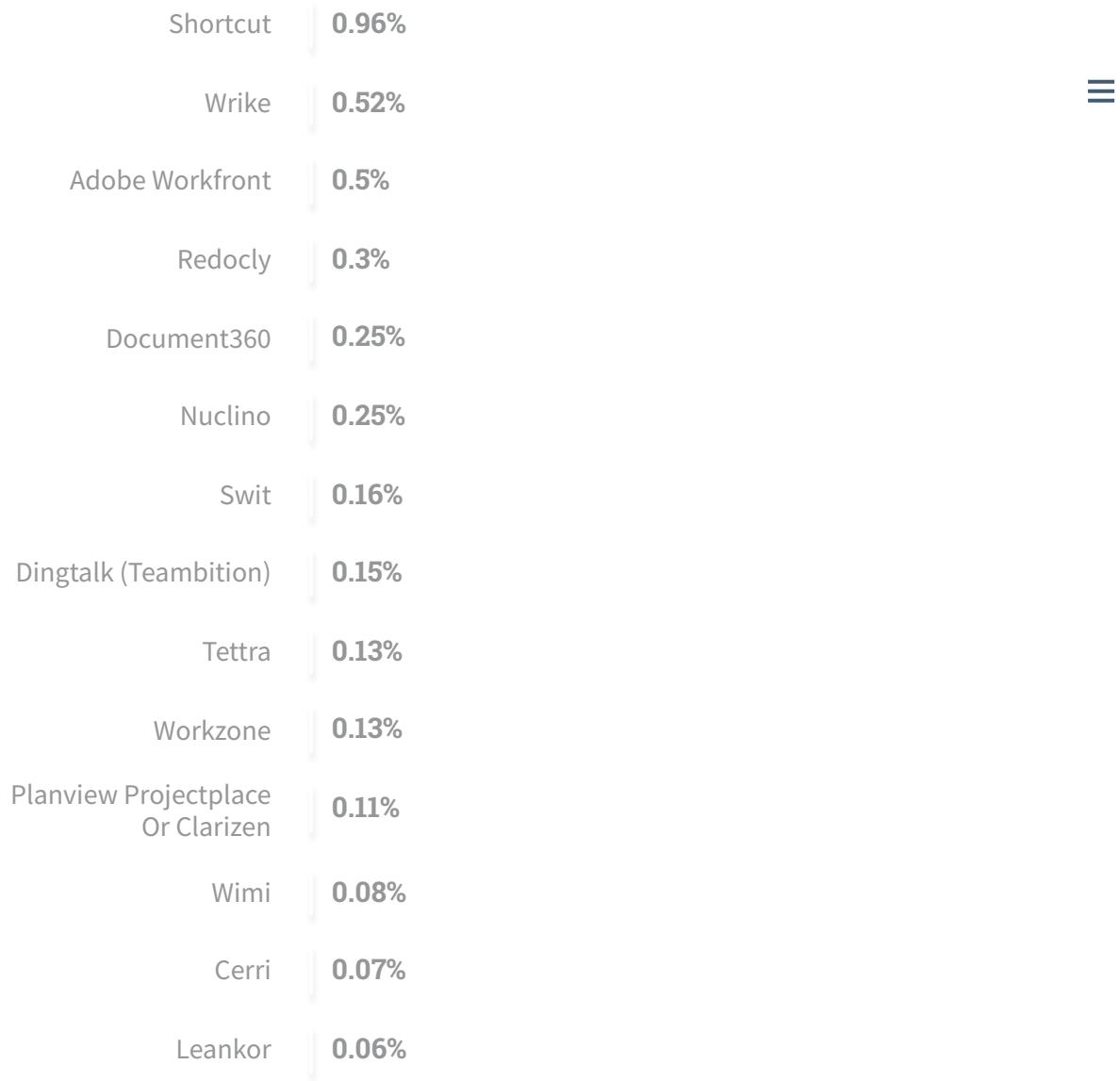
All Respondents

Professional Developers

71,878 responses



Jira	52.37%
Confluence	34.16%
Markdown File	26.17%
Trello	19.36%
Notion	17.8%
GitHub Discussions	16.98%
Azure Devops	15.56%
Miro	14.55%
Wikis	7.46%
Asana	5.04%
Clickup	4.02%
Doxxygen	3.73%
Redmine	2.68%
Monday.com	2.63%
Stack Overflow for Teams	2.52%
YouTrack	2.39%
Microsoft Planner	2.28%
Airtable	2.13%
Linear	2.07%
Basecamp	1.61%
Microsoft Lists	1.04%
Smartsheet	1.02%



% Percentages # Responses

❓ Which collaborative work management and/or code documentation tools did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply

Synchronous tools



The three most popular synchronous tools are universal for all respondents: Microsoft Teams, Slack, and Zoom. Zoom was top of the list last year but is third place this year with about 10 percentage points fewer people having worked with it in the past year.



For those learning, Discord and Whatsapp are used more than any of the top three (70% and 45% respectively).

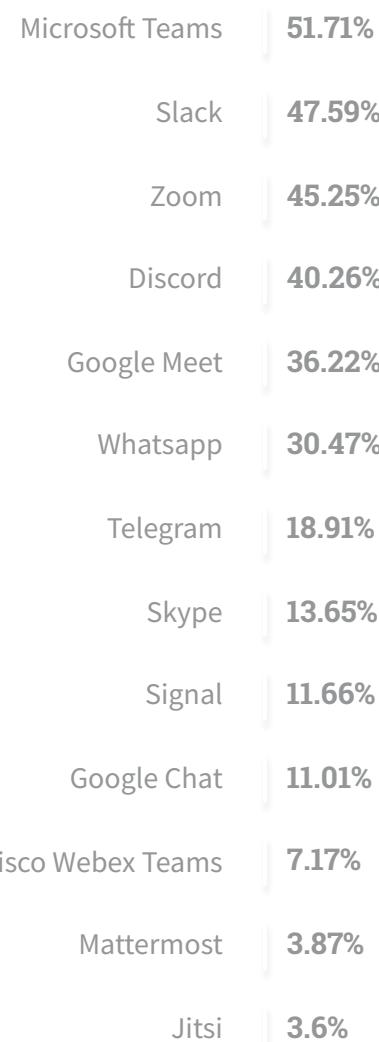
All Respondents

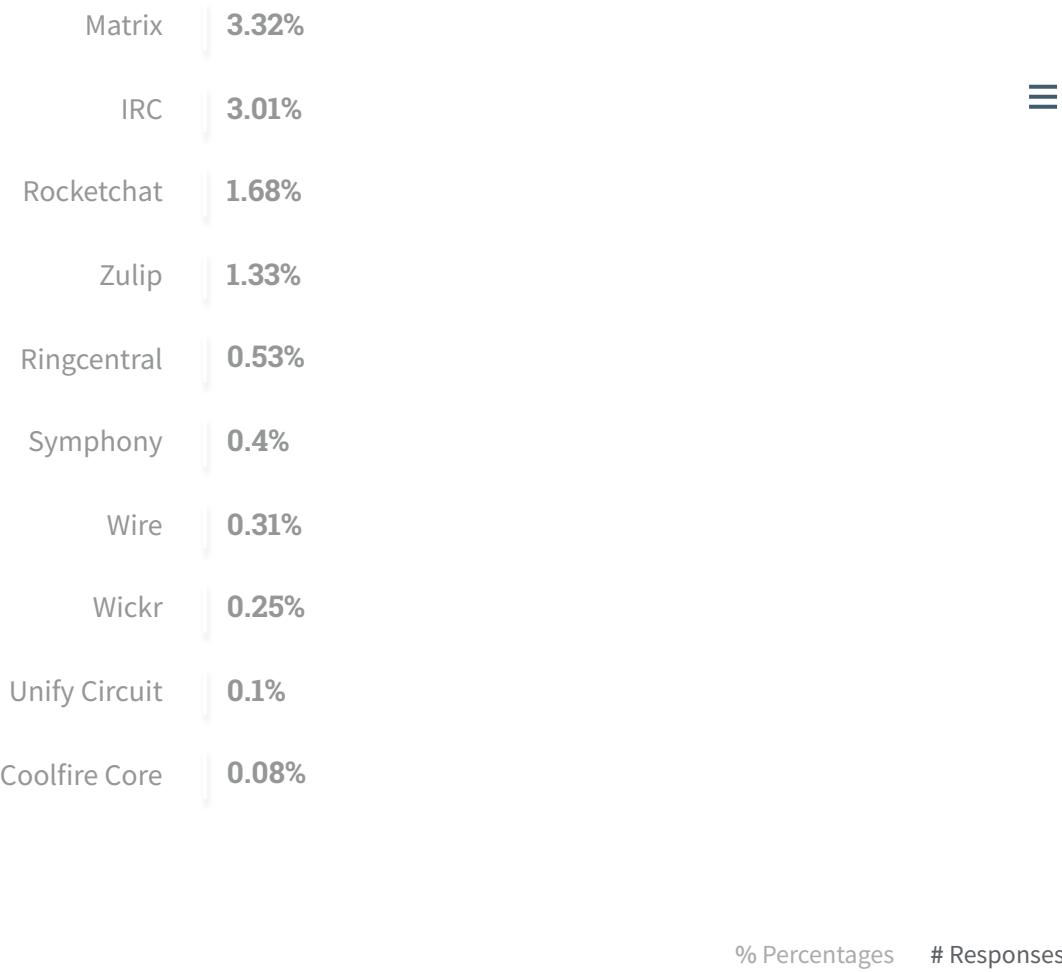
Professional Developers

84,152 responses

Learning to Code

Other Coders





💡 Which **communication tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply

Operating system



Windows is the most popular operating system for developers, across both personal and professional use.

87,222 responses

Windows

Personal use **59.72%**

Professional use | **46.91%**



MacOS

Personal use | **32.57%**

Professional use | **33%**

Ubuntu

Personal use | **27.28%**

Professional use | **26.69%**

Android

Personal use | **17.59%**

Professional use | **8.23%**

Windows Subsystem for Linux (WSL)

Personal use | **16.87%**

Professional use | **15.68%**

iOS

Personal use | **11.74%**

Professional use | **7.37%**

Debian

Personal use | **8.39%**

Professional use | **8.09%**

Other Linux-based

Personal use | **8.16%**

Professional use | **7.7%**



Arch

Personal use	8.06%
Professional use	4.37%

iPadOS

Personal use	5.68%
Professional use	2.77%

Red Hat

Personal use	2.14%
Professional use	4.64%

Fedora

Personal use	4.37%
Professional use	3.05%

ChromeOS

Personal use	1.88%
Professional use	1.06%

Cygwin

Personal use	1.04%
Professional use	0.92%

BSD

Personal use	0.96%
Professional use	0.59%

AIX



Solaris



Haiku



What is the primary **operating system** in which you work?

% Percentages # Responses

AI Search Tools



This is a new section this year, and respondents' top choice for AI search tools is ChatGPT: 83% of respondents have used it in the past year. This is above and beyond the second choice of Bing AI with 20% having used it.

The hype around emerging AI search technology has room to grow while the ChatGPT competitors grow their user base; only four tools had 10% or higher selection for those that want to try it in the next year.

All Respondents

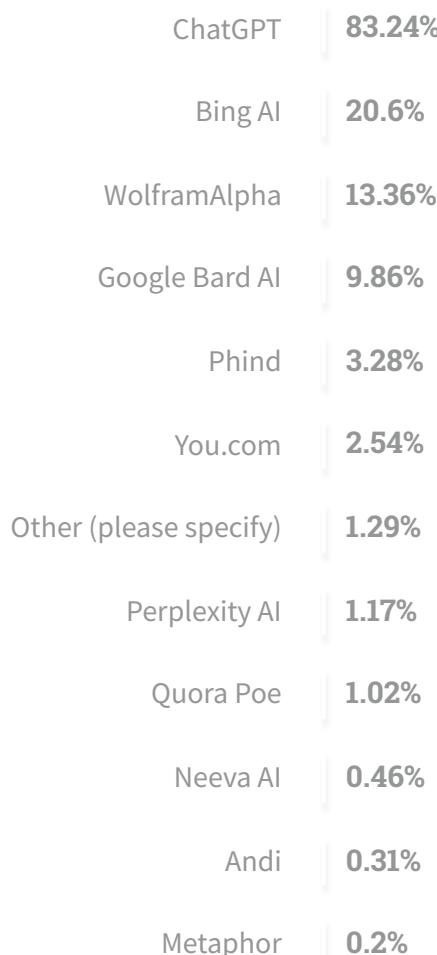
Professional Developers

63,024 resp



Learning to Code

Other Coders



% Percentages # Responses

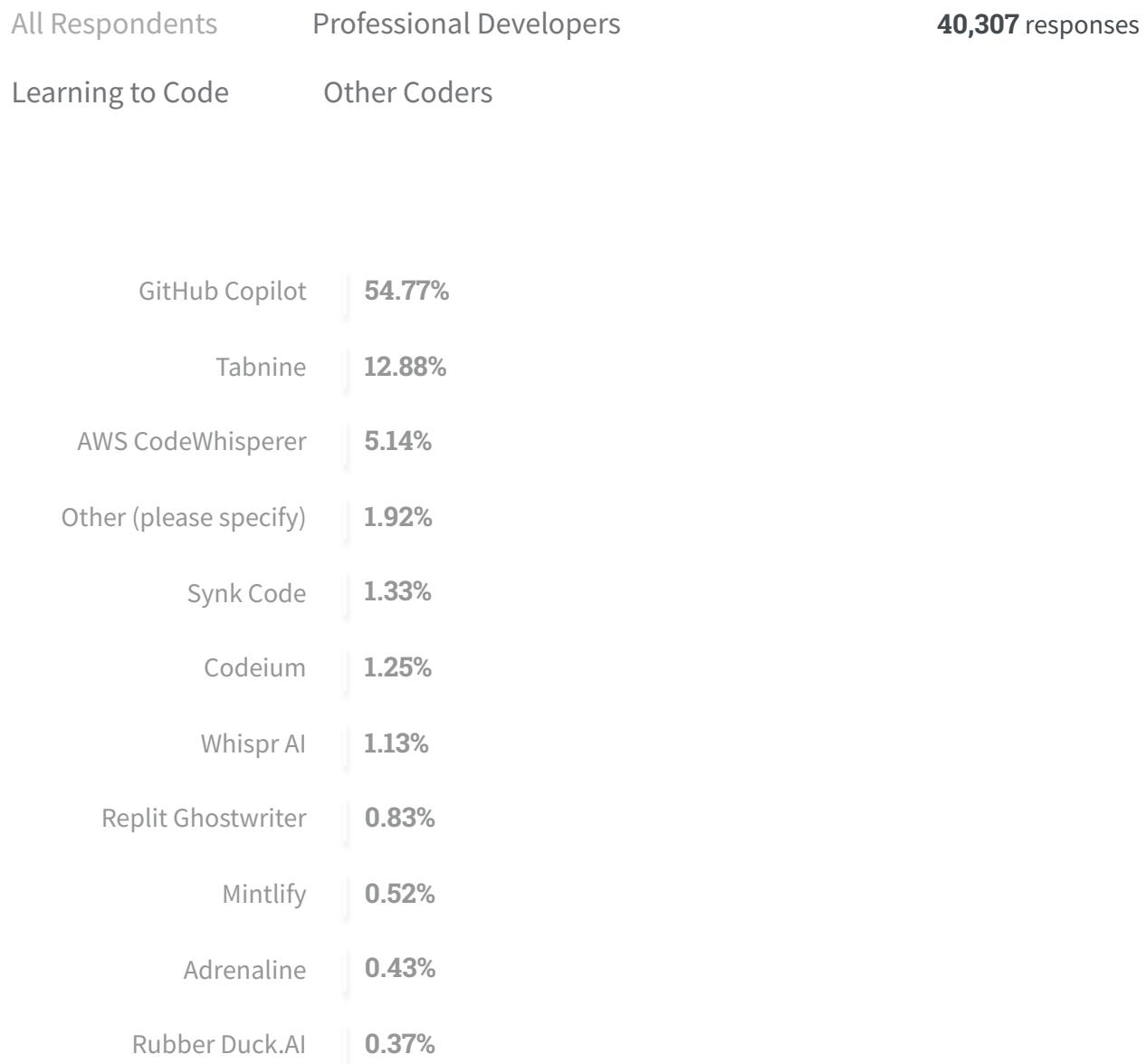
- ❓ Which **AI-powered search tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply.



In addition to asking about search tools beginning this year, we also asked about AI developer tools. GitHub Copilot is the overall pick for most used AI developer tool with 55% of respondents using it this past year, quadrupling the second top pick of Tabnine at 13%.



Those learning are using Tabnine a little more (18%) and Copilot a little less (45%), possibly due to costs associated with Copilot.



% Percentages # Resps



- 💡 Which AI-powered developer tools did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply
-

Technology

Share

Admired and Desired

In addition to reporting what popular technologies developers used in the past year, we have some technologies/tools that developers are currently using and know they want to use again in the future.

This year we added a new section to the survey results for technology trends' those who have used or want to use programming languages, tools, environments, libraries, etc. that we have dubbed "Admired and Desired". To better gauge hype versus reality, we created a visualization that shows the distance between the proportion of respondents who want to use a technology ("desired") and the proportion of users that have used the same technology in the past year and want to continue using it ("admired"). Wide distances means that momentum generated by the hype grows with hands-on use, and shorter distances means that the hype is doing much of the heavy lifting as far as general popularity is concerned. For example, we can see JavaScript, our most used programming language since 2011, has a relatively short distance between admired and desired (<10 percentage points), while Rust, a top choice for developers who want to use a new technology for the past 8 years, shows a wide distance (>60 percentage points); Rust is a language that generates for desire to use it once you get to know it than JavaScript. Seeing this growth in admiration for certain technologies gives us insight into what has staying power and what needs help in order to generate coveted evangelists to convert new users that will stick around.

This new visualization of the data replaces the old Loved, Dreaded, Wanted analysis.



Programming, scripting, and markup languages



Rust is the most admired language, more than 80% of developers that use it want to use it again next year. Compare this to the least admired language: MATLAB. Less than 20% of developers who used this language want to use it again next year.

87,510 responses



Desired Admired

- ? Which **programming, scripting, and markup languages** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the language and want to continue to do so, please check both boxes in that row.)

Databases



PostgreSQL, Redis, and Datomic are the most admired databases with Datomic having the least users. That kind of admiration should push others to consider Datomic as a viable option.

75,996 responses





Desired Admired

- ? Which **database environments** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the database and want to continue to do so, please check both boxes in that row.)
-

Cloud platforms



Hetzner and Vercel have a large proportion that have used and want to continue using them (69%+); more developers would choose to work with these two cloud platforms over those that would choose to and have worked with the top three (AWS, Azure, and Google Cloud).

68,885 responses





Desired Admired

- ? Which **cloud platforms** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the platform and want to continue to do so, please check both boxes in that row.)
-

Web frameworks and technologies



Phoenix is the most admired web framework and technology; more developers would choose to work with Phoenix again than those who have used the three most common: React, Node.js, and Next.js.

70,637 resr





- ?
- Which **web frameworks and web technologies** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)
-

Other frameworks and libraries



The most admired of the other frameworks and libraries category are Tauri, Hugging Face Transformers and .NET(5+). .NET(5+) is the most popular of it's category this year, while Tauri and Hugging Face Transformers are much less well known but have more admiration among its users.

66,235 responses





Desired Admired

- ? Which **other frameworks and libraries** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)

Other tools



More respondents want to continue using Cargo next year than the top competitors (top 6 tools that respondents want to use next year), however, Docker has almost double the proportion of respondents that want to use it next year compared to all other options.



79,679 responses





Desired Admired

- ? Which **developer tools for compiling, building and testing** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the technology and want to continue to do so, please check both boxes in that row.)

Integrated development environment



Visual Studio Code is the preferred IDE as far as what users want but Neovim has a higher proportion of users that want to continue using it next year (81% vs 77%).

86,310 responses





Desired Admired

- ? Which **development environments** did you use regularly over the past year, and which do you want to work with over the next year? Please check all that apply.
-

Asynchronous tools



Markdown files are the second most desired asynchronous tool and the most admired asynchronous tool. Markdown files can be deployed in various hosted instances and show an opportunity for paid solutions to reduce friction for sharing information.

70,750 responses



❓ Which **collaborative work management and/or code documentation tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply



Synchronous tools



Microsoft Teams and Zoom have the lowest proportion of users that want to continue using given first-hand experience out the top five solutions users want to use next year.

83,830 responses



- ? Which **communication tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply
-

AI Search Tools



Developers want to keep using ChatGPT for their AI Search. Other tools they want to use are Phind and WolframAlpha.

62,691 responses



- ?
- Which **AI-powered search tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply.

AI Developer Tools



Developers want to continue using GitHub Copilot and, in a flip, we see more developers overall who want to try it over the next year than those currently using Copilot.

39,615 responses



- ?
- Which **AI-powered developer tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply

Worked with vs. want to work with

Developers are naturally curious and interested in new technologies. We look at what technologies they are interested in trying based on what they are using now.

Programming, scripting, and markup languages



A lot of our top used programming languages are popular because those that use them want to use them again. JavaScript, TypeScript, and HTML/CSS users all selected these three languages as their top three they want to use next year.

All Respondents

Professional Developers

85,221 responses

Learning to Code

Other Coders

Minimum 5,000 respondents per connection.





Click to toggle the visibility of a language.

- Which **programming, scripting, and markup languages** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the language and want to continue to do so, please check both boxes in that row.)

Databases



~11K PostgreSQL users want to use Redis next year and ~9K Redis users want to use PostgreSQL next year, an indication of complementary database environments among our top ten.

All Respondents

Professional Developers

69,380 responses

Learning to Code

Other Coders

Minimum 5,000

respondents per connection.



Click to toggle the visibility of a language.

- ? Which **database environments** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the database and want to continue to do so, please check both boxes in that row.)
-

Cloud platforms



~14K AWS developers—a little less than half—want to develop in Google Cloud or Microsoft Azure next year.

All Respondents

Professional Developers

62,373 responses

Learning to Code

Other Coders

Minimum 1,000
respondents per
connection.



Click to toggle the visibility of a language.

- Which **cloud platforms** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the platform and want to continue to do so, please check both boxes in that row.)

Web frameworks and technologies



More jQuery users want to use Node.js or React next year rather than jQuery.

All Respondents

Professional Developers

60,821 responses

Learning to Code

Other Coders

Minimum 4,000
respondents per
connection.





Click to toggle the visibility of a language.

- ?
- Which **web frameworks and web technologies** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)
-

Other frameworks and libraries



The top three selections .NET(5+) users want to use next year are .NET(5+), .NET MAUI, and .NET Framework (1.0 - 4.8). .NET favoritism is strong within their community.

All Respondents

Professional Developers

55,345 responses

Learning to Code

Other Coders

Minimum 1,000 respondents per connection.



Click to toggle the visibility of a language.

- Which **other frameworks and libraries** have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the framework and want to continue to do so, please check both boxes in that row.)

Other tools



We see a lot of people working with npm, Kubernetes, and Docker who also want to work with those same technologies.

All Respondents

Professional Developers

76,132 responses

Learning to Code

Other Coders

Minimum 5,000
respondents per
connection.





Click to toggle the visibility of a language.

- ?
- Which developer tools for compiling, building and testing have you done extensive development work in over the past year, and which do you want to work in over the next year? (If you both worked with the technology and want to continue to do so, please check both boxes in that row.)
-

Integrated development environment



More than half of Visual Studio users want to use VS Code next year, while just 20% of VS Code users want to use Visual Studio next year. VS Code has a wide array of extensions and plugins unlike Visual Studio, making it more compatible for more developer needs.

All Respondents

Professional Developers

83,473 responses

Learning to Code

Other Coders

Minimum 5,000 respondents per connection.



Click to toggle the visibility of a language.

- Which **development environments** did you use regularly over the past year, and which do you want to work with over the next year? Please check all that apply.

Asynchronous tools



Jira and Confluence are most closely interconnected, which makes sense given they are under the same company.

We see interest in working with other asynchronous tools, likely because each of these tools serves a different purpose in a developer's workflow.

All Respondents

Professional Developers

67,381 responses

Learning to Code

Other Coders

Minimum 1,000
respondents per
connection.

Click to toggle the visibility of a language.

- ?
- Which collaborative work management and/or code documentation tools did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply
-

Synchronous tools



Discord is the third pick for synch tools users want to use next year for all three of the top synch tools users have used this past year: Microsoft Teams, Slack, and Zoom.

All Respondents

Professional Developers

83,345 responses

Learning to Code

Other Coders

Minimum 1,000 respondents per connection.



Click to toggle the visibility of a language.

- ? Which **communication tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply

AI Search Tools



42% of ChatGPT users want to use Google Bard or Bing AI next year. These users are enjoying their experience: 79% want to use ChatGPT again next year.

All Respondents

Professional Developers

56,181 responses

Learning to Code

Other Coders

Minimum 1,000
respondents per
connection.





Click to toggle the visibility of a language.

- ❓ Which AI-powered search tools did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply.
-

AI Developer Tools



70%+ of GitHub Copilot users want to use it again next year.

All Respondents

Professional Developers

25,208 responses

Learning to Code

Other Coders

Minimum 1,000 respondents per connection.



Click to toggle the visibility of a language.

- ❓ Which **AI-powered developer tools** did you use regularly over the past year, and which do you want to work with over the next year? Select all that apply

Top paying technologies



Top paying technologies



Zig is the highest-paid language to know this year (a new addition), while Clojure gets knocked from the top spot with a 10% decrease from 2022.

Dart and SAS saw the highest increase in median pay during 2023, growing more than 20% year-over-year.

47,883 responses

Zig	\$103,611
Erlang	\$99,492
F#	\$99,311
Ruby	\$98,522
Clojure	\$96,381
Elixir	\$96,381
Lisp	\$96,381
Scala	\$96,381
Perl	\$94,540
Go	\$92,760
OCaml	\$91,026
Objective-C	\$90,000

Flow	\$88,934
Rust	\$87,012
Swift	\$86,897
Groovy	\$86,271
Bash/Shell (all shells)	\$85,672
Haskell	\$85,672
Apex	\$81,552
PowerShell	\$81,311
SAS	\$81,000
Lua	\$80,690
Nim	\$80,000
Raku	\$79,448
Python	\$78,331
Kotlin	\$78,207
APL	\$77,500
Crystal	\$77,104
TypeScript	\$77,104
Assembly	\$77,010
Fortran	\$76,104
Cobol	\$76,000
C#	\$74,963
C++	\$74,963
Julia	\$74,963
R	\$74,963
SQL	\$74,963

C	\$74,351	
JavaScript	\$74,034	≡
Java	\$72,701	
Solidity	\$72,656	
Ada	\$71,500	
HTML/CSS	\$70,148	
Prolog	\$70,000	
Delphi	\$69,608	
GDScript	\$69,608	
VBA	\$65,698	
Visual Basic (.Net)	\$65,000	
MATLAB	\$61,735	
PHP	\$58,899	
Dart	\$55,862	

\$ Median yearly salary (USD) # Responses

- ?
- What is your current total **annual** compensation (salary, bonuses, and perks, before taxes and deductions)? Please enter a whole number in the box below, without any punctuation. If you are paid hourly, please estimate an equivalent yearly salary. If you prefer not to answer, please leave the box empty.

Change in salaries between 2022 and 2023



Median salary for all respondents increased 10% and increased 11% for professional developers.

SAS

2022 Median yearly salary (USD) **\$64,243**

2023 Median yearly salary (USD) **\$81,000**

Dart

2022 Median yearly salary (USD) **\$43,724**

2023 Median yearly salary (USD) **\$55,862**

Kotlin

2022 Median yearly salary (USD) **\$69,318**

2023 Median yearly salary (USD) **\$78,207**

JavaScript

2022 Median yearly salary (USD) **\$65,580**

2023 Median yearly salary (USD) **\$74,034**

Swift

2022 Median yearly salary (USD) **\$78,468**

2023 Median yearly salary (USD) **\$86,897**

PHP

2022 Median yearly salary (USD) **\$50,496**

2023 Median yearly salary (USD) **\$58,899**

Java

2022 Median yearly salary (USD) **\$64,572**

2023 Median yearly salary (USD) **\$72,701**



R

2022 Median yearly salary (USD) **\$67,734**

2023 Median yearly salary (USD) **\$74,963**

Python

2022 Median yearly salary (USD) **\$71,105**

2023 Median yearly salary (USD) **\$78,331**

C

2022 Median yearly salary (USD) **\$67,186**

2023 Median yearly salary (USD) **\$74,351**

C++

2022 Median yearly salary (USD) **\$68,000**

2023 Median yearly salary (USD) **\$74,963**

Objective-C

2022 Median yearly salary (USD) **\$83,165**

2023 Median yearly salary (USD) **\$90,000**

TypeScript

2022 Median yearly salary (USD) **\$70,276**

2023 Median yearly salary (USD) **\$77,104**

HTML/CSS

2022 Median yearly salary (USD) **\$63,984**



2023 Median yearly salary (USD) | **\$70,148**

SQL

2022 Median yearly salary (USD) | **\$69,108**

2023 Median yearly salary (USD) | **\$74,963**

Delphi

2022 Median yearly salary (USD) | **\$63,984**

2023 Median yearly salary (USD) | **\$69,608**

Ruby

2022 Median yearly salary (USD) | **\$93,000**

2023 Median yearly salary (USD) | **\$98,522**

C#

2022 Median yearly salary (USD) | **\$69,516**

2023 Median yearly salary (USD) | **\$74,963**

Haskell

2022 Median yearly salary (USD) | **\$80,250**

2023 Median yearly salary (USD) | **\$85,672**

Perl

2022 Median yearly salary (USD) | **\$90,073**

2023 Median yearly salary (USD) | **\$94,540**

MATLAB

2022 Median yearly salary (USD) | **\$57,588**

2023 Median yearly salary (USD) **\$61,735**



OCaml

2022 Median yearly salary (USD) **\$86,948**

2023 Median yearly salary (USD) **\$91,026**

F#

2022 Median yearly salary (USD) **\$95,526**

2023 Median yearly salary (USD) **\$99,311**

Scala

2022 Median yearly salary (USD) **\$92,780**

2023 Median yearly salary (USD) **\$96,381**

Go

2022 Median yearly salary (USD) **\$89,204**

2023 Median yearly salary (USD) **\$92,760**

Elixir

2022 Median yearly salary (USD) **\$92,959**

2023 Median yearly salary (USD) **\$96,381**

VBA

2022 Median yearly salary (USD) **\$62,328**

2023 Median yearly salary (USD) **\$65,698**

PowerShell

2022 Median yearly salary (USD) **\$78,084**



2023 Median yearly salary (USD) | **\$81,311**

Solidity

2022 Median yearly salary (USD) | **\$70,368**

2023 Median yearly salary (USD) | **\$72,656**

Assembly

2022 Median yearly salary (USD) | **\$75,000**

2023 Median yearly salary (USD) | **\$77,010**

APL

2022 Median yearly salary (USD) | **\$75,932**

2023 Median yearly salary (USD) | **\$77,500**

Lua

2022 Median yearly salary (USD) | **\$79,568**

2023 Median yearly salary (USD) | **\$80,690**

Groovy

2022 Median yearly salary (USD) | **\$85,320**

2023 Median yearly salary (USD) | **\$86,271**

Rust

2022 Median yearly salary (USD) | **\$87,047**

2023 Median yearly salary (USD) | **\$87,012**

Julia

2022 Median yearly salary (USD) | **\$77,966**

2023 Median yearly salary (USD) **\$74,963**



Erlang

2022 Median yearly salary (USD) **\$103,000**

2023 Median yearly salary (USD) **\$99,492**

Fortran

2022 Median yearly salary (USD) **\$80,000**

2023 Median yearly salary (USD) **\$76,104**

Crystal

2022 Median yearly salary (USD) **\$84,690**

2023 Median yearly salary (USD) **\$77,104**

Clojure

2022 Median yearly salary (USD) **\$106,644**

2023 Median yearly salary (USD) **\$96,381**

\$ Median yearly salary (USD) # Responses

- ❓ What is your current total **annual** compensation (salary, bonuses, and perks, before taxes and deductions)? Please enter a whole number in the box below, without any punctuation. If you are paid hourly, please estimate an equivalent yearly salary. If you prefer not to answer, please leave the box empty.

AI

This was a new section for 2023 – we have a deeper dive into all of this data on our [Stack Overflow Labs write-up](#).



We wanted to gain insight into the real sentiments behind this year's surge in AI popularity. Is it making a real impact in the way developers work or is it all hype?

Sentiment and usage →



Developer tools →

AI

Share

Sentiment and usage

We asked a number of questions this year about perceptions of AI, how AI tools may or may not impact developer workflows, and more. We have a deeper dive into all of this data on our [Stack Overflow Labs write-up](#)



AI tools in the development process



70% of all respondents are using or are planning to use AI tools in their development process this year. Those learning to code are more likely than professional developers to be using or use AI tools (82% vs. 70%).

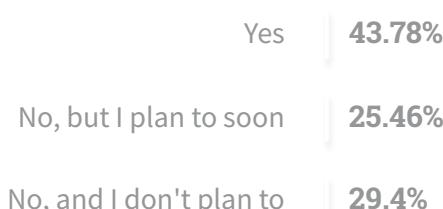
All Respondents

Professional Developers

89,184 responses

Learning to Code

Other Coders



Do you currently use AI tools in your development process? *

% Percentages # Responses

AI tool sentiment



77% of all respondents are favorable or very favorable of AI tools for development. Professional developers are more likely to be indifferent than those learning to code (17% vs. 15%).

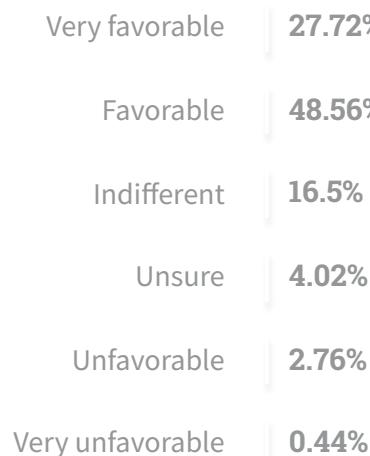
All Respondents

Professional Developers

61,501 responses

Learning to Code

Other Coders



% Percentages # Responses

How favorable is your stance on using AI tools as part of your development workflow?

Developer tools



Benefits of AI tools



Increasing productivity is the biggest benefit that developers see from AI tools. Speeding up learning and greater efficiency are tied for secondary benefits.

38,594 responses

Increase productivity	32.81%
Speed up learning	25.17%
Greater efficiency	24.96%
Improve accuracy in coding	13.31%
Improve collaboration	3.75%

% Percentages # Responses

- For the AI tools you use as part of your development workflow, what are the MOST important benefits you are hoping to achieve? Please check all that apply.

Accuracy of AI tools



We see developers split on their trust in the accuracy of the AI output from tools. About 42% trust the accuracy of the output, while 31% are on the fence.



39,042 responses



% Percentages # Responses

❓ How much do you trust the accuracy of the output from AI tools as part of your development workflow?

AI in the development workflow



Those currently using AI tools mostly report benefits for writing code, while those not interested in using AI tools find this the least beneficial. This disconnect most likely is with the fundamental difference of type of developers not interested in using these tools with those that are interested and have more applicable use cases for the current functionality available.

Currently Using

Interested in Using

37,726 resp



Not Interested in Using

Writing code	82.55%
Debugging and getting help	48.89%
Documenting code	34.37%
Learning about a codebase	30.1%
Testing code	23.87%
Project planning	13.52%
Committing and reviewing code	10.09%
Deployment and monitoring	4.74%
Collaborating with teammates	3.65%

% Percentages # Responses

- ❓ Which parts of your development workflow are you currently using AI tools for and which are you interested in using AI tools for over the next year? Please select all that apply.

AI tools next year



Regardless of being a professional developer or someone learning to code, people believe that their development workflow will be different in a year because of AI tools.

All Respondents

Professionals

Learning to Code

35,450 resp



Other Coders



- ?
- Thinking about how your workflow and process changes over time, how similar or different do you anticipate your workflow to be 1 year from now as a result of AI tools you are currently using?



Work

Employment →

Company info →

Salary →

Purchasing technology →

Coding outside of work →



Employment

Share



Employment status



For all respondents this year we see a slight increase in “Independent contractor, freelancer, or self-employed” and equal-sized decrease in full-time students (1 percentage point) compared to last year and other employment status' changing less than that.

The costs of investing in oneself has risen with inflation in 2023 but not enough to sway many from the opportunity to level up their developer skills.

All Respondents

Professional Developers

87,898 responses

Employed, full-time **69.28%**

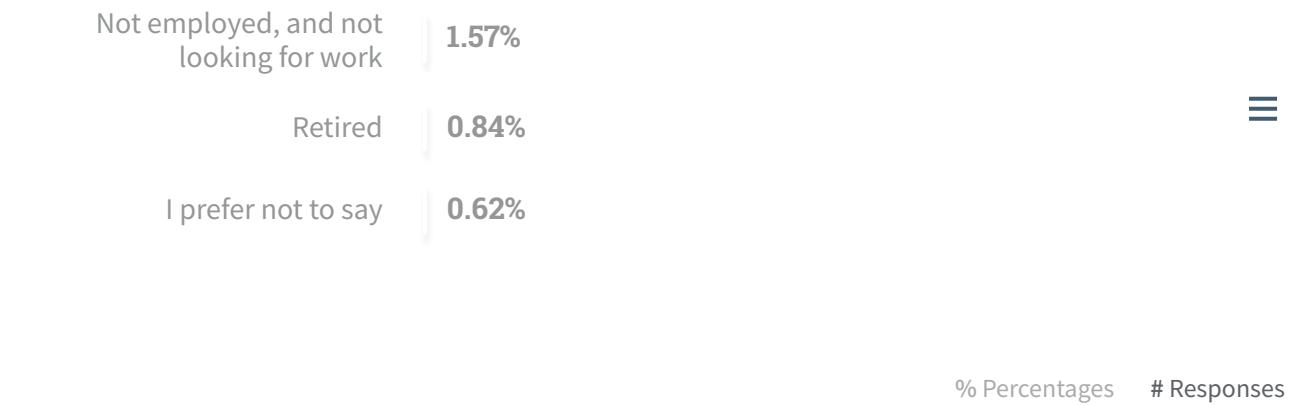
Independent contractor,
freelancer, or self-
employed **15.91%**

Student, full-time **13.39%**

Employed, part-time **5.72%**

Not employed, but
looking for work **4.75%**

Student, part-time **3.86%**



❓ Which of the following best describes your current employment status? Select all that apply.

Employment status by geography



Full-time employment has gone down in the top five countries while Independent contractor, freelancer, or self-employed has gone up (all less than 1%).

United States	Germany	India	20,984 responses
United Kingdom	Canada		

Employed, full-time **68.91%**

Independent contractor,
freelancer, or self-
employed **9.79%**

Student, full-time **9.29%**

Not employed, but
looking for work **3.82%**

Employed, part-time **3.06%**

Student, part-time **2.04%**



❓ Which of the following best describes your current employment status? Select all that apply.

Work environment



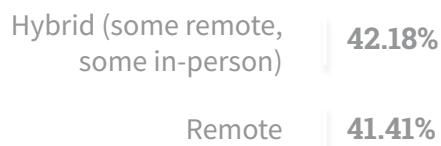
Hybrid is here to stay for larger organizations; over half of employees in 5,000+ organizations are hybrid. The smaller organizations are most likely to be in-person, with one out of five organizations with fewer than 20 people report being in-person.

More developers this year are working in-person this year than last year (+2%). Return to office initiatives aside, coding easily lends itself to fully remote work and one third or more of all organization sizes are still fully remote.

All Respondents

By Organization Size

73,810 responses



In-person

16.41%



?

Which best describes your current work situation?

% Percentages

Responses

Work

Share

Company info

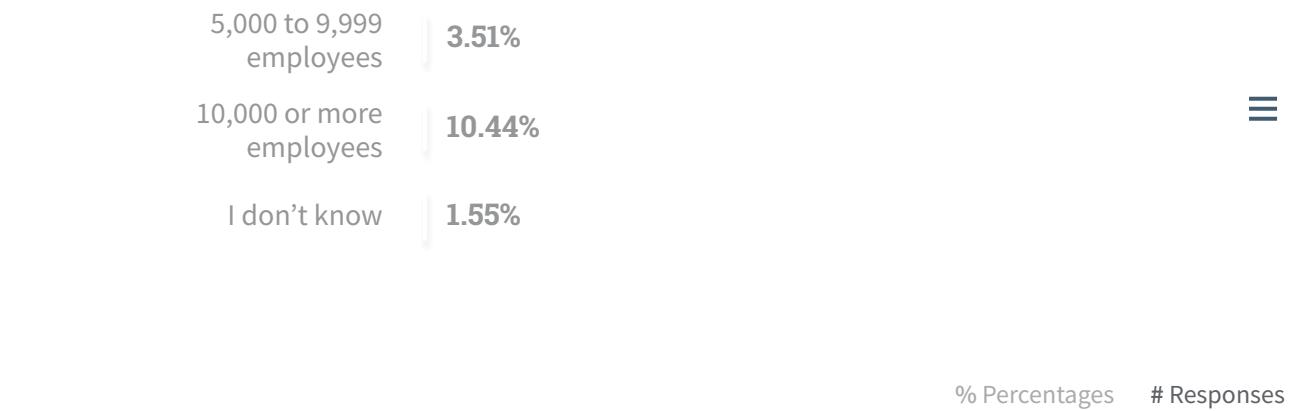
Company size



40% of respondents work for an organization that has less than 100 employees.

59,336 responses

Just me - I am a freelancer, sole proprietor, etc.	5.35%
2 to 9 employees	8.92%
10 to 19 employees	7.41%
20 to 99 employees	18.64%
100 to 499 employees	16.75%
500 to 999 employees	6.06%
1,000 to 4,999 employees	9.61%



? Approximately how many people are employed by the company or organization you currently work for? This should only include your primary company, and not the entire holding or parent company if that applies.

Work

Share

Salary

Salary by developer type



Senior roles like c-suite executives and engineering managers tend to have the highest salaries.

In Germany, engineering managers make comparable salaries to c-suite executives, and in the United States, United Kingdom, and Canada we see that Developer Experience professionals have as high or higher salaries than c-suite.

All Respondents	United States	India	46,411 resp Median yearly sa usD
Germany	United Kingdom	Canada	
Senior Executive (C-Suite, VP, etc.)	\$124,753.5		
Engineering manager	\$124,138		
Marketing or sales professional	\$116,000		
Engineer, site reliability	\$115,657		
Developer Experience	\$107,090		
Cloud infrastructure engineer	\$105,000		
Blockchain	\$103,743		
Developer Advocate	\$100,312.5		
Security professional	\$99,311		
Scientist	\$92,321		
Product manager	\$88,934		
Hardware Engineer	\$85,672		
Research & Development role	\$85,672		
Engineer, data	\$83,515		
Data scientist or machine learning specialist	\$80,317		
DevOps specialist	\$80,158.5		
Database administrator	\$78,686.5		
Developer, embedded applications or devices	\$77,104		
Developer, back-end	\$76,034		
Developer, full-stack	\$71,140		

Developer, game or graphics	\$71,007	
Developer, desktop or enterprise applications	\$70,759	
Developer, mobile	\$68,192.5	
Educator	\$65,269.5	
Developer, QA or test	\$63,927	
Project manager	\$63,183	
Data or business analyst	\$61,555	
Developer, front-end	\$59,970	
Designer	\$59,815	
System administrator	\$55,764	
Academic researcher	\$53,545	
Student	\$15,421	

\$ Median yearly salary (USD) # Responses

-  What is your current total **annual** compensation (salary, bonuses, and perks, before taxes and deductions)? Please enter a whole number in the box below, without any punctuation. If you are paid hourly, please estimate an equivalent yearly salary. If you prefer not to answer, please leave the box empty.

Salary and experience by developer type



Years of experience continues to be the determining factor in higher salaries. The three highest-paid roles have, on average, more than 11 years of experience.

46,242 resr





- ?
- What is your current total **annual** compensation (salary, bonuses, and perks, before taxes and deductions)? Please enter a whole number in the box below, without any punctuation. If you are paid hourly, please estimate an equivalent yearly salary. If you prefer not to answer, please leave the box empty.
-

Salary and experience by language



Zig developers are paid the most per years of experience compared to other languages (11 years average) with the same or more experience. Raku and Cobol developers have much more experience (19 years average) but make at least 25% less.

46,151 responses





Hover over each point for full details. Color scale is logarithmic.

- ?
- What is your current total **annual** compensation (salary, bonuses, and perks, before taxes and deductions)? Please enter a whole number in the box below, without any punctuation. If you are paid hourly, please estimate an equivalent yearly salary. If you prefer not to answer, please leave the box empty.
-

Work

Share

Purchasing technology

Influence on technology purchases



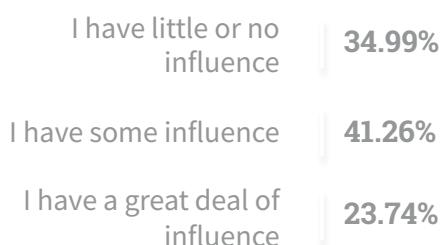
Similarly to last year, 66% of Professional Developers have at least some influence over their organization's purchases of new technologies.

Developer positions with the most influence are senior executives and engineering managers; 99% of senior-level positions have some or a great deal of influence when purchasing new technologies, followed by 86% of engineering managers.

All Respondents

By Developer Type

64,964 responses



% Percentages # Responses

What level of influence do you, personally, have over new technology purchases at your organization?

Short list or investigate new tech purchases



Most respondents investigate new technology purchases on their own (80%) instead of relying on a list provided to them.



All Respondents

By Developer Type

60,851 responses



% Percentages # Responses

- When thinking about new technology purchases at your organization, are you more likely to be given a short list of products/services to evaluate or be told to investigate on your own?

Researching new tools and technologies



Starting a free trial is the most common way to evaluate new tools and is up 2% among all respondents from last year's survey.

Full-stack and mobile developers prefer to start a free trial, while SRE and embedded application developers are more likely to ask a colleague/friend, indicating a need for different perspectives in the research process for certain roles.

All Respondents

By Developer Type

83,009 resp



Start a free trial	73.74%
Ask developers I know/work with	71.02%
Visit developer communities like Stack Overflow	64.11%
Read ratings or reviews on third party sites like G2 Crowd	33.64%
Ask a generative AI tool	15.39%
Research companies that have advertised on sites I visit	14.86%
Research companies that have emailed me	5.46%

% Percentages # Responses

When buying a new tool or software, how do you discover and research available solutions? Select all that apply.

Work

Share

Coding outside of work

Coding outside of work



Most Professional Developers code outside of work as a hobby (70%), but 37% code outside of work for professional development or self-paced learning from online courses.



73,764 responses



% Percentages # Responses

❓ Which of the following best describes the code you write outside of work? Select all that apply.

Community

Community is at the center of all that we do. Here we take a look at how people use Stack Overflow and how connected they feel to the community.

[Stack Overflow site use →](#)



Stack Overflow site use

Share



Visiting sites across Stack Overflow and Stack Exchange



Less than 1% of respondents have never visited Stack Overflow or the Stack Exchange Network. For those learning, it's 4%.

Developers learning to code are mostly using online resources, but are also more likely to use online courses to learn and get up-to-speed on questions they may ask or search for on Stack Overflow.

All Respondents

Professional Developers

87,973 responses

Learning to Code



❓ Which of the following Stack Overflow sites have you visited? Select all that apply. *

Frequency of visiting Stack Overflow



92.5% visit Stack Overflow at least weekly or a few times a month.

89,184 responses

Multiple times per day	13.4%
Daily or almost daily	24.81%
A few times per week	31.49%
A few times per month or weekly	22.78%
Less than once per month or monthly	5.23%

❓ How frequently would you say you visit Stack Overflow?

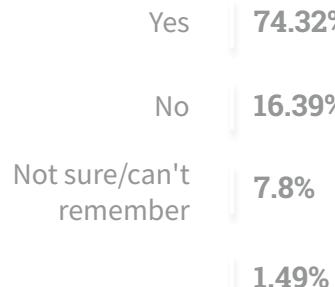
% Percentages # Responses



Have an account on Stack Overflow

Seven out of ten respondents have a Stack Overflow account.

89,184 resp



?

Do you have a Stack Overflow account?

% Percentages # Responses

Frequency of participation on Stack Overflow



Of those with a Stack Overflow account,
a majority (39%) are participating on the
site less than once per month or
monthly.

89,184 responses



- ?
- How frequently would you say you participate in Q&A on Stack Overflow? By participate we mean ask, answer, vote for, or comment on questions.

Feel like a part of the Stack Overflow community

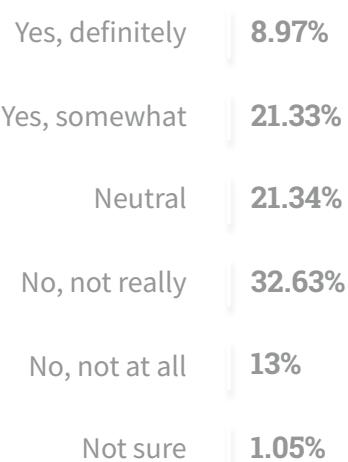


30% of respondents consider themselves “somewhat” or “definitely” a member of the Stack Overflow community. Of these respondents, 63% are between the ages of 25-44 and most likely have enough but not too much work experience to ask and answer questions compared to their more junior or senior counterparts.

All Respondents

By Age

89,184 responses



- ?
- Do you consider yourself a member of the Stack Overflow community?

Professional Developers

We asked Professional Developers to tell us about what impacts their productivity at work, how often it happens, and how much time that takes out of their day. We also asked them about the developer experience at work—do they have the processes, tools, and programs to make it easier to do their jobs?

Productivity impacts →
Developer Experience →



Productivity impacts

Share



Participation in Professional Developer series



49% of all respondents agreed to participate in this year's professional developer series, resulting in over 43,000 responses—6K more than last year.

89,184 responses



Would you like to participate in the Professional Developer Series? *

% Percentages # Responses

Individual contributor or people manager



The vast majority of respondents (86%) are individual contributors.

43,668 responses



People manager | **13.7%**



?

Are you an individual contributor or people manager?

% Percentages # Responses

Years of professional work experience



27% of respondents are 5-9 years into their professional careers.

This is inline with the majority response individual contributors (28% for 5-9 years), rather than people managers (21% for 5-9 years).

All Respondents

Individual Contributor

43,318 responses

People Manager

1 to 4 years | **23.81%**

5 to 9 years | **26.86%**

10 to 14 years | **18.55%**

15 to 19 years | **11.21%**

20 to 24 years | **8.39%**

25 to 29 years | **5.11%**

30 to 34 years | **2.73%**

35 to 39 years | **1.47%**



Industry



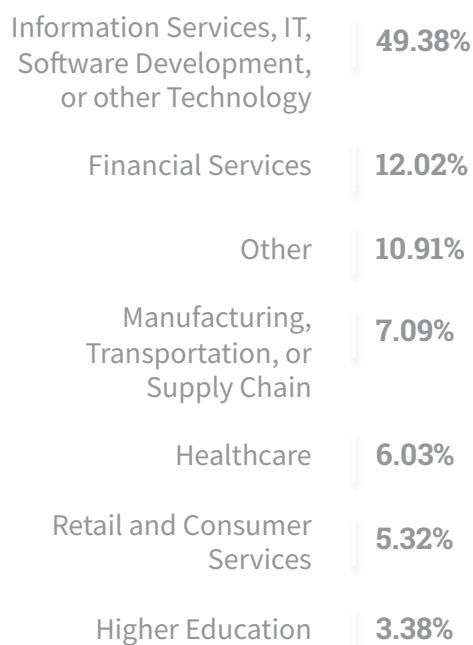
Most respondents are individual contributors and are in the IT industry (49%), followed by financial services and supply chain.

All Respondents

Individual Contributor

36,774 responses

People Manager



Advertising Services	2.14%	☰
Insurance	1.92%	
Oil & Gas	0.75%	
Legal Services	0.57%	
Wholesale	0.5%	

❓ What industry is the company you work for in?

% Percentages # Responses

Ability to find knowledge and information within their organization

83% of respondents agree or strongly agree that they have interactions outside of their immediate team. The collaboration among developers and coworkers to find solutions at work is strong.

People managers more so than individual contributors (75% vs 66%) agree or strongly agree that they know which system or resource to use to find the answers they need. Managers help remove blockers for their team so this makes sense.

Interactions with team members and managers aren't enough to help developers as more than half (53%) of developers agree or strongly agree that they are slowed down at work waiting on answers.

In a new question this year, we asked if people feel like they have what they need to quickly understand and work on any area of their company's code. About half of developers say they have what they need, which means that the other half don't feel confident they have what they need to quickly understand and work on a new area.

All Respondents

Individual Contributor

42,621 responses



?

Please rate your level of agreement with the following statement:

Frequency of productivity frictions



90% of developers interact with members outside their team at least once per week.

People Managers more frequently than individual contributors need help from members outside their team: 22% (vs. 12%) find themselves doing this three or more times per week.

All Respondents

Individual Contributor

42,066 resp



People Manager



?

How frequently do you experience each of the following?

Daily time spent searching for answers/solutions



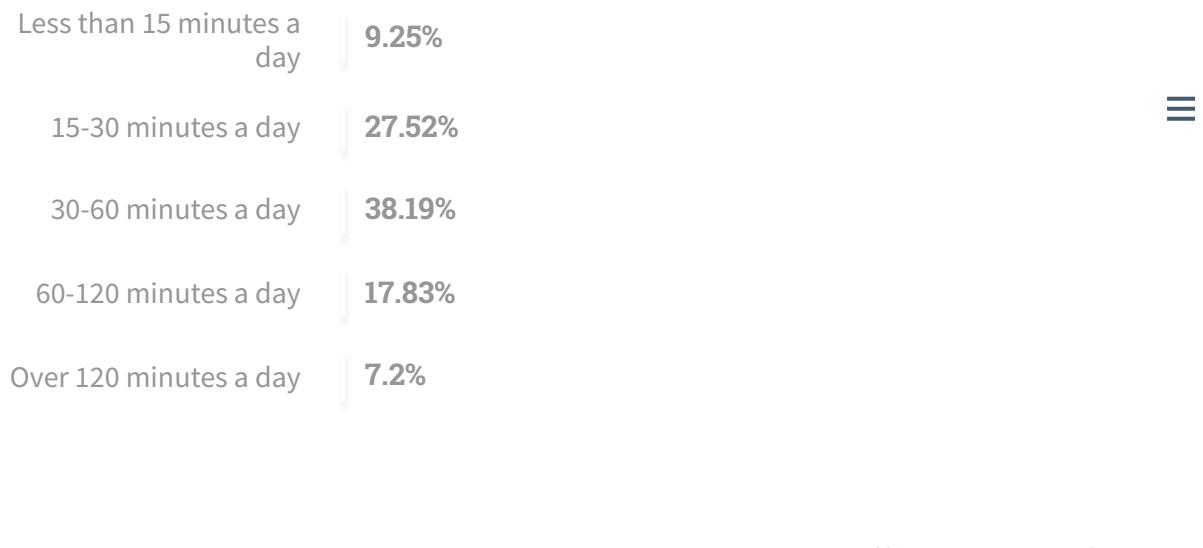
63% of all respondents spend more than 30 minutes a day searching for answers or solutions to problems. People managers are more likely to spend less time searching than individual contributors (42% vs. 36% spend 30 minutes or less).

All Respondents

Individual Contributor

42,778 responses

People Manager



- On an average day, how much time do you typically spend searching for answers or solutions to problems you encounter at work? (This includes time spent searching on your own, asking a colleague, and waiting for a response).
-

Daily time spent answering questions



49% of all respondents spend more than 30 minutes a day answering questions.

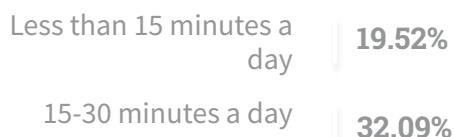
We would expect people managers are more likely to spend more time each day answering questions; 36% versus only 16% of individual contributors spend an hour or more answering questions.

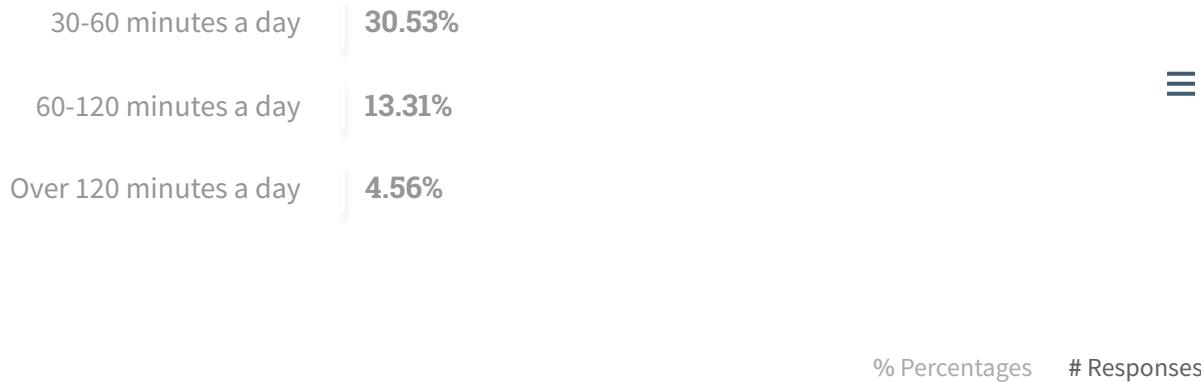
All Respondents

Individual Contributor

42,629 responses

People Manager





💡 On an average day, how much time do you typically spend answering questions you get asked at work?

Professional Developers

Share

Developer Experience

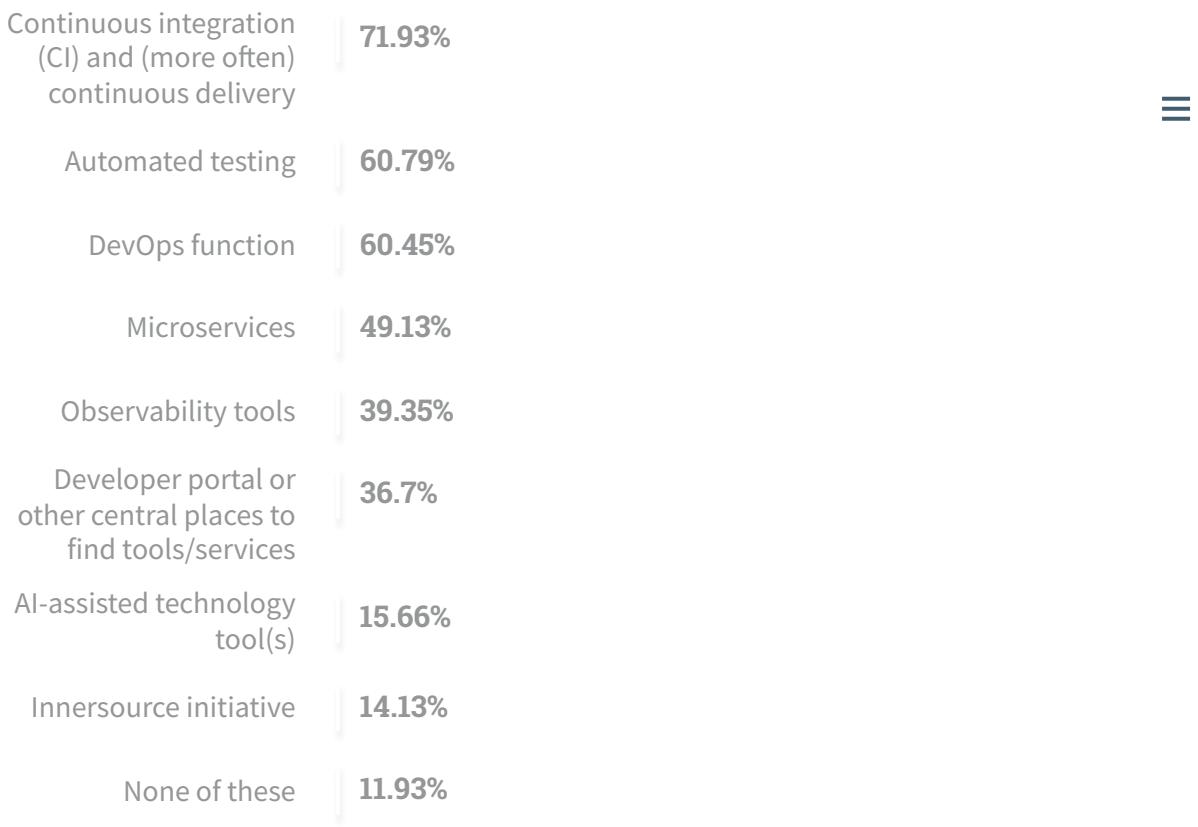
Developer Experience: Processes, tools, and programs within an organization

Most Professional Developers report having CI/CD, automated testing, and DevOps available at their organization.

16% of organizations have AI-assisted technology.

Slightly more developers report having observability tools than a developer portal to make it easy to find tools and services (39% vs. 37%).

41,783 responses



?

My company has:

% Percentages # Responses

Methodology

How we planned and analyzed our survey



General →

Feedback →

Participants →



Methodology

Share

General

This report is based on a survey of 89,184 software developers from 185 countries around the world. This is the number of responses we consider “qualified” for analytical purposes based on consenting to share their information in this survey and finishing all the required questions; approximately 2,000 responses were not included in this analysis.

The survey was fielded from May 8, 2023 to May 19, 2023.



The median time spent on the survey for qualified responses was almost 18 minutes, an increase we expected this year because of additional questions asked.

Respondents were recruited primarily through channels owned by Stack Overflow. The top sources of respondents were onsite messaging, blog posts, email/newsletter subscribers, banner ads, and social media posts. Since respondents were recruited in this way, highly-engaged users on Stack Overflow were more likely to notice the prompts to take the survey over the duration of the collection promotion.

Due to United States transport/export sanctions, our survey was, unfortunately, inaccessible to prospective respondents in Crimea, Cuba, Iran, North Korea, and Syria, due to the traffic being blocked by our third-party survey software. While some respondents used VPNs to get around the block, the limitation should be kept in mind when interpreting survey results.

Many questions were only shown to respondents based on their previous answers. For example, questions about jobs and work were only shown to those who said they were working in a job.

We asked respondents about their salaries. First, we asked what currency each respondent typically used. Then we asked the respondents what their salary was in that currency annually.

We converted salaries from user currencies to USD using the exchange rate on June 2, 2023.

The salary question, like most on the survey, was optional. There were 48,026 respondents who gave us salary data. Salary comparisons in the Technology section bring in all salaries provided by respondents that were associated with having worked with a particular programming language. Salary comparisons in the Work section only compare salaries for those that indicated their developer role, excluding write-in responses, regardless of whether they provided a salary.

Less than 1% of salaries inside and outside of the US were excluded because they exceeded threshold values.





To identify which technologies to include in the survey this year, included those used in the previous year and added popular ones written in as "Other". We submitted this list to our Meta community to solicit feedback and finalize a collection of technologies.

The questions were organized into several blocks of questions, which were randomized in order.

Free form text responses are primarily used to influence future survey choices but are not included in the published results.

Corrections to the results site since June 13, 2023: Updated the salary filter for sample size so that subsets of 30 or less are filtered from results, updated the AI section for 'AI Tools next year' as it was erroneously displaying professional coder responses in the all respondents tab, and updated Professional Developers section to display a new question this year for industry.

Methodology

Share

Feedback

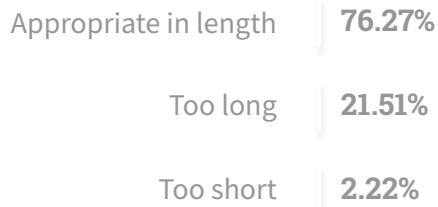
How do you feel about the length of the survey this year?



The majority of respondents felt like this year's survey was an appropriate length.



86,485 responses



?

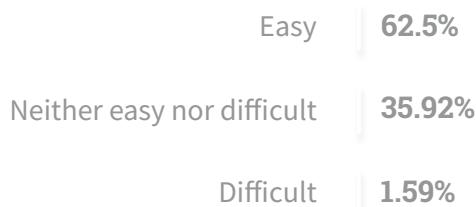
How do you feel about the length of the survey this year?

% Percentages # Responses

How easy or difficult was this survey to complete?

2% of respondents felt like this year's survey was difficult.

86,554 responses



?

How easy or difficult was this survey to complete?

% Percentages # Responses

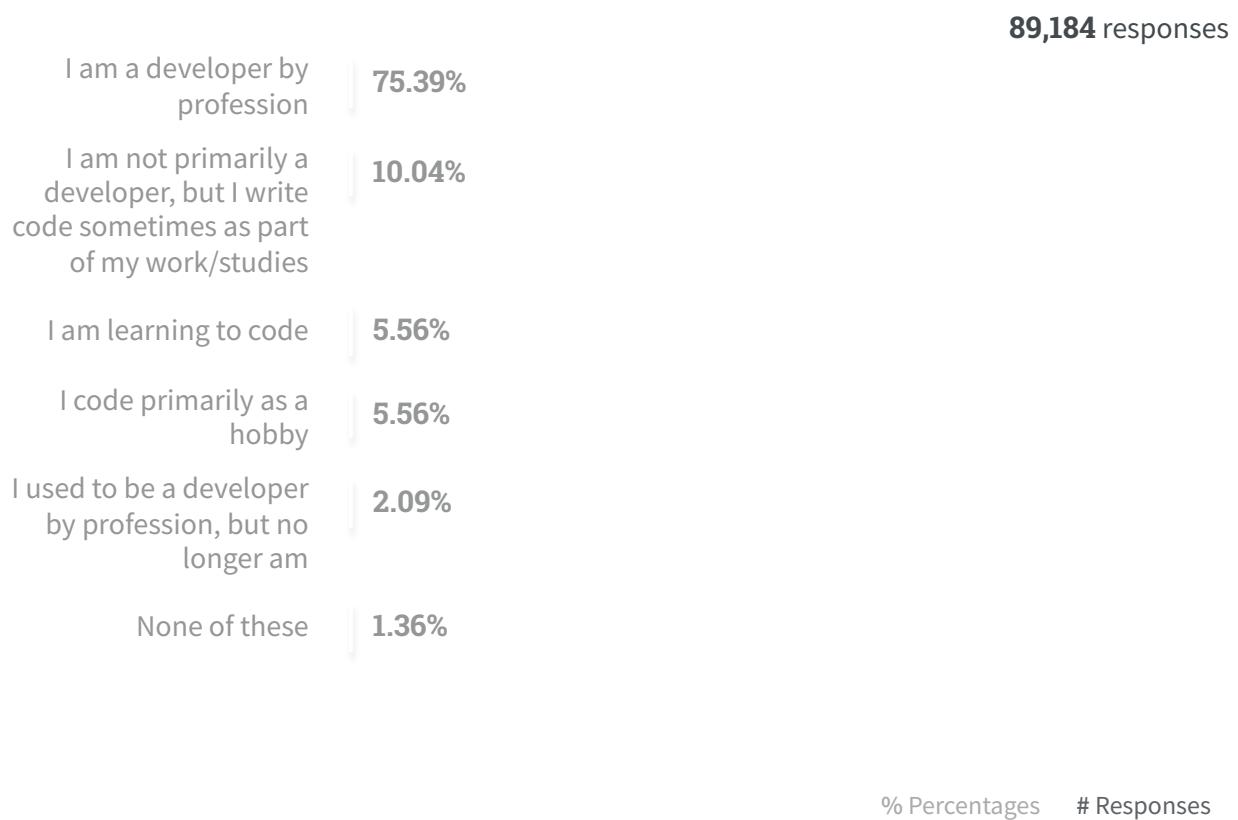
Participants



Who participated in this survey



Similar to previous years the overwhelming majority of respondents are a developer by profession.



- ? Which of the following options best describes you today? For the purpose of this survey, a developer is "someone who writes code". *