Insights › Developer Survey

2021

In May 2021 over 80,000 developers told us how they learn and level up, which tools they're using, and what they want.

Read the overview →

Methodology →

Overview

The questions we ask in our annual survey will help us improve the Stack Overflow community and the platform that serves them.

This year, for example, we observed a significant evolution in the way developers educate themselves. For the rising cohort of coders under the age of 18, online resources like videos and blogs are more popular than books and school combined, a statistic that doesn't hold for any of our other age cohorts. Overall, the profession is full of new joiners, with more than 50% indicating they have been coding for less than a decade, and more than 35% having less than five years in the trade.

The challenge and opportunity for us is to continue expanding and improving our ability to help all developers and to make them feel welcome in our community.

Read on for more great insights about the attitudes, tools, and environments that are shaping the art and practice of software today.

It is no surprise that almost 60% of respondents learned how to code from online resources. Younger respondents tend to learn from online courses, forums, and other online resources. Older respondents, on the other hand, learned from more traditional mediums like school and books.

Learning how to code →

AWS maintains its lead as the most widely used cloud platform, but Google Cloud and Microsoft Azure made substantial gains from last year. It is worth noting that this is the first year that we broke out cloud platforms from our general platforms question.

Cloud platforms →

This year, React.js surpassed jQuery as the most commonly used web framework.

Web frameworks →

Newcomer Svelte takes the top spot as the most loved framework. React is the most wanted, desired by one in four developers.

Web frameworks   →

Perl moves from being the highest-paid language last year to the fifth highest-paid this year. Clojure developers have the highest median salary, 14k more than second place which belongs to F#.

Top paying technologies   →

81% of professional developers are employed full-time, a decrease from 83% in 2020. The percentage of professional developers saying they were independent contractors, freelancers, or self-employed increased from 9.5% in 2020 to 11.2% in 2021 - indicating potential job insecurity or a shift to more flexible work arrangements.

Employment status   →

Developer Profile

What we know about the global community of developers

Key territories →

Experience →

Developer roles →

Education →

Demographics →

Developer Profile

Share

Key territories

Stack Overflow serves the international community, and our survey received responses from almost every country on Earth.

Geography

≡

The United States and India continue to provide the highest volume of survey responses, followed by Germany and UKI (UK and Ireland). The top ten countries account for almost 60% of all respondents. To see the top ten countries, refer to the methodology section. When we zoom into the United States (our top-responding country), we see that the states with established tech hubs have the most respondents: California, New York, Washington, and Texas.
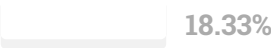
Top 10 Countries

All Countries

United States

49,116 responses

United States of America

18.33%

India

12.61%

Germany

6.75%

United Kingdom of Great Britain and Northern Ireland

5.37%

Canada

3.61%

France

3.25%

Brazil

2.7%

Poland

2.16%

Netherlands

2.13%

Italy

2%

? Where do you live? *   % Percentages   # Responses

Developer Profile   Share

Experience

Senior executives and managers tend to have the most years of coding experience, while those working in data science and machine learning tend to have the least, on average less than even an academic researcher.

Writing that first line of code

Coders start young: over 50% of respondents wrote their first line of code between the ages of 11 to 17.

83,243 responses

Younger than 5 years

1.09%

5 - 10 years

14.08%

11 - 17 years

53.06%

18 - 24 years

24.1%

25 - 34 years

5.04%

35 - 44 years

1.58%

45 - 54 years

0.65%

55 - 64 years

0.29%

Older than 64 years

0.1%

% Percentages   # Responses

❓ At what age did you write your first line of code or program? (e.g., webpage, Hello World, Scratch project)
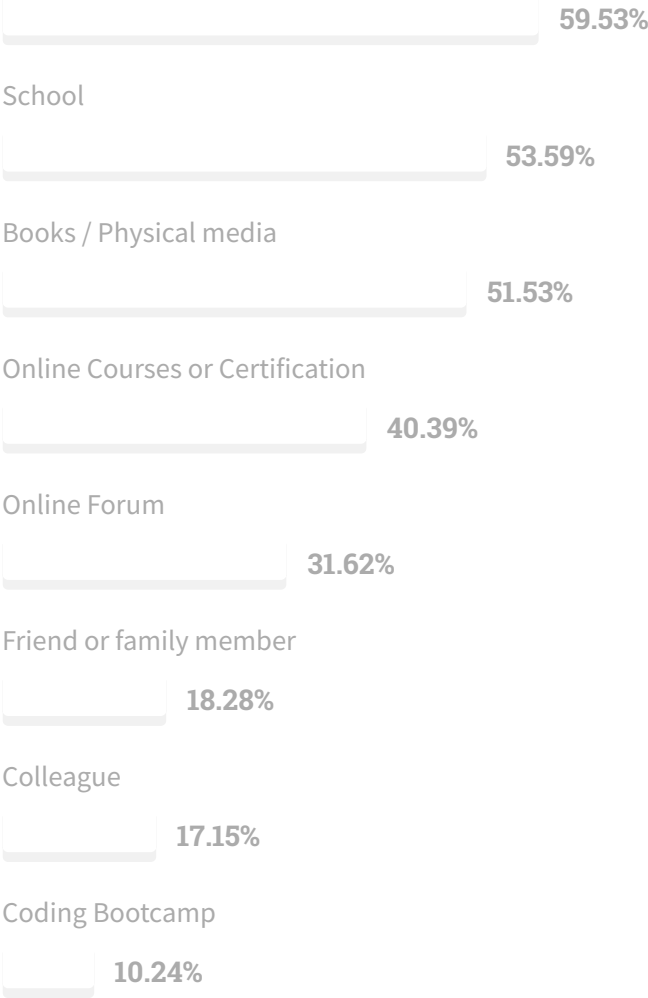
Learning how to code

It is no surprise that almost 60% of respondents learned how to code from online resources. Younger respondents tend to learn from online courses, forums, and other online resources. Older respondents, on the other hand, learned from more traditional mediums like school and books.

All Respondents

By Age

82,963 responses

Other online resources (videos, blogs, etc)

59.53%

School

53.59%

Books / Physical media

51.53%

Online Courses or Certification

40.39%

Online Forum

31.62%

Friend or family member

18.28%

Colleague

17.15%

Coding Bootcamp

10.24%

[?] How did you learn to code? Select all that apply.

% Percentages　　**# Responses**

Years coding

50% of respondents have been coding for ten years or less. Respondents from the United Kingdom, on average, have the most years coding out of our top ten countries.
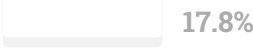

All Respondents

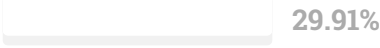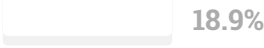Average by Top 10 Countries

81,641 responses

Less than 1 year

1.82%

1 to 4 years

17.8%

5 to 9 years

29.91%

10 to 14 years

18.9%

15 to 19 years

10.4%

20 to 24 years

8.17%

25 to 29 years

4.48%

30 to 34 years

3.41%

35 to 39 years

2.65%

40 to 44 years

1.75%

45 to 49 years

0.41%

More than 50 years

0.28%

Including any education, how many years have you been coding in total?

% Percentages   # Responses

Years coding professionally

A majority of respondents have been working for ten or less years as a professional developer, meaning they've never worked in a world without Stack Overflow.
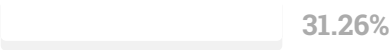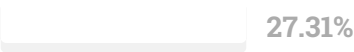
≡

61,216 responses

Less than 1 year

4.41%

1 to 4 years

31.26%

5 to 9 years

27.31%

10 to 14 years

15.36%

15 to 19 years

8.29%

20 to 24 years

6.88%

25 to 29 years

2.99%

30 to 34 years

1.83%

35 to 39 years

0.95%

40 to 44 years

0.49%

45 to 49 years

0.12%

More than 50 years

0.1%

% Percentages   # Responses

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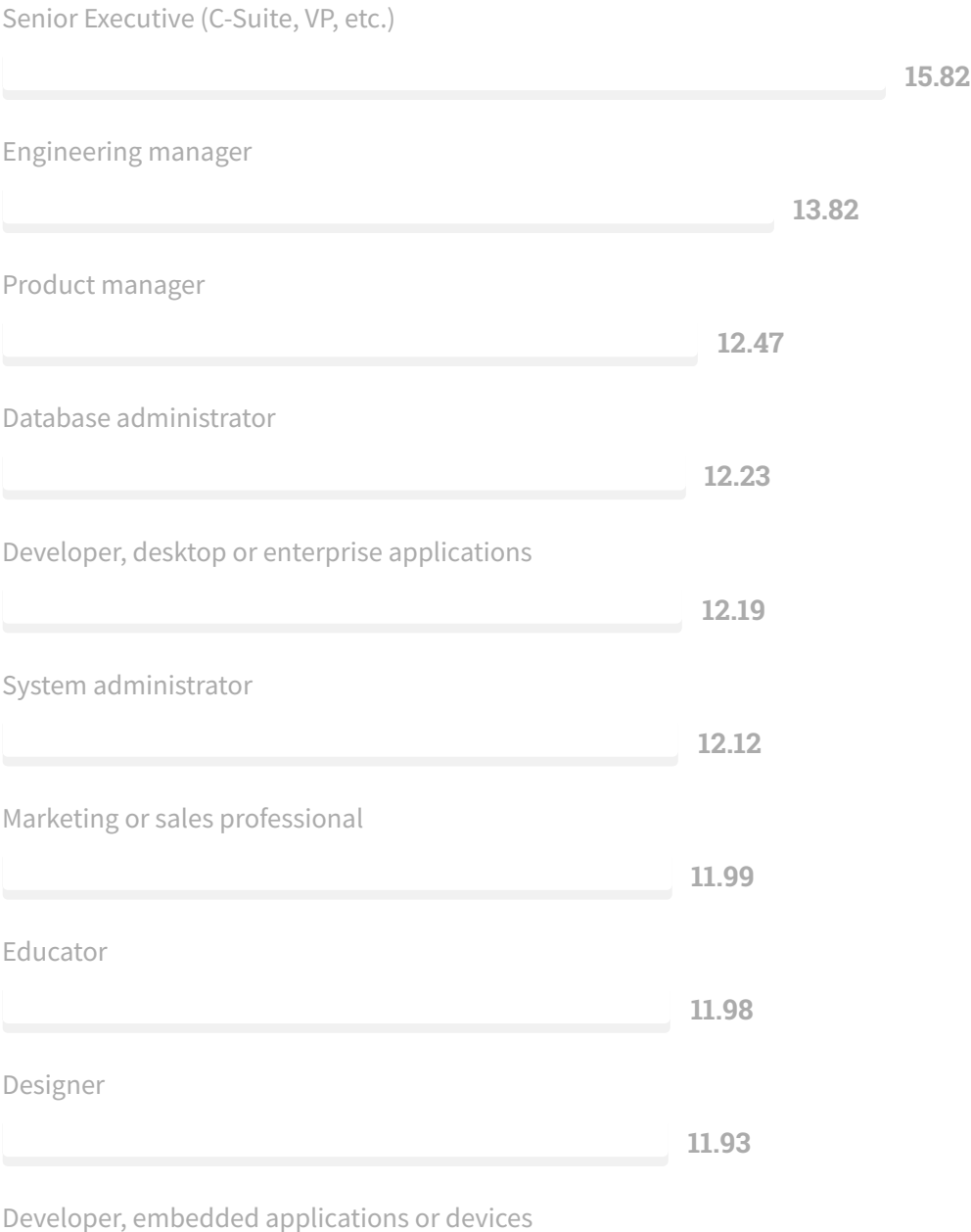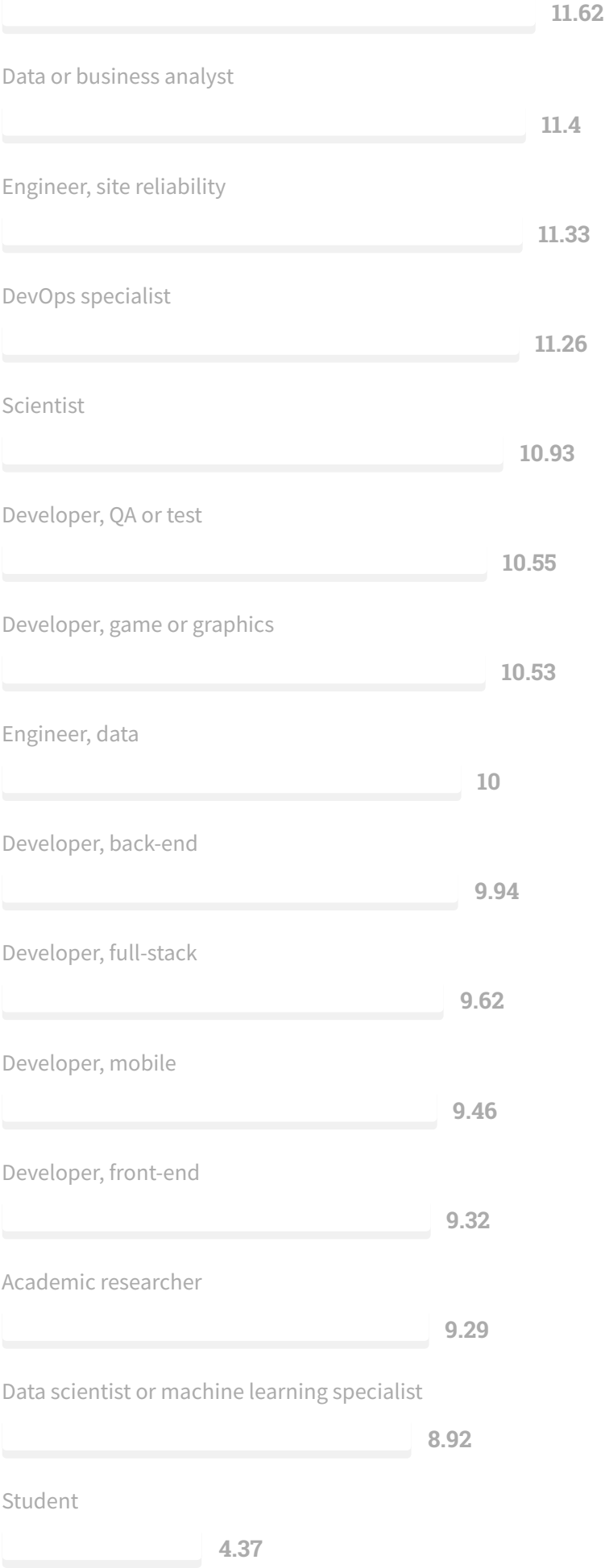
≡

Years of professional coding experience by developer type

Developers in more senior roles have the most years of coding professionally. Data scientists and machine learning specialists, meanwhile, have the least experience, with fewer years than academic researchers.

61,216 responses

Senior Executive (C-Suite, VP, etc.)

15.82

Engineering manager

13.82

Product manager

12.47

Database administrator

12.23

Developer, desktop or enterprise applications

12.19

System administrator

12.12

Marketing or sales professional

11.99

Educator

11.98

Designer

11.93

Developer, embedded applications or devices

11.62

Data or business analyst

11.4

Engineer, site reliability

11.33

DevOps specialist

11.26

Scientist

10.93

Developer, QA or test

10.55

Developer, game or graphics

10.53

Engineer, data

10

Developer, back-end

9.94

Developer, full-stack

9.62

Developer, mobile

9.46

Developer, front-end

9.32

Academic researcher

9.29

Data scientist or machine learning specialist

8.92

Student

4.37

Average Years Coding Professional   # Respc

≡

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

Developer Profile   Share

Developer roles

People holding full stack developer roles are the most prevalent. Interestingly, the role of designer has fallen since last year, swapping spots with system administrators.
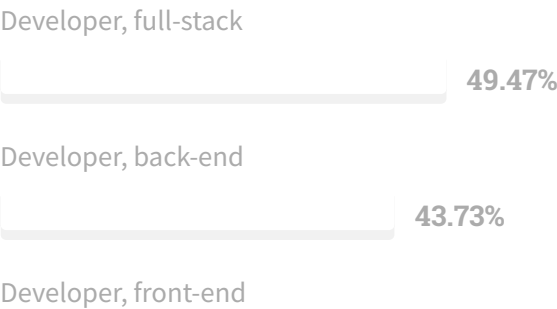
Developer type

Full stack, back-end, front-end, and desktop developers continue to account for the majority of all respondents.

All Respondents

United States

66,484 responses

Developer, full-stack

49.47%

Developer, back-end

43.73%

Developer, front-end

27.42%

Developer, desktop or enterprise applications

16.6%

Developer, mobile

14.74%

DevOps specialist

10.62%

System administrator

9.14%

Database administrator

8.51%

Designer

6.94%

Developer, embedded applications or devices

6.92%

Data scientist or machine learning specialist

6.43%

Student

6.3%

Engineer, data

6.28%

Engineering manager

5.73%

Data or business analyst

5.7%

Developer, QA or test

5.43%

Product manager

4.62%

Academic researcher

4.36%

Engineer, site reliability

3.68%

Educator

3.56%

Developer, game or graphics

3.18%

Senior Executive (C-Suite, VP, etc.)

3.16%

Scientist

3.03%

Marketing or sales professional

0.96%

[?] Which of the following describes your current job? Please select all that apply.　　　% Percentages　　**# Responses**

Developer Profile　　　　　　　　　　　　　　　　　Share

Education

Developers are a highly educated bunch, with more than 65% holding a bachelor's degree or higher. But a traditional university education isn't everything, and around a quarter of respondents have less than a bachelor's degree.

Educational attainment

70% of all respondents and 80% of professional developers have completed some form of higher education, a bachelor's degree being the most common.

≡

All Respondents

Professional Developers

83,439 responses

Primary/elementary school

2.97%

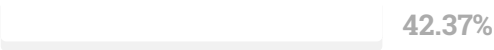Secondary school (e.g. American high school, German Realschule or Gymnasium, etc.)

11.43%

Some college/university study without earning a degree

12.69%

Associate degree (A.A., A.S., etc.)

2.67%

Bachelor's degree (B.A., B.S., B.Eng., etc.)

42.37%

Master's degree (M.A., M.S., M.Eng., MBA, etc.)

20.99%

Professional degree (JD, MD, etc.)

1.51%

Other doctoral degree (Ph.D., Ed.D., etc.)

3.08%

Something else

1.92%

% Percentages   **# Responses**

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

Developer Profile

Demographics

Roughly a third of respondents responded to our question on mental health. This is twice the percentage that offered feedback in 2020 and may reflect the growing awareness of mental health's importance and the impact of the ongoing pandemic.

Age

🔗

48% of professional developers are 25-34 years old. Almost half of the respondents 65 years or older do not consider themselves professional developers.

All Respondents

Professional Developers

82,407 responses

Under 18 years old

6.52%

18-24 years old

25.47%

25-34 years old

39.52%

35-44 years old

18.42%

45-54 years old

6.64%

55-64 years old

2.21%

65 years or older

0.51%

Prefer not to say

0.7%
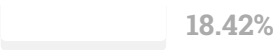
? What is your age?　　　　　　　　　　% Percentages　　# Responses

Gender

91% of all respondents and 92% of professional developers identify as a man. The United States has the highest percentage of gender minorities (Woman, Non-binary, genderqueer, or gender non-conforming). We have considerable work to do to ensure our platform is inclusive and that our survey is representative of developers everywhere.
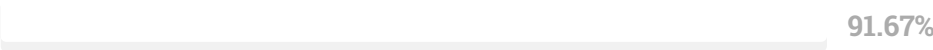
All Respondents

Professional Developers

Gender Minorities by Country

82,286 responses

Man

91.67%

Woman

5.31%

Prefer not to say

1.75%

Non-binary, genderqueer, or gender non-conforming

1.42%

Or, in your own words:

0.92%

≡

⍰ Which of the following describe you, if any? Please check all that apply.   % Percentages   # Responses
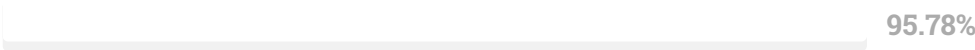
Transgender   ⌘

Only 1% of respondents identify as transgender, half of them being professional developers.

All Respondents

Professional Developers

80,678 responses

No

95.78%

Prefer not to say

2.19%

Yes

1.28%

Or, in your own words:

0.75%

⍰ Do you identify as transgender?   % Percentages   # Responses

Sexual orientation

≡

11.5% of respondents identify as something other than straight / heterosexual, with 6.5% preferring not to identify with any orientation. There's still so much work to be done to ensure the developer community is more inclusive.

All Respondents

Professional Developers

73,366 responses

Straight / Heterosexual

84.52%

Prefer not to say

6.52%

Bisexual

5.36%

Gay or Lesbian

2.39%
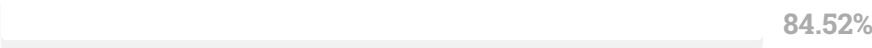
Prefer to self-describe:

2.29%

Queer

1.5%

[?] Which of the following describe you, if any? Please check all that apply.   % Percentages   # Responses

---

Race and ethnicity

We continue to see evidence that people of color are underrepresented among professional developers.

☰

All Respondents

Professional Developers

79,464 responses

White or of European descent

58.43%

South Asian

11.6%

Hispanic or Latino/a/x

7.01%

Middle Eastern

5.31%

Southeast Asian

5.14%

East Asian

4.7%

Prefer not to say

3.85%

Or, in your own words:

3.67%

Black or of African descent

3.38%

I don't know

3.38%

Multiracial

1.66%

Biracial

1.18%

Indigenous (such as Native American, Pacific Islander, or Indigenous Australian)

0.72%

☰

? Which of the following describe you, if any? Please check all that apply.

% Percentages   # Responses

Disability status

🔗

2,960 respondents have a physical difference, with the majority of these respondents being blind or having difficulty seeing.

2,960 responses

I am blind / have difficulty seeing

1.6%

Or, in your own words:

1.24%

I am deaf / hard of hearing

0.77%

I am unable to / find it difficult to walk or stand without assistance

0.42%

I am unable to / find it difficult to type

0.41%

? Which of the following describe you, if any? Please check all that apply.

% Percentages   # Responses

Mental health

≡

Over 16,000 respondents replied to our question on mental health, with almost 10% of all respondents indicating they deal with anxiety.

16,529 responses

I have an anxiety disorder

9.53%

I have a mood or emotional disorder (e.g. depression, bipolar disorder)

8.94%

I have a concentration and/or memory disorder (e.g. ADHD)

8.51%

I have autism / an autism spectrum disorder (e.g. Asperger's)

3.7%

Or, in your own words:

1.81%

[?] Which of the following describe you, if any? Please check all that apply.   % Percentages   **# Responses**

Technology

Technology

Each year we explore the tools and technologies developers are currently using. And, as always, we ask them what technologies are most Loved, Dreaded, and Wanted across several categories.

This year we also introduced a new section, Worked With vs. Want to Work With, which shows us precisely what developers used in the past year and what they want to work on in the following year. If you need a refresher on how we structure Loved, Dread and Wanted, or if you want to read about the intuition behind Worked With vs. Want to Work With, check out this post our meta post.

Most popular technologies →

Most loved, dreaded, and wanted →

Worked with vs. want to work with →

Learning & problem solving →

Top paying technologies →

Technology   Share

Most popular technologies

Python passed SQL to become our third most popular technology, and Node.JS moves to the sixth most popular technology.
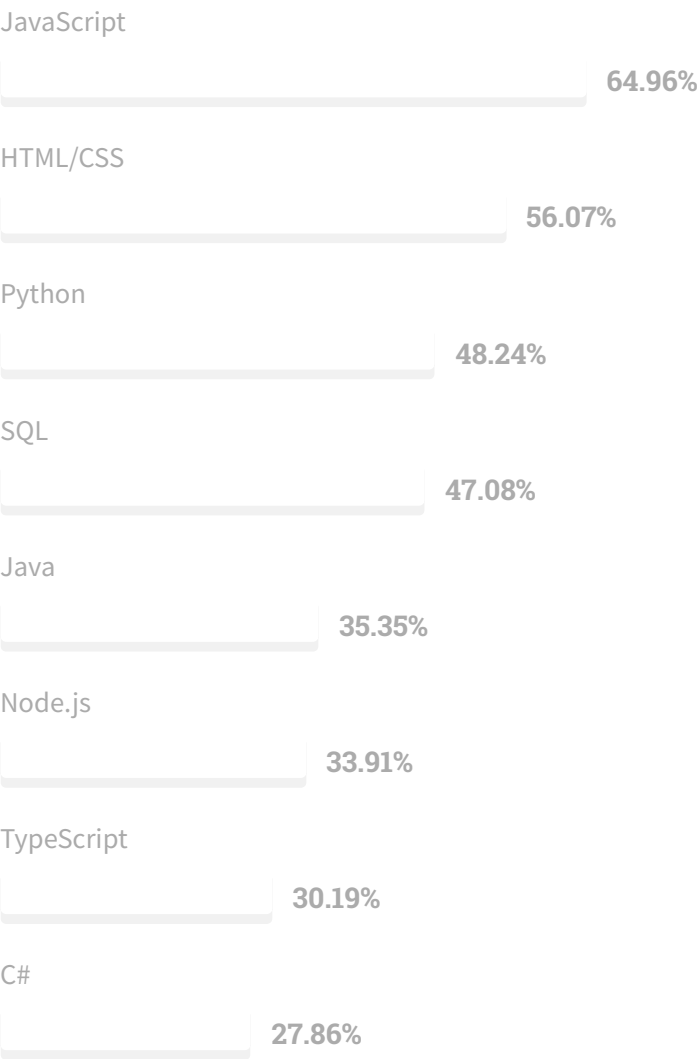
☰

Programming, scripting, and markup languages

⌗

JavaScript completes its ninth year in a row as the most commonly used programming language. For most developers, programming is web programming. Python traded places with SQL to become the third most popular language.

All Respondents

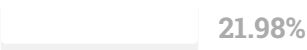Professional Developers

83,052 responses

JavaScript

64.96%

HTML/CSS

56.07%

Python

48.24%

SQL

47.08%

Java

35.35%

Node.js

33.91%

TypeScript

30.19%

C#

27.86%

Bash/Shell

27.13%

C++

24.31%

PHP

21.98%

C

21.01%

PowerShell

10.75%

Go

9.55%

Kotlin

8.32%

Rust

7.03%

Ruby

6.75%

Dart

6.02%

Assembly

5.61%

Swift

5.1%

R

5.07%

VBA

4.66%

Matlab

4.66%

Groovy

3.01%

Objective-C

2.8%

Scala

2.6%

Perl

2.46%

Haskell

2.12%

Delphi

2.1%

Clojure

1.88%

Elixir

1.74%

LISP

1.33%

Julia

1.29%

F#

0.97%

Erlang

0.79%

APL

0.65%

Crystal

0.56%

COBOL

0.53%

% Percentages   # Respc

? 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

The most common databases are consistent between all respondents and professional developers. The only difference we observed is that professional developers are slightly more likely to use Microsoft SQL Server over MongoDB.

All Respondents

Professional Developers

73,317 responses

MySQL

50.18%

PostgreSQL

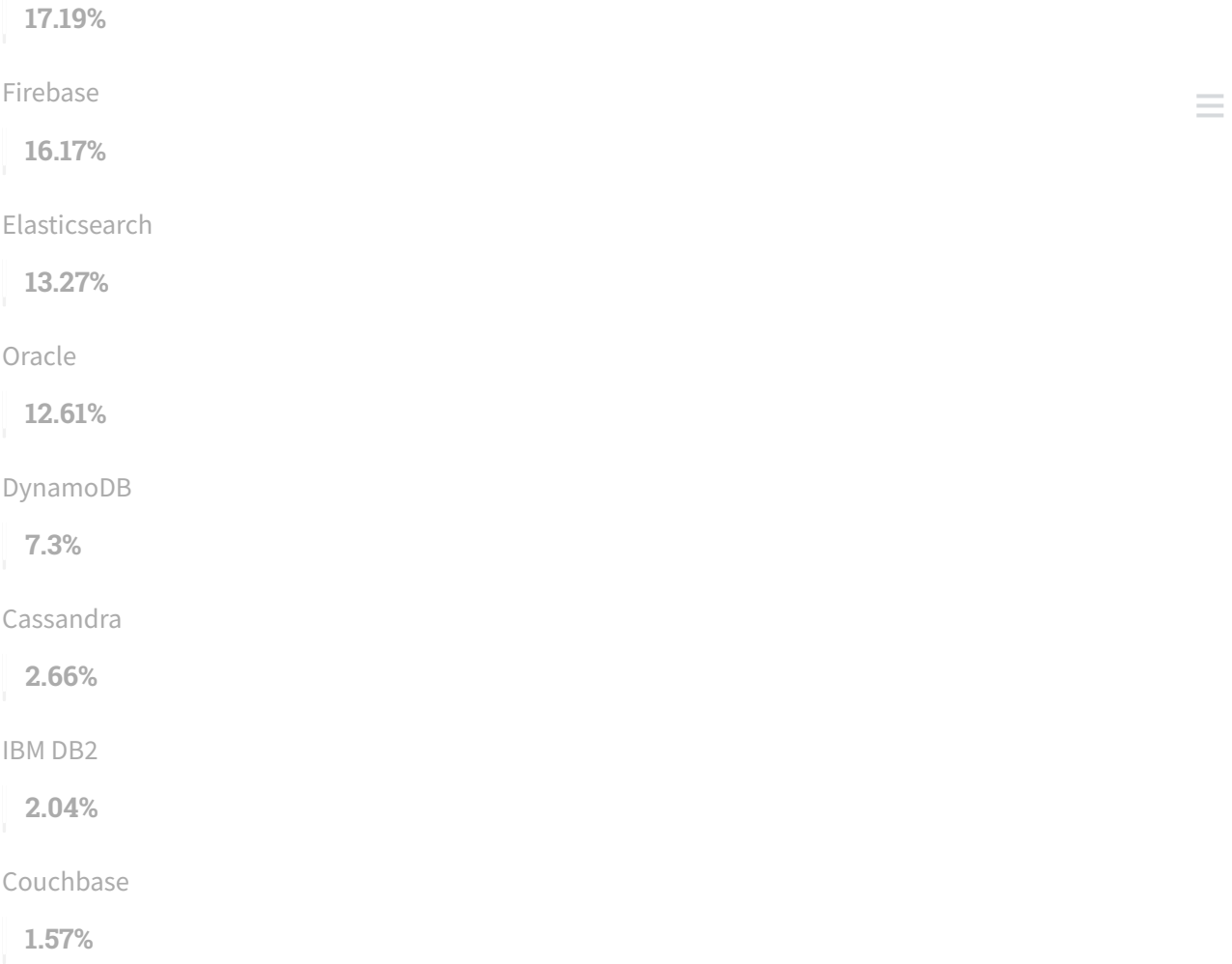**40.42%**

SQLite

32.18%

MongoDB

27.7%

Microsoft SQL Server

26.87%

Redis

20.69%

MariaDB

17.19%

Firebase

16.17%

Elasticsearch

13.27%

Oracle

12.61%

DynamoDB

7.3%

Cassandra

2.66%

IBM DB2

2.04%

Couchbase

1.57%

% Percentages   **# Responses**

[?] 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 maintains its lead as the most widely used cloud platform, but Google Cloud and Microsoft Azure made substantial gains from last year. It is worth noting that this is the first year that we broke out cloud platforms from our general platforms question.

All Respondents

Professional Developers

62,061 responses　　　　　　　　　　　　　　　☰

AWS

54.22%

Google Cloud Platform

31.05%

Microsoft Azure

30.77%

Heroku

24%

DigitalOcean

17.67%

IBM Cloud or Watson

2.55%

Oracle Cloud Infrastructure

1.89%

% 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　　　　　　　　　　　　🔗

This year, React.js surpassed jQuery as the most commonly used web framework.

All Respondents

Professional Developers

67,593 responses

React.js

40.14%

jQuery

34.42%

Express

23.82%

Angular

22.96%

Vue.js

18.97%

ASP.NET Core

18.1%

Flask

16.14%

ASP.NET

15.74%

Django

14.99%

Spring

14.56%

Angular.js

11.49%

Laravel

10.12%

Ruby on Rails

7.04%

Gatsby

3.97%

FastAPI

3.88%

Symfony

3.85%

Svelte

2.75%

Drupal

2.39%

% Percentages   # Responses

[?] Which **web 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 frameworks and libraries

The .NET framework gets the most love in other technologies, though several data science libraries for Python make strong showings.

All Respondents
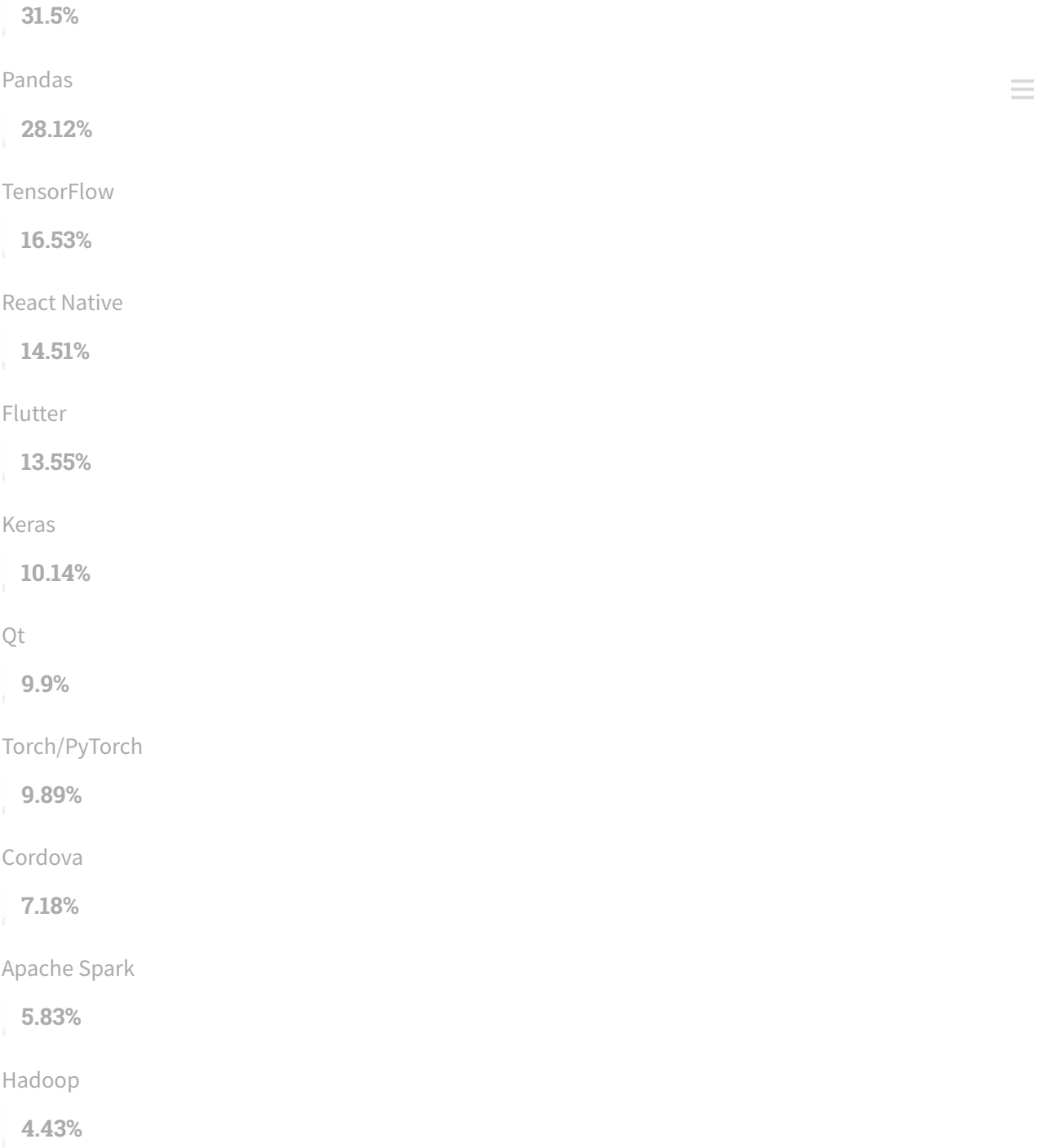
Professional Developers

59,921 responses

.NET Framework

34.2%

NumPy

33.84%

.NET Core / .NET 5

31.5%

Pandas

☰

28.12%

TensorFlow

16.53%

React Native

14.51%

Flutter

13.55%

Keras

10.14%

Qt

9.9%

Torch/PyTorch

9.89%

Cordova

7.18%

Apache Spark

5.83%

Hadoop

4.43%

% 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

Over 90% of respondents use Git, suggesting that it is a fundamental tool to being a developer.

≡

All Respondents

Professional Developers

76,253 responses

Git

93.43%

Docker

48.85%

Yarn

17.73%

Kubernetes

16.6%

Unity 3D

9.88%

Ansible

7.68%

Terraform

7.46%

Xamarin

3.9%

Unreal Engine

3.21%

Puppet

1.8%

Deno

1.41%

Chef

1.35%

Flow

1.27%

≡

Pulumi

0.5%

% Percentages   **# Responses**

[?] Which **tools** 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 has a significant lead as the IDE of choice across all developers.

All Respondents

Professional Developers

82,277 responses

Visual Studio Code

71.06%

Visual Studio

33.03%

Notepad++

29.71%

IntelliJ

28.74%

Vim

24.19%

Android Studio

22.22%

Sublime Text

20.47%

PyCharm

19.29%

Eclipse

15.87%

Atom

12.94%

IPython/Jupyter

12.63%

Xcode

11.07%

Webstorm

8.04%

PHPStorm

7.47%

NetBeans

7.15%

Emacs

5.3%

Neovim

4.99%

Rider

3.99%

RStudio

3.92%

RubyMine

1.49%
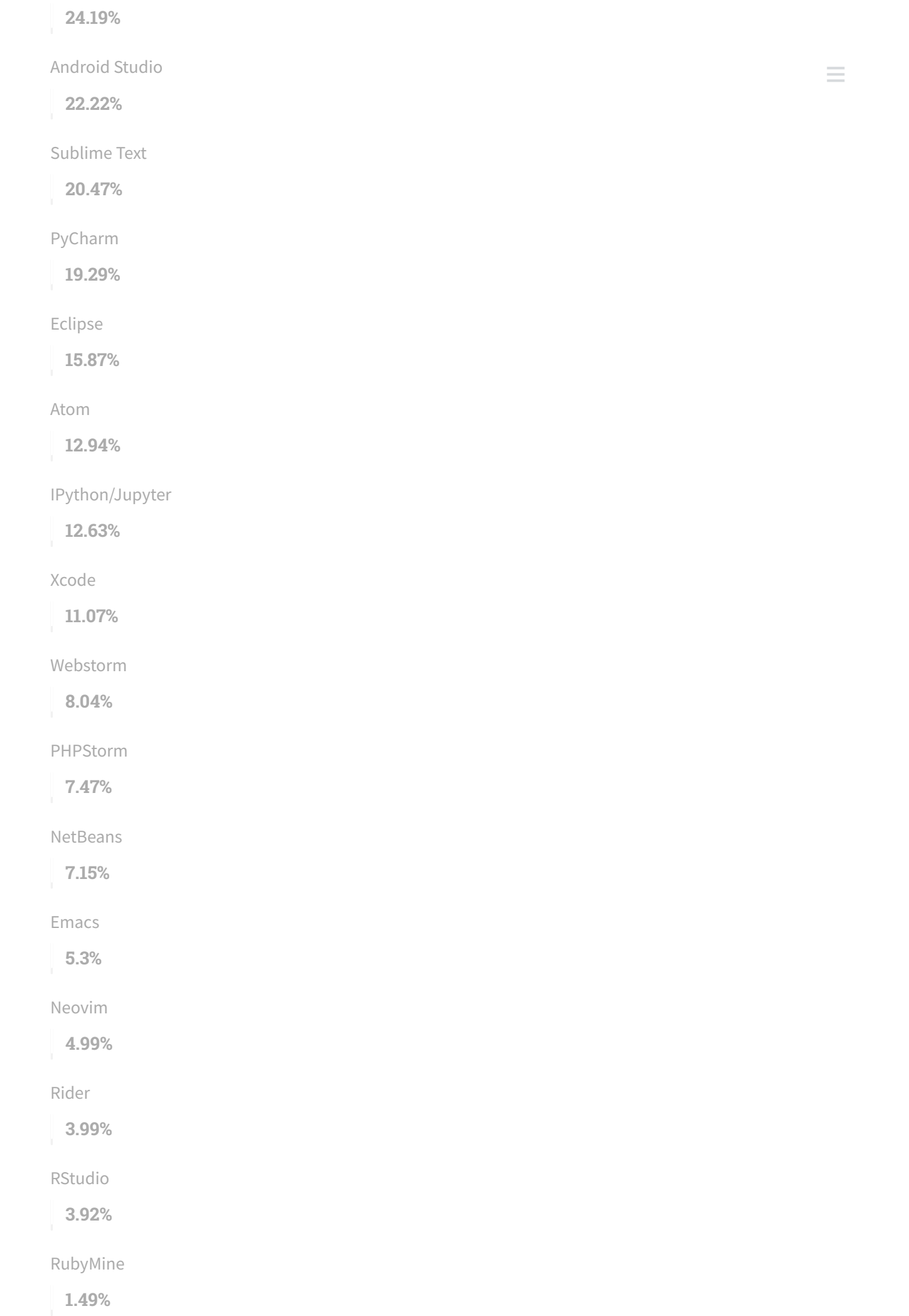
TextMate

0.83%

≡

% Percentages　　# Responses

❓ 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.

Operating system

🔗

Windows continues to be the most popular operating system, though slightly less so among
professional developers. This year was also the first time we added WSL as an option.

All Respondents

Professional Developers

82,719 responses

Windows

45.33%

Linux-based

25.32%

MacOS

25.19%

Windows Subsystem for Linux (WSL)

3.29%

BSD

0.18%

Technology

Share

Most loved, dreaded, and wanted

Rust reigns supreme as most loved. Python and Typescript are the languages developers want to work with most if they aren't already doing so.

Programming, scripting, and markup languages

For the sixth-year, Rust is the most loved language, while Python is the most wanted language for its fifth-year.

Loved vs. Dreaded

Want

82,914 responses

☰

[?] 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

Redis is in its fifth year as the most loved database. PostgreSQL barely passes MongoDB with less than a percent as the most wanted database. And IBM DB2 is on its second year in a row as the most dreaded database.

Loved vs. Dreaded

Want

72,517 responses

☰

[?] 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.)

Platforms   🔗

AWS is leading as not only the most loved cloud platform but also the most wanted.

Loved vs. Dreaded

Want

60,516 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

Newcomer Svelte takes the top spot as the most loved framework. React is the most wanted, desired by one in four developers.

Loved vs. Dreaded

Want

66,202 responses

? Which **web 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 frameworks and libraries

While Tensorflow is the most wanted library, Pytorch is a more loved library. As .NET Core users here at Stack Overflow, we're pleased to see it in the top spot.

≡

Loved vs. Dreaded

Want

58,282 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

☰

Earlier, we saw that Git was used by 93% of all respondents. Now we saw that 85% of those respondents want to continue working with Git. Git, Docker, and Kubernetes are both the most loved and most wanted tools.

Loved vs. Dreaded

Want

75,793 responses

❓ Which **tools** 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.)

Collaboration tools

While Neovim is the most loved editor it is the 10th most wanted editor.

Loved vs. Dreaded

Want

81,838 responses

☰

❓ 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.

Technology   Share

Worked with vs. want to work with

Programming, scripting, and markup languages   🔗

There is a lot to unpack here, but here are some of the most notable trends we uncovered. There are over 10k Javascript developers that want to start or continue developing in Go or Rust. The majority of developers that want to use Dart are currently using JavaScript. We also see the only developers that want to work in PHP are SQL developers.

All Respondents

Professional Developers

80,496 responses
Minimum 5,000 respondents per connection.

Click to toggle the visibility of a la ☰

[?] 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 ⌘

12,590 MySQL developers want to work with PostgreSQL, while 6,429 PostgreSQL developers want to work with MySQL.

All Respondents

Professional Developers

67,942 responses
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.)

Platforms   🔗

While AWS is the most loved platform, we see a large influx of AWS developers wanting to develop in Google Cloud next year. 8,586 AWS developers want to work with Google Cloud, while only 7,668 Google Cloud developers want to work in AWS. Developers currently using Heroku or Digital Ocean prefer to start working with or continue working with AWS, then Google Cloud, and lastly Azure. Very few developers currently using Azure want to move to Heroku.

All Respondents

Professional Developers

≡

51,638 responses
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

🔗

Django, Flask, and Spring developers are content to continue working in their respective frameworks. Very few developers want to work with ASP.NET.

All Respondents

Professional Developers

59,625 responses
Minimum 4,000 respondents per connection.

Click to toggle the visibility of a language.

[?] Which **web 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 frameworks and libraries

The developers who want to work in Hadoop are currently using Pandas or Numpy. There and 3,328 Tensorflow developers that want to continue to use PyTorch, but only 2,328 Pytorch developers that want to move to Tensorflow.

All Respondents

Professional Developers

46,811 responses
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

All Respondents

Professional Developers

71,828 responses
Minimum 5,000 respondents per connection.

≡

Click to toggle the visibility of a language.

? Which **tools** 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.)

Collaboration tools

🔗

We see IPython/Jupyter users want to work in VS Code. This is likely due to VS Codes adding a Notebook API to their IDE.

All Respondents

Professional Developers

79,419 responses
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.

Technology

Learning & problem solving

What do you do when you get stuck

🔗

Respondents most often use Google when they get stuck or visit Stack Overflow.

All Respondents

Professional Developers

83,052 responses

Google it

89.69%

Visit Stack Overflow

79.96%

Do other work and come back later

48.01%

Watch help / tutorial videos

43.56%
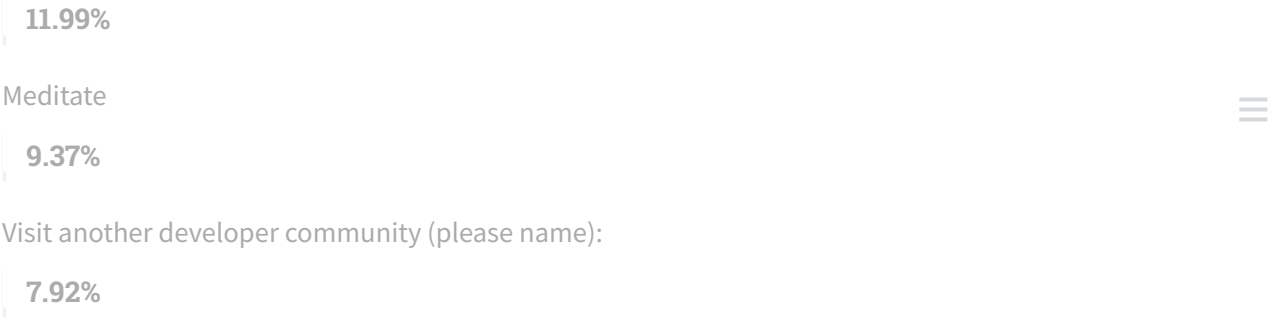
Call a coworker or friend

39.5%

Go for a walk or other physical activity

37.04%

Play games

14.63%

Panic

11.99%

Meditate

9.37%

Visit another developer community (please name):

7.92%

? What do you do when you get stuck on a problem? Select all that apply.   % Percentages   # Responses

---

Technology   Share

Top paying technologies

Top paying technologies

Perl moves from being the highest-paid language last year to the fifth highest-paid this year. Clojure developers have the highest median salary, 14k more than second place which belongs to F#.

Programming, Scripting, and Markup Languages

Databases

Platforms

Web Frameworks

Other Frameworks and Libraries

Other Tools

Collaboration Tools

46,693 responses

Clojure ☰

$95,000

F#

$81,037

Elixir

$80,077

Erlang

$80,077

Perl

$80,000

Ruby

$80,000

Scala

$77,832

Rust

$77,530

Go

$75,669

LISP

$75,669

APL

$75,631

Groovy

$75,002

Crystal

$72,400

Bash/Shell

$71,340

PowerShell

$68,824

Haskell

$67,021

Julia

$65,228

Objective-C

$64,859

Python

$59,454

R

$59,454

TypeScript

$59,172

Swift

$58,910

C#

$58,368

SQL

$56,228

Assembly

$55,211

Kotlin

$55,071

Node.js

$54,672

C++

$54,049

JavaScript

$54,049

VBA

$53,825

C

$53,184

HTML/CSS

$52,980

COBOL

$52,340

Java

$51,888

Delphi

$46,704

Matlab

$43,948

PHP

$38,916

Dart

$32,986

$ Median yearly salary (USD)   # Responses

? What is your current total 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 weekly, monthly, or yearly salary. If you prefer not to answer, please leave the box empty.

Work

Employment →

Company info →

Salary →

Work

Share

Employment

We see a greater percentage of respondents working part time or in school, while those indicating full time employment decreased. This may reflect the effects of the pandemic, which saw workers from all industries stepping back and reevaluating their relationship to full and in-person employment.

Employment status

≡

81% of professional developers are employed full-time, a decrease from 83% in 2020. The percentage of professional developers saying they were independent contractors, freelancers, or self-employed increased from 9.5% in 2020 to 11.2% in 2021 - indicating potential job insecurity or a shift to more flexible work arrangements.

All Respondents

Professional Developers

83,323 responses

Employed full-time

64.31%

Student, full-time

14.14%

Independent contractor, freelancer, or self-employed

9.65%

Not employed, but looking for work

3.55%

Employed part-time

2.95%

Student, part-time

2.46%

Not employed, and not looking for work

1.47%

I prefer not to say

1.07%

Retired

0.39%

? Which of the following best describes your current **employment status**?

% Percentages   # Respc

Employment status by geography

The percent of employed full-time respondents from India decreased by 15 percentage points compared to last year. In contrast, the number of students increased by 9 percentage points.

United States

India

Germany

United Kingdom

Canada

15,266 responses

Employed full-time

73.46%

Student, full-time

11.06%

Independent contractor, freelancer, or self-employed

6.39%

Not employed, but looking for work

2.78%

Employed part-time

1.72%

Not employed, and not looking for work

1.6%

I prefer not to say

1.21%

Student, part-time

0.92%

Retired

0.85%

[?] Which of the following best describes your current **employment status**?　　　% Percentages　　# Responses

Work

Share

Company info

Company size

This year we saw an increase in respondents that are freelancing compared to last year.

54,982 responses

Just me - I am a freelancer, sole proprietor, etc.

6.5%

2 to 9 employees

11.06%

10 to 19 employees

9.26%

20 to 99 employees

21.3%

100 to 499 employees

17.52%

500 to 999 employees

6.16%

1,000 to 4,999 employees

9.95%

5,000 to 9,999 employees

3.52%

10,000 or more employees

12.66%

I don't know

2.07%

% Percentages　　**# Responses**

[?]　Approximately how many people are employed by the company or organization you currently work for?

Work　　　　　　　　　　　　　　　　　　　　　　　Share

Salary

Salary by developer type

Across the board, engineering managers, SREs, DevOps specialists, and data engineers tend to receive the highest salaries. When focusing on the US, we see some differences at the bottom of the salary spectrum. In the US, mobile developers and educators tend to have a higher salary relative to other occupations when compared to the global developer population.

All Respondents

United States

46,092 responses
Median yearly salary in USD

Engineering manager

$95,976

Senior Executive (C-Suite, VP, etc.)

$94,996

Engineer, site reliability

$84,000

DevOps specialist

$70,264

Engineer, data

$68,034

Scientist

$64,859

Data scientist or machine learning specialist

$63,216

Data or business analyst

$60,505

Product manager

$60,000

Marketing or sales professional

$58,772.5

Developer, desktop or enterprise applications

$58,639

Developer, embedded applications or devices

$58,373

Developer, back-end

$56,723

Developer, full-stack

$56,038

Developer, QA or test

$55,973

System administrator

$55,271

Database administrator

$55,224

Developer, game or graphics

$54,480

Educator

$53,832

Designer

$51,647

Developer, front-end

$49,725

Academic researcher

$49,457.5

Developer, mobile

$41,597

Student

$19,452

$ Median yearly salary (USD)   # Responses

[?]   What is your current total 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 weekly, monthly, or yearly salary. If you prefer not to answer, please leave the box empty.

Salary and experience by developer type

Even though Engineering managers, SREs, DevOps specialist roles pay the most, we see they also have, on average, over ten years of professional experience. Data scientists or machine learning specialists are the 8th most paid but, on average, have the fewest years of experience. Designers are the lowest paid even though they have over ten years of experience on average.

43,800 responses

☰

Hover over each point for full details.

[?] What is your current total 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 weekly, monthly, or yearly salary. If you prefer not to answer, please leave the box empty.

Salary and experience by language

PHP developers are disproportionately underpaid compared to other languages with the same experience.

43,676 responses

Hover over each point for full details.

[?] What is your current total 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 weekly, monthly, or yearly salary. If you prefer not to answer, please leave the box empty.

Community

Community is at the center of all that we do.

≡

Stack Overflow site use →

Stack Overflow community now →

Community

Stack Overflow site use

Visited Stack Exchange Sites

Less than 1% of respondents have never visited Stack Overflow or the Stack Exchange Network.

All Respondents

Professional Developers

83,171 responses

Stack Overflow

98.47%

Stack Exchange

69.77%

Stack Overflow for Teams (private knowledge sharing & collaboration platform for companies)

4.85%

I have never visited Stack Overflow or the Stack Exchange network

0.9%

[?] Which of the following Stack Overflow sites have you visited? Select all that apply.　　% Percentages　　# Responses
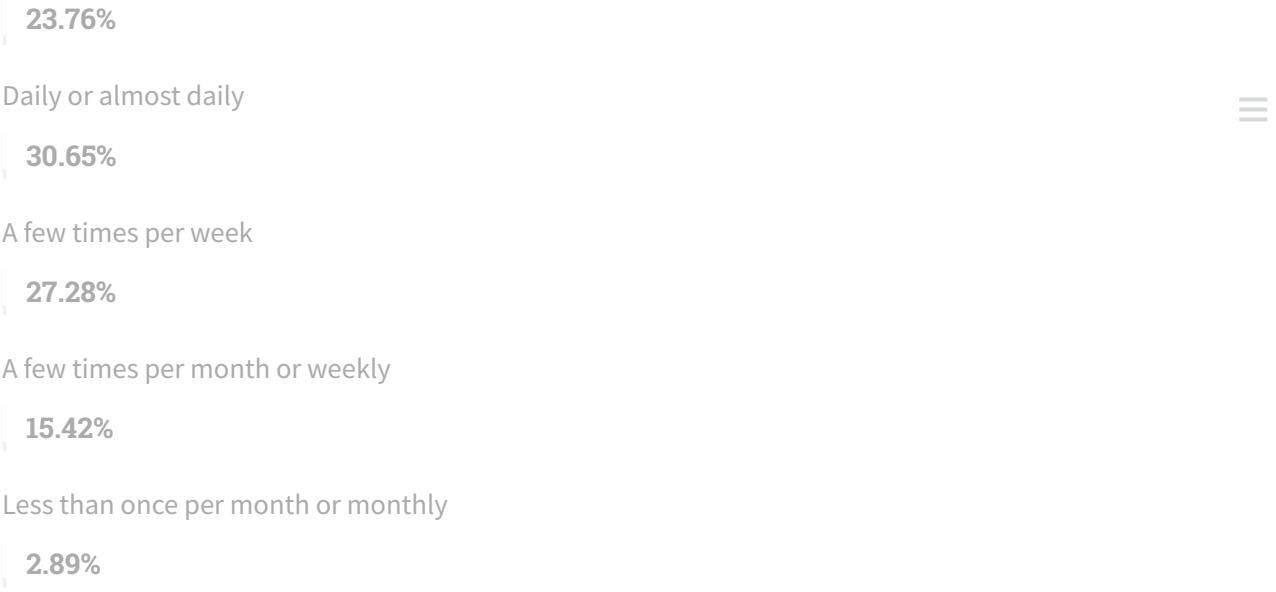
Visiting Stack Overflow

We know that developers visit Stack Overflow a lot, and earlier this year, we confirmed that they copy code just as much. From this year's survey, we also know that 80% of respondents visit Stack Overflow weekly, and 55% of them visit daily.

All Respondents

United States

82,413 responses

Multiple times per day

23.76%

Daily or almost daily

30.65%

A few times per week

27.28%

A few times per month or weekly

15.42%

Less than once per month or monthly

2.89%

[?] How frequently would you say you visit Stack Overflow?   % Percentages   # Responses

How many participants have a Stack Overflow account?

8 out of 10 respondents have a Stack Overflow account.

82,525 responses

Yes

82.17%

No

12.74%

Not sure/can't remember

5.09%

[?] Do you have a Stack Overflow account?   % Percentages   # Responses

How often do developers participate on Stack Overflow? ☰

Of those with a Stack Overflow account, 46% are participating on the site less than once per month or monthly.

All Respondents

United States

67,553 responses

Multiple times per day

1.86%

Daily or almost daily

3.87%

A few times per week

8.42%

A few times per month or weekly

19.21%

Less than once per month or monthly

45.56%

I have never participated in Q&A on Stack Overflow

21.08%

% Percentages   **# 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.

Do developers consider themselves part of the Stack Overflow

community?

Only 44% of respondents consider themselves "somewhat" or "definitely" a member of the Stack Overflow community. Of these respondents, we see that gender minorities are less likely to consider themselves a member of the Stack Overflow community.

All Respondents

By Gender

By Age

82,319 responses

Yes, somewhat

28.65%

No, not really

25.14%

Neutral

20.75%

Yes, definitely

15.66%

No, not at all

8.06%

Not sure

1.74%

?   Do you consider yourself a member of the Stack Overflow community?   % Percentages   # Responses

---

Community   Share

Stack Overflow community now

≡

Member of other online developer community

Most respondents do not belong to any other development communities online.

82,828 responses

No

64.43%

Yes

35.57%

❓ Are you a member of any other online developer communities?

% Percentages　　　**# Responses**

Other communities public or private

Almost 25 thousand respondents belong to other online developer communities. 85% of the them are open to the public for anyone to join. The majority of these other communities belong on Reddit, Github or Discord.

All Respondents

Top Other Communities

24,534 responses

Public - Anyone can join

84.76%

Private - Invitation required to join

15.24%

% Percentages   # Responses

? Please name up to 5 other online developer communities you belong to, and indicate whether they are public (anyone can join) or private (invitation required).

Methodology

How we planned and analyzed our survey

General →

Feedback →

Participants →

Methodology   Share

General

This report is based on a survey of 83,439 software developers from 181 countries around the world. This is the number of responses we consider "qualified" for analytical purposes based on time spent on the full, completed survey; another approximately 172 responses were submitted but not included in the analysis because respondents spent less than three minutes on the survey.

The survey was fielded from May 25 2021 to June 15 2021.

The median time spent on the survey for qualified responses was 10.21 minutes.

Respondents were recruited primarily through channels owned by Stack Overflow. The top sources of respondents were onsite messaging, blog posts, email lists, 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 collection promotion.

As an incentive, respondents who finished the survey could opt in to a "Census" badge if they completed the survey.

Due to United States transport/export sanctions, our survey was unfortunately unaccessible 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 salary. First, we asked what currency each respondent typically used. Then we asked that respondent what their salary was in that currency and whether that salary was weekly, monthly, or yearly.

The salary question, like most on the survey, was optional. There were 46,844 respondents who gave us salary data.

We converted salaries from user currencies to USD using the exchange rate on 2021-06-16, and also converted to annual salaries assuming 12 working months and 50 working weeks.

The top approximately 2% of salaries inside and outside of the US were trimmed and replaced with threshold values. The threshold values for inside and outside the US were different.

To identify which technologies to include on the survey this year, we looked at both the most popular and fastest growing tags on Stack Overflow (in terms of questions posted). We compared these to the technologies we included last year and looked at how many people chose each option. We synthesized all this together to curate a collection of technologies to include.

The questions were organized into several blocks of questions, which were randomized in order. Also, the answers to most questions were randomized in order.

Methodology

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.

81,711 responses

Appropriate in length

78.95%

Too long

16.02%

Too short

5.03%

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

% Percentages　　**# Responses**

How easy or difficult was this survey to complete?

Less than one percent of respondents felt like this year's survey was difficult.

81,948 responses

Easy

76.98%

Neither easy nor difficult

☰

22.08%

Difficult

0.94%

❓ How easy or difficult was this survey to complete?   % Percentages   # Responses

---

Methodology   Share

Participants

Who participated in this survey   🔗

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

82,926 responses

I am a developer by profession

69.7%

I am a student who is learning to code

14.42%

I am not primarily a developer, but I write code sometimes as part of my work

7.88%

I code primarily as a hobby

5.91%

I used to be a developer by profession, but no longer am

1.48% ☰

% Percentages **# Responses**

[?] Which of the following options best describes you today? Here, by "developer" we mean "someone who writes code." *

Where do you live? 🔗

The following countries are the top 10 countries that we received responses from.

49,116 responses

United States of America

18.32%

India

12.6%

Germany

6.74%

United Kingdom of Great Britain and Northern Ireland

5.36%

Canada

3.61%

France

3.25%

Brazil

2.7%

Poland

2.16%

Netherlands

2.12%

Italy

2%

? Where do you live? *

% Percentages   # Responses