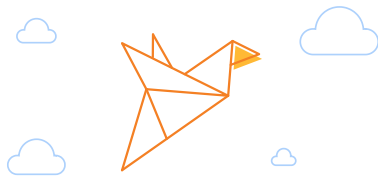


Developer Survey Results

2019



Overview

This year, nearly 90,000 developers told us how they learn and level up, which tools they're using, and what they want.

Stack Overflow's annual Developer Survey is the largest and most comprehensive survey of people who code around the world. Each year, we field a survey covering everything from developers' favorite technologies to their job preferences. This year marks the ninth year we've published our annual Developer Survey results, and nearly 90,000 developers took the 20-minute survey earlier this year.

Despite our survey's broad reach and capacity for informing valuable conclusions, we acknowledge that our results don't represent everyone in the developer community evenly. We have further work to do to make Stack Overflow the welcoming, inclusive, and diverse platform we want it to be, and this is reflected in our survey sample. We are committed to building on [steps we've taken in 2018](#) and improving in this area this year and beyond. Some of these survey results directly guide those efforts.

To address the characteristics of our data, be sure to check out where we summarize results by country or gender, highlight results for underrepresented racial/ethnic groups, or use survey weighting to correct for demographic skew.

Look for this icon, which highlights differences between developer demographics.

We looked at breakdowns by demographics throughout our analysis, and in most cases it did not have a significant effect. Look for the icon to see where we highlight results where it did have an interesting impact. Also be sure to check out a few new topics this year ranging from hours worked per week to the best music to listen to while coding!

Want to dive into the results yourself? The anonymized results of the survey are [available for download](#) under the [Open Database License \(ODbL\)](#). We look forward to seeing what you find!

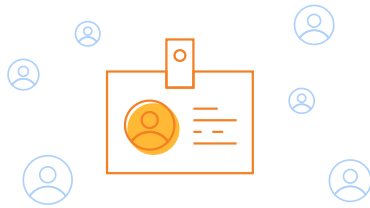


Key Results

Here are a few of the top takeaways from this year's results.

- Python, the fastest-growing major programming language, has risen in the ranks of programming languages in our survey yet again, edging out Java this year and standing as the second most loved language (behind Rust).
- Over half of respondents had written their first line of code by the time they were sixteen, although this experience varies by country and by gender.
- [DevOps specialists](#) and site reliability engineers are among the highest paid, most experienced developers most satisfied with their jobs, and are looking for new jobs at the lowest levels.
- Of the top countries on our survey, China has developers that are the most optimistic, believing that people born today will have a better life than their parents. Developers in Western European countries like France and Germany are among the least optimistic about the future.
- When thinking about blockers to productivity, different kinds of developers report different challenges. Men are more likely to say that being tasked with non-development work is a problem for them, while gender minority respondents are more likely to say that toxic work environments are a problem.

- We asked respondents to think about the last time they solved coding problems with and without our site. The data indicates that Stack Overflow saves a developer 30 to 90 minutes of time per week!



Developer Profile

What we know about the developers who are writing the script for the future



Geography

Each month, about 50 million people visit Stack Overflow to learn, share, and build their careers. We estimate that 21 million of these people are professional developers and university-level students. The majority of our survey respondents this year were people who said they are professional developers or who code sometimes as part of their work, or are students preparing for such a career. About 4% of respondents code as a hobby but not as a profession, and just under 2% of respondents used to be professional developers but no longer are.

See our [Methodology](#) section for details on how developers around the world accessed our survey.



Developer Roles

Developer Type

About 50% of respondents identify as [full-stack developers](#), and about 17% consider themselves mobile developers. The median number of developer type identifications per respondent this year is 3, and the most common pairs are combinations of back-end, front-end, and full-stack developer. Pairs that are highly correlated include database administrator and system administrator, DevOps specialist and site reliability engineer, academic researcher and scientist, and designer and front-end developer.

Survey weighting is an approach used to analyze survey data when the survey sample doesn't match the underlying population well. For example, in our survey this year, 11% of US respondents identify as women, but data from the US Bureau of Labor Statistics estimates that [women's participation in the software developer workforce](#) is about twice that, more like 20%. We can use survey weighting to adjust for the mismatch between our survey sample and the population of developers. We know that there is a difference in [developer type representation by gender](#), so let's compare the overall proportions in our raw results for the United States with weighted proportions, assuming that we undersampled gender minorities at the rate indicated by the BLS report. When we use weighting, we see small increases in the representation of developer roles that have the most representation from women, like designers, and decreases in others with low representation from women, like DevOps.

We know there are more ways in which our survey sample doesn't match the underlying population of developers than only gender (including frequency of use of Stack Overflow), and the United States is not the only country for which we expect such a mismatch. The reason we're using this specific example of weighting here is that it is one where we know we have systemic sampling issues *and* we have an estimate about the expected population proportion. We can demonstrate the effect of our survey sample on our results, both in direction and magnitude.

Contributing to Open Source

About 65% of professional developers on Stack Overflow contribute to open source projects once a year or more. Involvement in open source varies with language. Developers who work with Rust, WebAssembly, and Elixir contribute to open source at the highest rates, while developers who work with VBA, C#, and SQL do so at about half those rates.

Coding as a Hobby

Many developers work on code outside of work. About 80% of our respondents say that they code as a hobby. Other responsibilities outside of software can reduce developers' engagement in coding as a hobby; developers who say they have children or other caretaking responsibilities are less likely to code as a hobby. Respondents who are women are also less likely to say they code as a hobby.

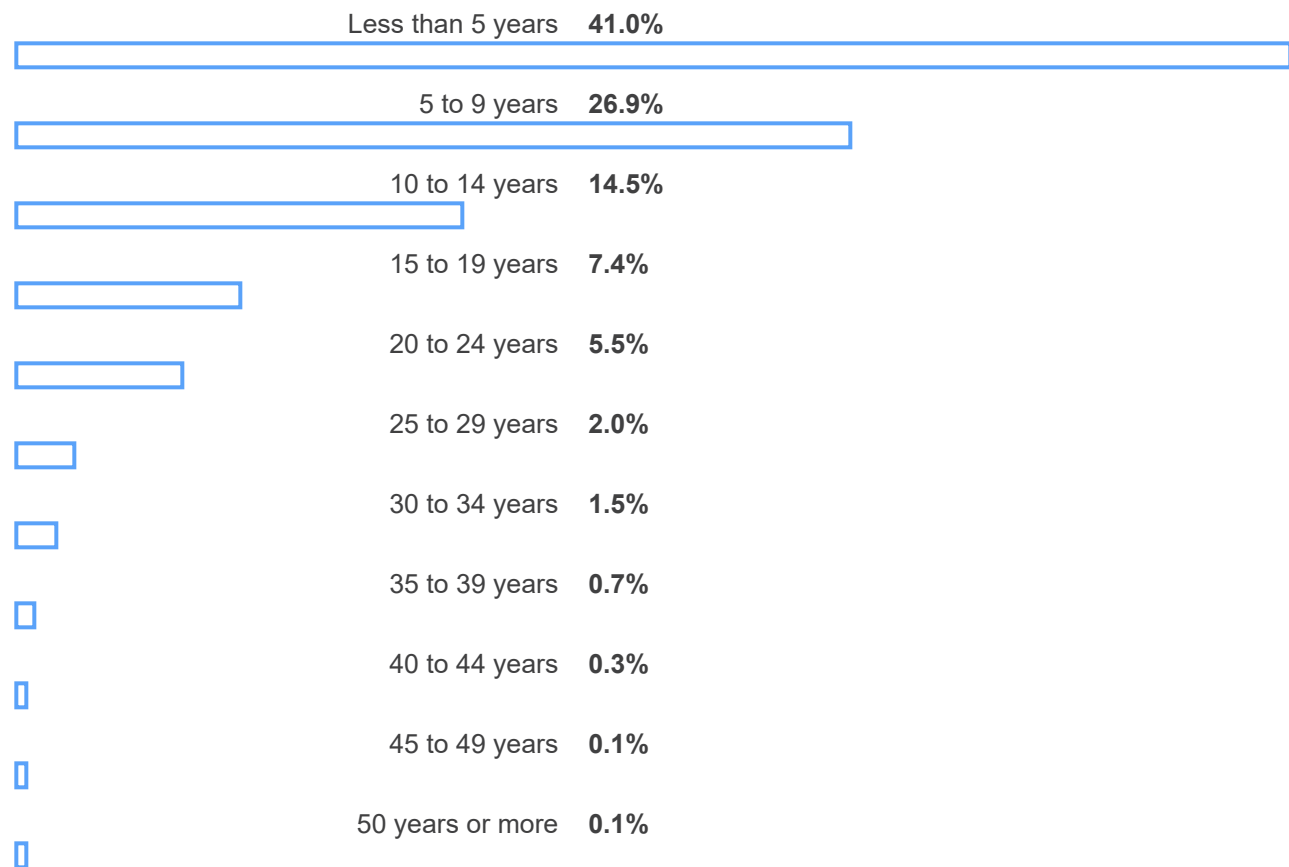


Experience

Years Since Learning to Code

There is a wide range of experience levels among developers, and a full 45% of professional developers on Stack Overflow learned to code less than 10 years ago. See more on how [experience is related to gender](#).

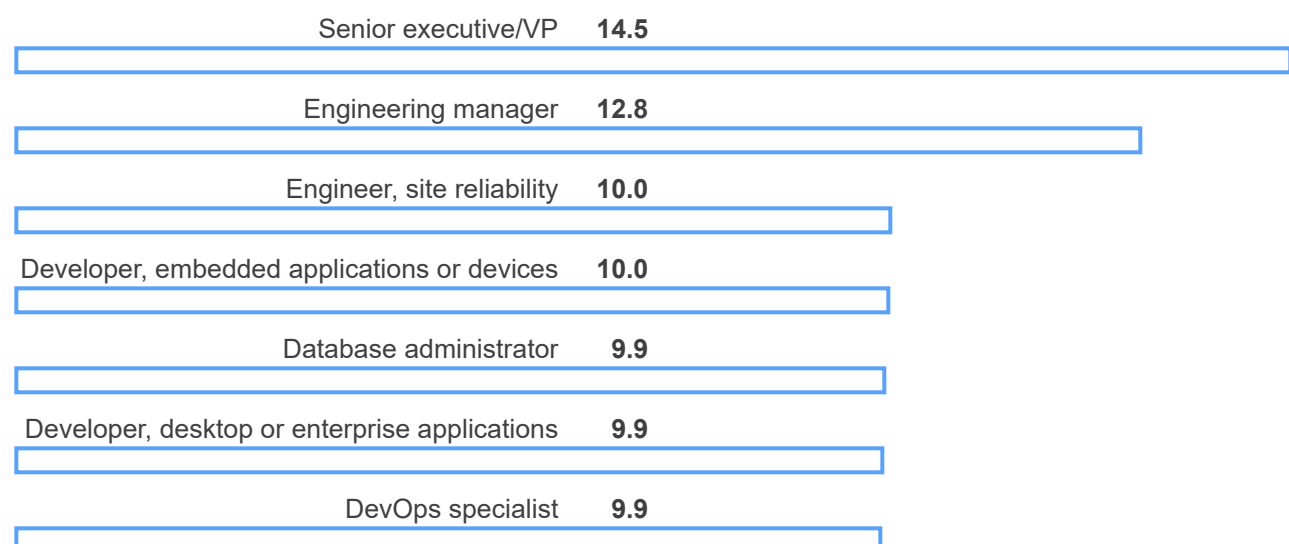
Years Coding Professionally

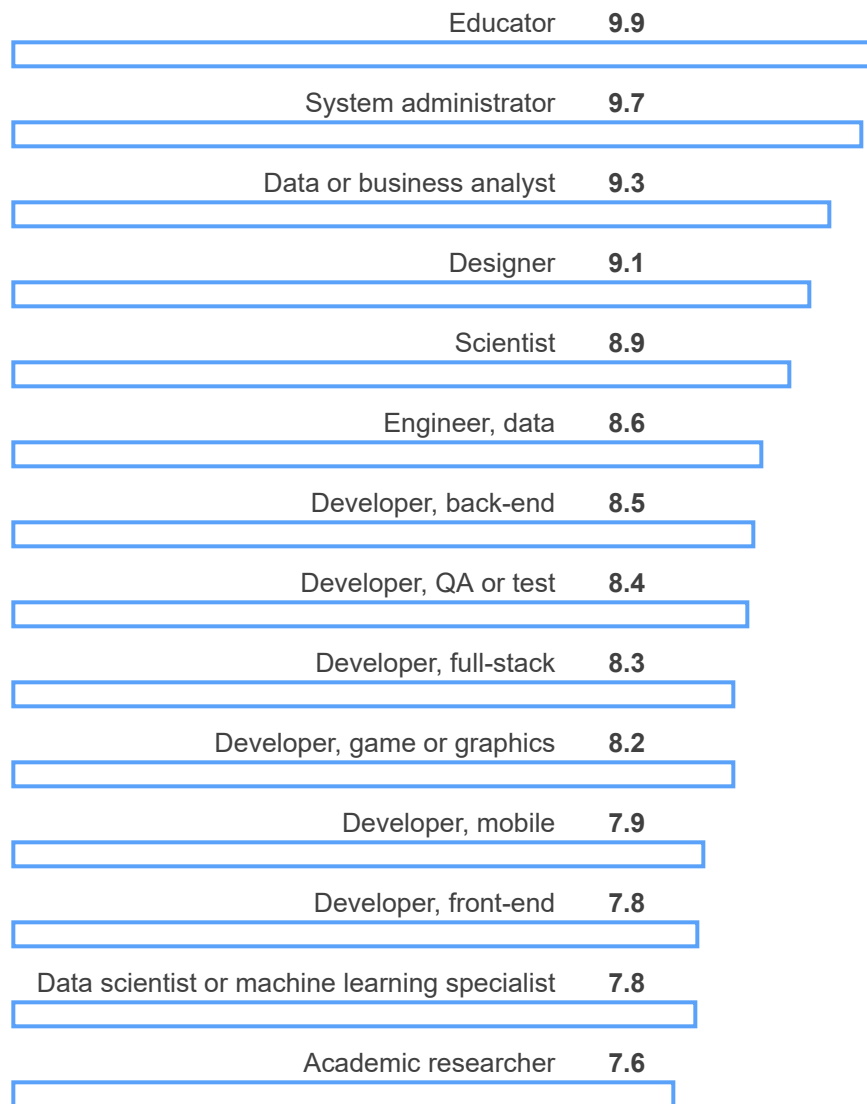


74,331 responses

Over 40% of respondents have less than five years of professional coding experience. Developers who work with languages such as VBA, F#, and Clojure have the most years of professional coding experience, while developers who work with languages like Python, PHP, and Kotlin have the fewest.

Years of Professional Coding Experience by Developer Type





Mean of 72,069 responses

Developers who work in different areas of software development have different average amounts of experience. Aside from technical executives and managers, SREs and developers who build for embedded devices have the most experience, while academic researchers and data scientists have the fewest years of experience. The related roles and disciplines of site reliability engineering and DevOps are somewhat new, but the people working in this field are highly experienced.

Writing That First Line of Code

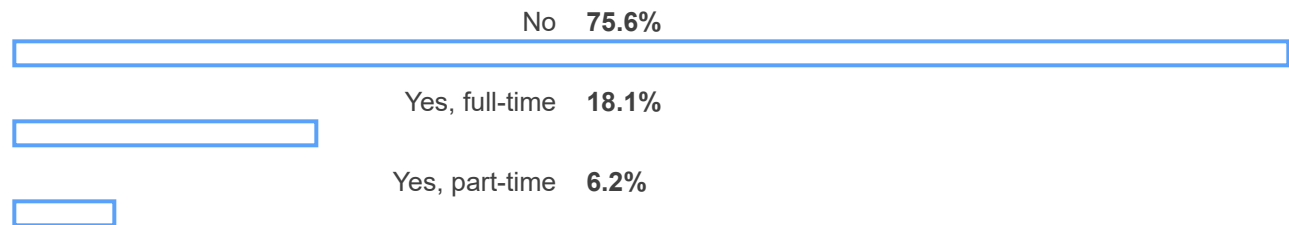
We asked respondents how old they were the first time they wrote a line of code or program, whether that was to make a webpage or say hello to the world. Overall, over half of respondents had written code by the time they were sixteen, but experience varies widely. There is two years' or more difference in the mean first age from countries like Australia and the UK compared to India and Brazil. If we control for developer age today, we see an even more dramatic disparity between India (where developers who are older today started coding later in life) and the UK (where developers who are

older today started coding earlier in life). We also see differences with gender, with women writing their first code later than men and non-binary respondents writing code earlier than men.



Education

How Many Developers are Students?



87,014 responses

About one-quarter of respondents are enrolled in a formal college or university program full-time or part-time.

Educational Attainment

Worldwide, about three-fourths of professional developer respondents have the equivalent of a bachelor's degree or higher, consistent with what we've found in previous years. However, it is not that rare to find accomplished professional developers who have not completed a degree.

Undergraduate Major

Of professional developers who studied at the university level, over 60% said they majored in computer science, computer engineering, or software engineering. This proportion is somewhat higher in currently enrolled students, and the proportion of respondents majoring in other engineering disciplines like electrical and mechanical engineering is lower among current students than among professionals.

Other Types of Education

Developers are lifelong learners; almost 90% of all developers say they have taught themselves a new language, framework, or tool outside of their formal education. Among professional developers, about 60% say they took an online course like a MOOC (up significantly from last year), and about a quarter have participated in a hackathon.



Demographics

Race and Ethnicity

We asked our respondents about their racial/ethnic identities and see evidence that people of color continue to be underrepresented among developers, especially among professional developers. We see higher proportions of people of color in students than professional developers. We have seen incremental improvement in this area year over year. In the United States this year, 22% of respondents are people of color (meaning they chose one or more non-white options on this question); last year 19% of United States respondents were people of color. Like with gender representation, this gradual change is encouraging, but the overall participation levels indicate we still have work to do, both on Stack Overflow and as the tech industry more broadly.

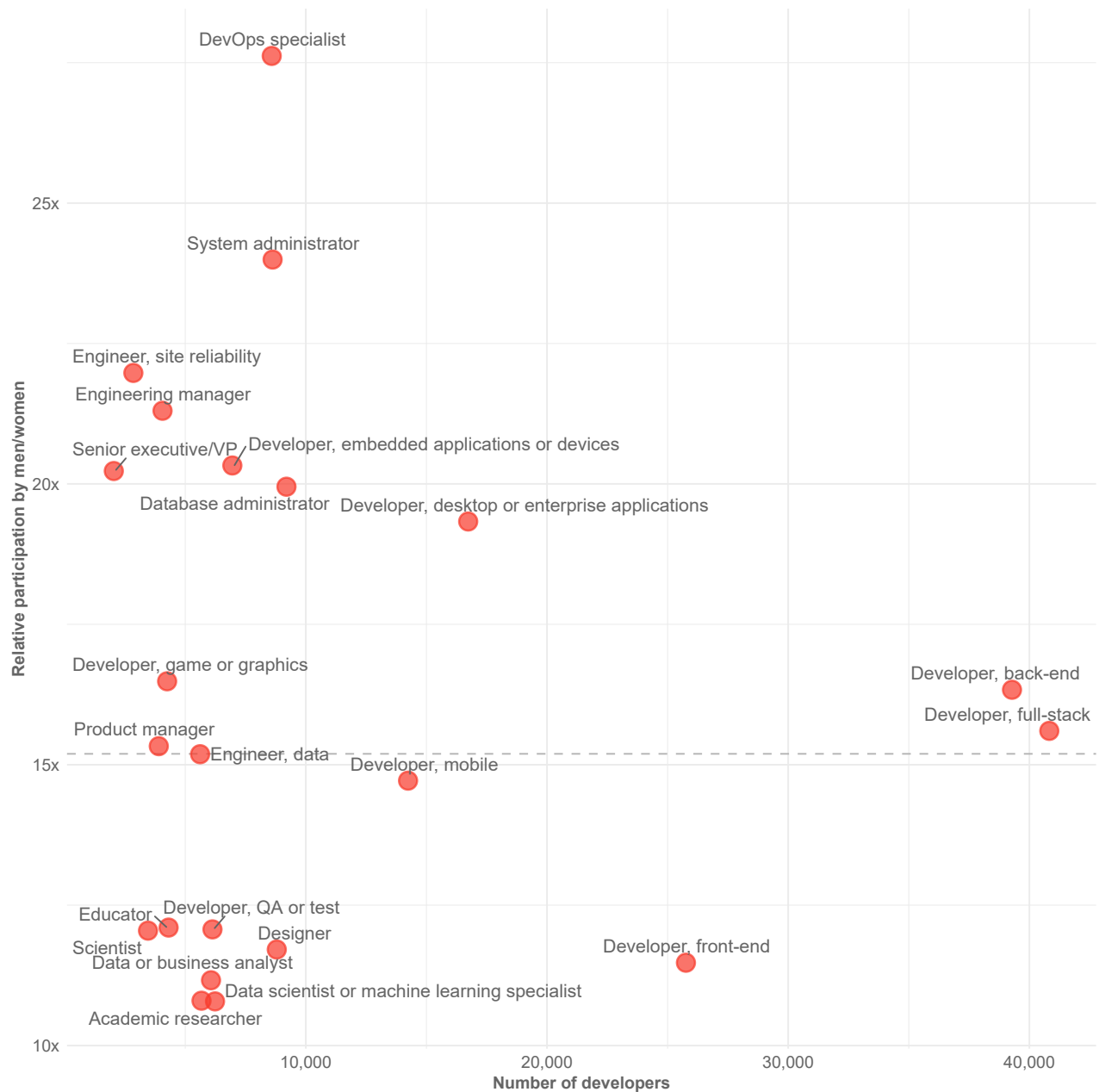
Gender

We asked our respondents about their gender identity, and found that about globally 90% of our respondents are men. In regions including the United States, India, and the UK, women are represented at higher levels among students than among professional developers.

This year 11% of US survey respondents are women, up from 9% on last year's survey. This represents incremental improvement in this area, but the continued low proportion points to problems with inclusion in the tech industry in general and on Stack Overflow in particular.

This year, 1.2% of respondents identified as transgender, about double from last year. The gender identification question allowed respondents to select all that apply, and the question about transgender identity was separate from the question about gender identity.

Developer Role and Gender



The dashed line shows the average ratio of men's to women's participation

We see varying representation from men and women in different developer roles on our survey. All categories have dramatically more developers who identify as men than women but the ratio of men to women varies. Developer types above the line have respondents that are more likely than average to be men, and those below the line have respondents who are more likely than average to be women. Developers who are data scientists or academic researchers are about 10 times more likely to be men than women, while developers who are system admins or DevOps specialists are 25-30 times more likely to be men than women. Women have the highest representation as front-end developers, designers, data scientists, data analysts, QA or test developers, scientists, and educators.

Experience and Gender

When we look at differences in years since learning to code by gender, we see evidence for the shifting demographics of coding as a profession, as well as retention problems in the tech industry for underrepresented groups. [Research shows](#), for example, that women leave jobs in tech at higher rates than men. Among our respondents, both in the United States and internationally, women are about twice as likely as men to have three years of coding experience or less. Companies interested in building a diverse developer workforce that is more reflective of society should focus on retention of their senior developers from underrepresented groups, along with thoughtful hiring from the population of more junior developers.

Sexual Orientation

This is the second year we asked our respondents about their sexual orientation, and the proportions of respondents are mostly consistent since last year.

Disability Status

Individuals with many forms of disability and difference are part of the developer community, including those with mental health challenges and physical disabilities. Mental health issues like depression and anxiety are particularly common among our respondents. In the United States, almost 30% of respondents said they deal with a mental health challenge, a higher proportion than other large countries such as the UK, Canada, Germany, or India.

Age

About three-fourths of professional developers who took our survey are younger than 35.

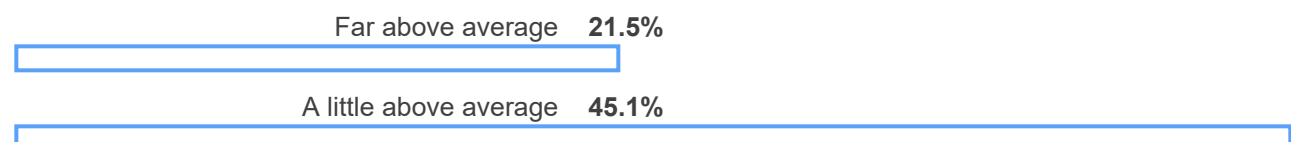
Age and Experience by Country

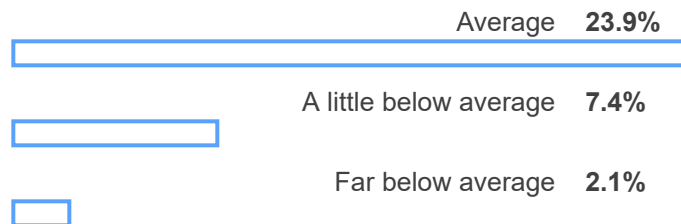
Developers on Stack Overflow are older with more experience in Australia, Western Europe, and North America and younger with less experience in regions like India and Eastern Europe.



Evaluating Competence

All of the Developers Are Above Average?

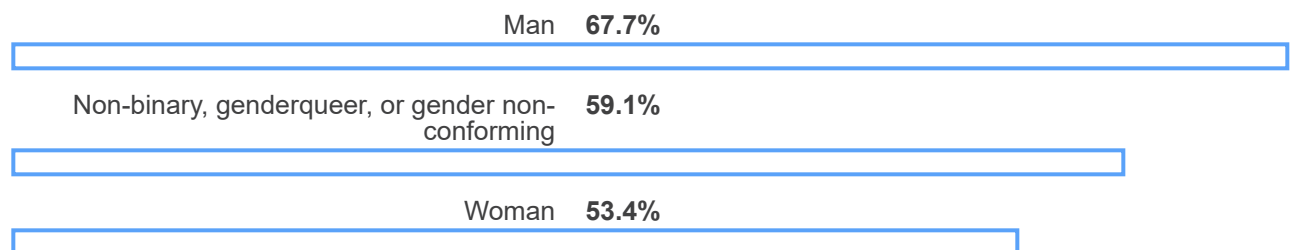




71,779 responses

We asked respondents to evaluate their own competence, for the specific work they do and years of experience they have, and almost 70% of respondents say they are above average while less than 10% think they are below average. This is statistically unlikely with a sample of over 70,000 developers who answered this question, to put it mildly.

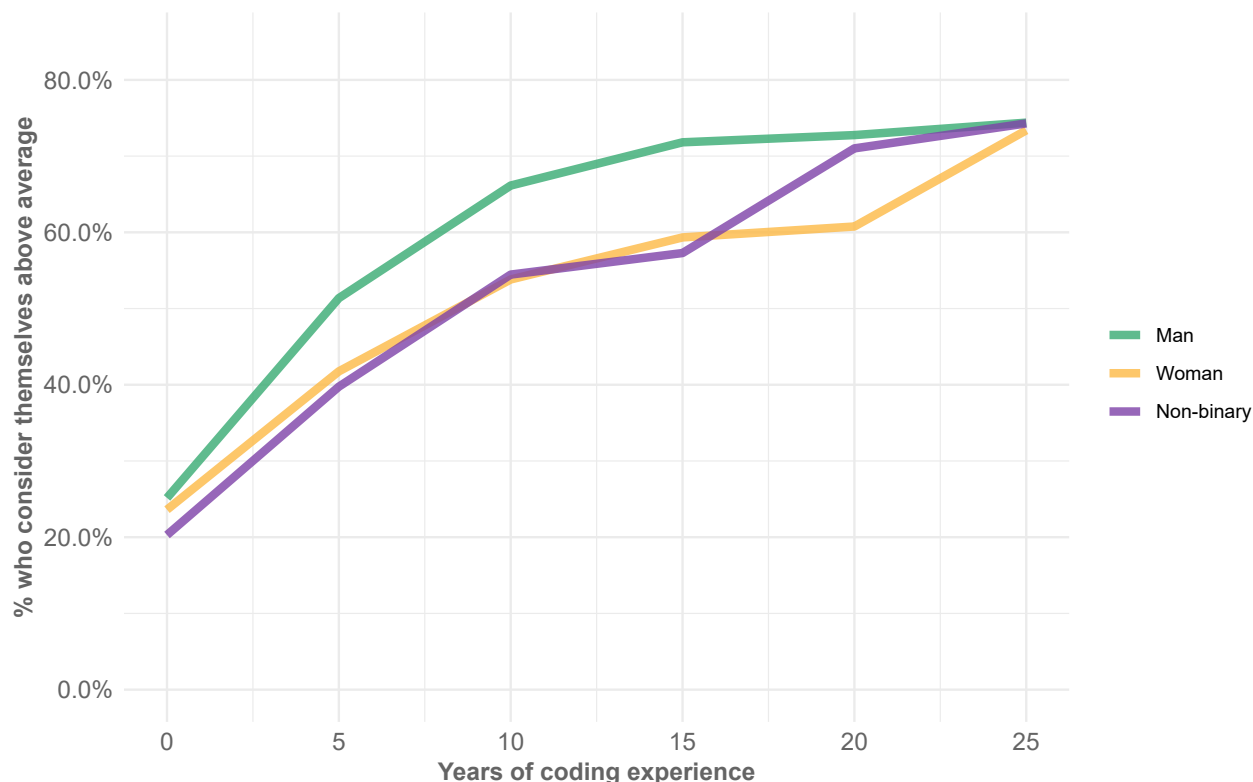
Feelings of Competence By Gender



Mean of 70,411 responses; percent who consider themselves far or a little above average; gender is select all that apply

When asked to evaluate their own competence for the kind of work they do and their years of experience, men are much more likely to say they are far or a little above average than gender minorities in tech.

Competence and Experience



We specifically asked respondents to evaluate themselves *for their years of experience*, but we see differences in opinion with experience. New developers are much less likely to evaluate themselves as above average for their experience, and this effect does not flatten out until about 10 years of experience. We see evidence here among the most junior developers for *impostor syndrome*, pervasive patterns of self-doubt, insecurity, and fear of being exposed as a fraud. Among our respondents, men grew more confident much more quickly than gender minorities.



Life Outside Work

Children and Other Dependents

For the second year, we asked respondents if they have children or other dependents that they care for, and almost 40% of respondents say that they do, up from last year.

The developers who said they do not have dependents to care for are younger on average with less experience than those who do. Over 60% of developers with 10 or more years of professional coding experience have children or other dependents. Respondents in the United States are more likely to say they have dependents than the rest of the world, but within the US, women are *less* likely to report having caretaking responsibilities. This fits in with other evidence we see for retention problems specific to underrepresented groups in tech.

Families and IT Support

We've all been there, either giving or receiving help.

Will People Born Today Have a Better Life Than Their Parents?

This question mirrors a [question that's asked by Gallup](#) every year. The 2018 Gallup results saw 61% of the American population believing today's youth will live better than their parents; that percentage was the highest since Gallup's 2010 survey. If we filter our survey for American respondents, the percentage is also 61%, mirroring Gallup's results. Either way, it seems that developers don't overwhelmingly believe we're headed toward dystopia.

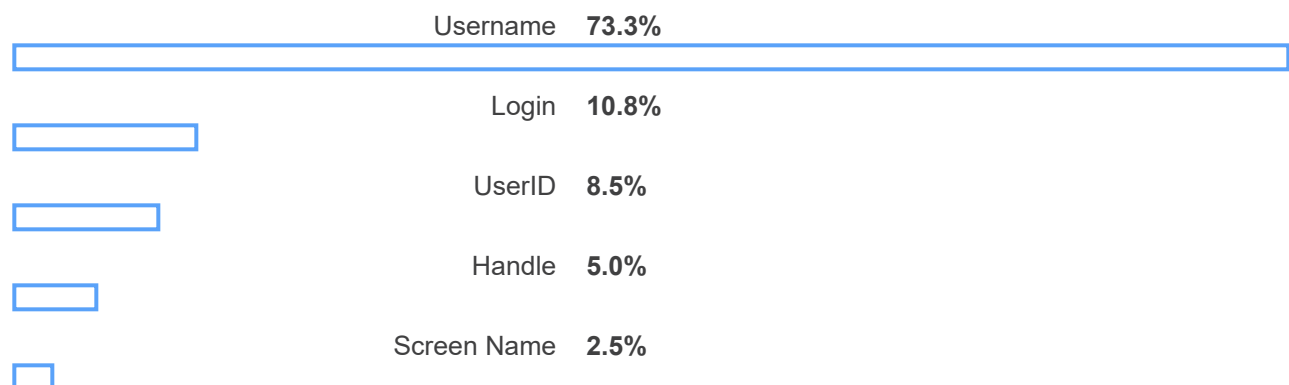
Respondents in China are the most optimistic, and those in regions like Eastern Europe, Latin America, and the Middle East are especially hopeful compared to those in Western Europe. This is especially notable in countries like Germany and France, which are the 4th and 7th largest economies in the world, respectively.

Social Media Use

We asked our respondents this year what social media site they use the most, and Reddit and YouTube were the most common answers. Developers' preferences aren't reflective of the most popular social media platforms in the world where Facebook ranks first and Reddit doesn't even crack the top 10. (Reddit has about [330 million active users](#) compared to [Facebook's 2.32 billion monthly users](#).)

When we look in the United States, the situation is a little different. Twitter and Facebook are ranked higher. Notice that the United States result weighted by gender exhibits some interesting differences from the unweighted result; Instagram even gains a full rank.

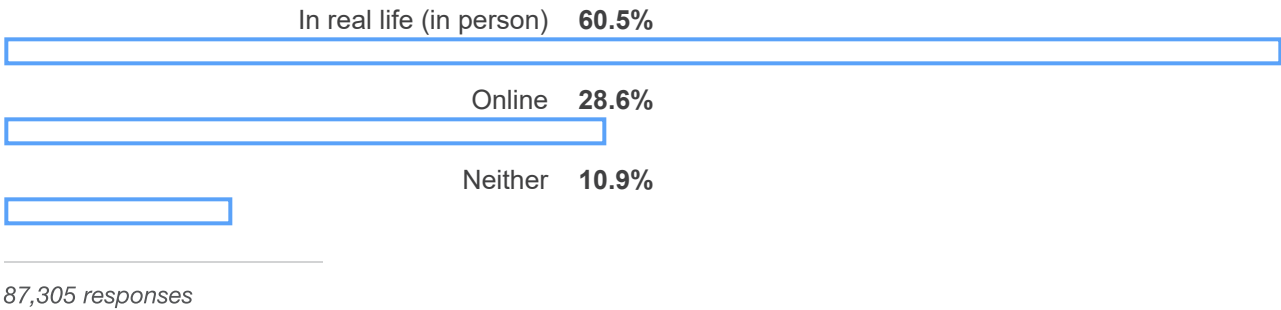
What's Your Handle?



80,486 responses

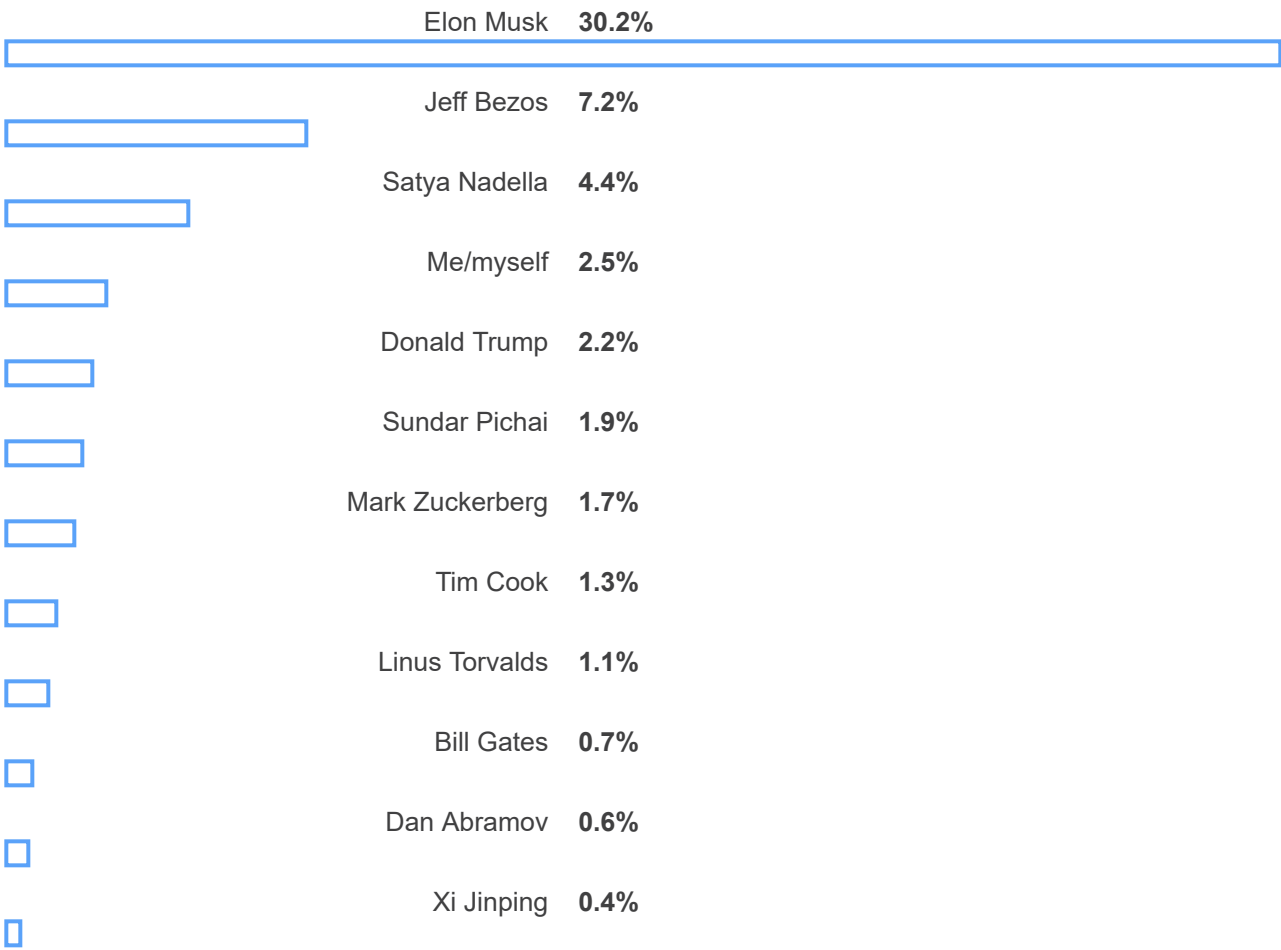
There have been many iterations on the names we use in chat apps or online communities to identify ourselves. The most common choice for our respondents was username by a landslide. Respondents who chose userId are the oldest, and respondents who chose username are the youngest.

IRL or online chat?



Developers may have a reputation for introversion, but a firm majority of our respondents said they prefer face-to-face conversations to online chat. We're happy to report that only 11% of our respondents said they didn't want to communicate with their fellow human beings via either method.

What Individual Person Will Have the Most Influence In Tech This Year?



□	Evan You	0.4%
□	Andrew Ng	0.3%
□	Richard Stallman	0.3%
□	Vitalik Buterin	0.3%
□	Larry Page	0.3%
□	Rich Hickey	0.2%
□	Ajit Pai	0.2%
□	Jeff Dean	0.2%
□	Lisa Su	0.2%
□	Jon Skeet	0.2%
□	Demis Hassabis	0.2%
□	Jack Ma	0.2%
□	Werner Vogels	0.2%

30,398 responses

We asked respondents what person they thought would be most influential in 2019 in a free-text field. Besides CEOs of companies including Tesla, Amazon, Microsoft, Google, Facebook, and Apple, respondents mentioned developers building and maintaining React.js and Vue.js (the [most loved web frameworks](#) this year), along with leaders from the Linux world and other tech domains. A few world leaders received mentions from respondents, along with a fair number of humble respondents nominating...themselves! Some individuals mentioned here are likely not viewed favorably by those who listed them, such as the [current chairman of the United States Federal Communications Commission \(FCC\)](#). Only one woman made it to the top 25 of this list: Lisa Su, the CEO of AMD.



Technology

The tools of the trade



Most Popular Technologies

Programming, Scripting, and Markup Languages

For the seventh year in a row, [JavaScript](#) is the most commonly used programming language, but [Python](#) has risen in the ranks *again*. This year, Python just edged out Java in overall ranking, much like it surpassed C# last year and PHP the year before. Python is the fastest-growing major programming language today.

Web Frameworks

This year, we asked about frameworks for the web separately from other frameworks and libraries. jQuery is the most broadly used of these web frameworks, and this year more developers say they use React.js than Angular, a switch from last year.

Other Frameworks, Libraries, and Tools

This is the first year we've asked about many of the technologies in this category, and Node.js is the most commonly used. More developers say they use .NET than .NET Core, and the deep learning framework TensorFlow is many times more popular than the deep learning framework Torch/PyTorch.

Databases

Like last year, MySQL is the most commonly used database. PostgreSQL has taken the second spot this year, edging ahead of Microsoft SQL Server.

Platforms

Linux and Windows are the most common platforms that our respondents say they have done development work for this year. We asked about container technologies like [Docker](#) for the first time this year, and Docker was the third most broadly used platform.



Most Loved, Dreaded, and Wanted

Most Loved, Dreaded, and Wanted Languages

For the fourth year in a row, Rust is the most loved programming language among our respondents, followed close behind by Python, the fastest-growing major language today. This means that proportionally, more developers want to continue working with these than other languages.

VBA and Objective-C rank as the most dreaded languages this year. Most dreaded means that a high percentage of developers who are currently using these technologies express no interest in continuing to do so.

[Python](#) is the most wanted language for the third year in a row, meaning that developers who do not yet use it say they want to learn it.

Most Loved, Dreaded, and Wanted Web Frameworks

[React.js](#) and [Vue.js](#) are both the most loved and most wanted web frameworks by developers, while Drupal and jQuery are most dreaded.

Most Loved, Dreaded, and Wanted Other Frameworks, Libraries, and Tools

.NET Core and Torch/PyTorch are both used less than other counterparts in their respective ecosystems (.NET and Tensorflow, respectively) but are loved by developers more. Chef and Cordova rank as the most dreaded in this category of frameworks, libraries, and tools.

Most Loved, Dreaded, and Wanted Databases

For the third year in a row, Redis is the most loved database, meaning that proportionally more developers want to continue working with it than any other database. Couchbase and Oracle rank as the most dreaded databases, and for the third year in a row, [MongoDB](#) is the most wanted database.

Most Loved, Dreaded, and Wanted Platforms

[Linux](#) is once again the most loved platform for development, with both Docker and Kubernetes also highly loved this year. WordPress is the most dreaded development platform, and many developers say they want to start developing using Docker and [AWS](#).



Development Environments and Tools

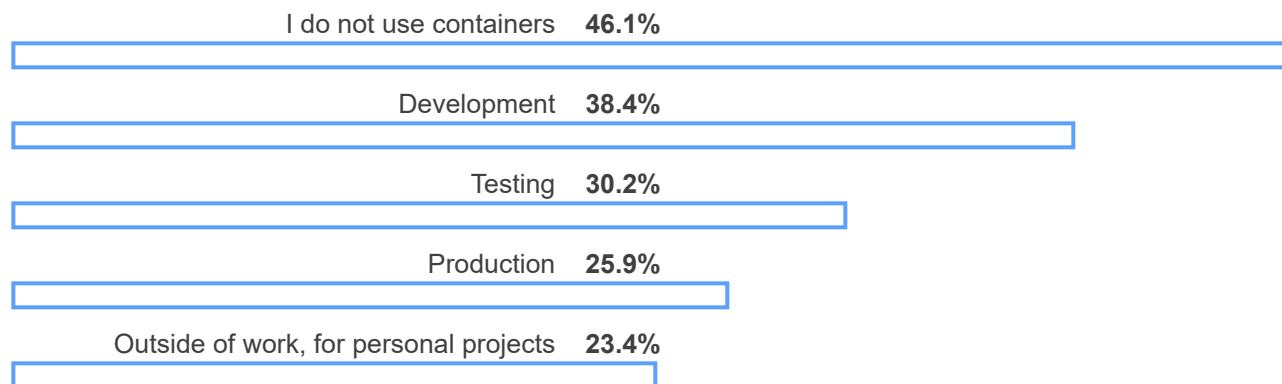
Most Popular Development Environments

Visual Studio Code is a dominant player among developer environment tools this year. There are differences in tool choices by developer type and role, but Visual Studio Code was a top choice across the board. Developers who write code for mobile apps are more likely to choose Android Studio and Xcode. A popular choice for DevOps and SREs is Vim, and data scientists are more likely to work in IPython/Jupyter, PyCharm, and RStudio.

Developers' Primary Operating Systems

We asked our respondents what operating systems they use for work. About half said they mainly use Windows, and the remainder were about evenly split between MacOS and Linux.

Using Containers



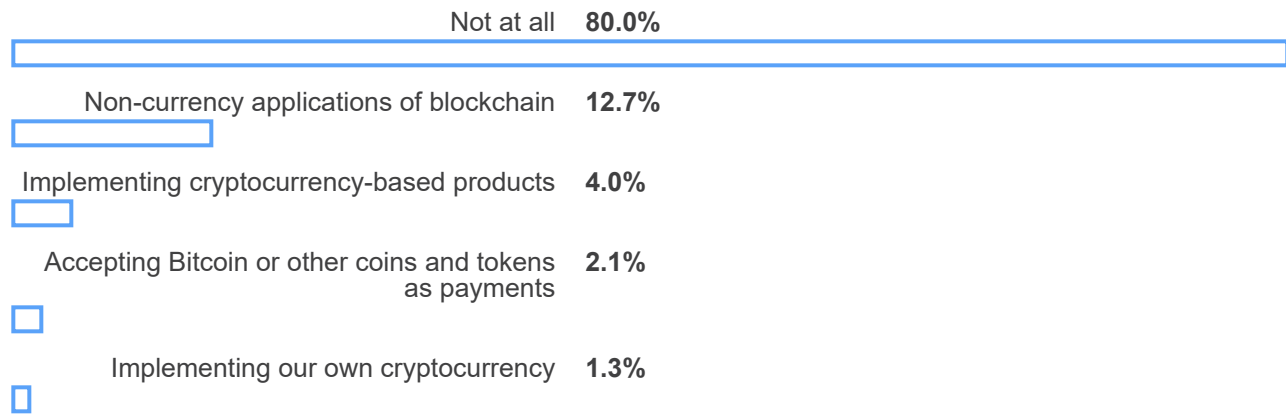
85,366 responses; select all that apply

When asked how they are using container technology such as Docker or Open Container Initiative, about half of our respondents said they are not using any such technology today. Those who are using containers most commonly put them to work in development.



Blockchain in the Real World

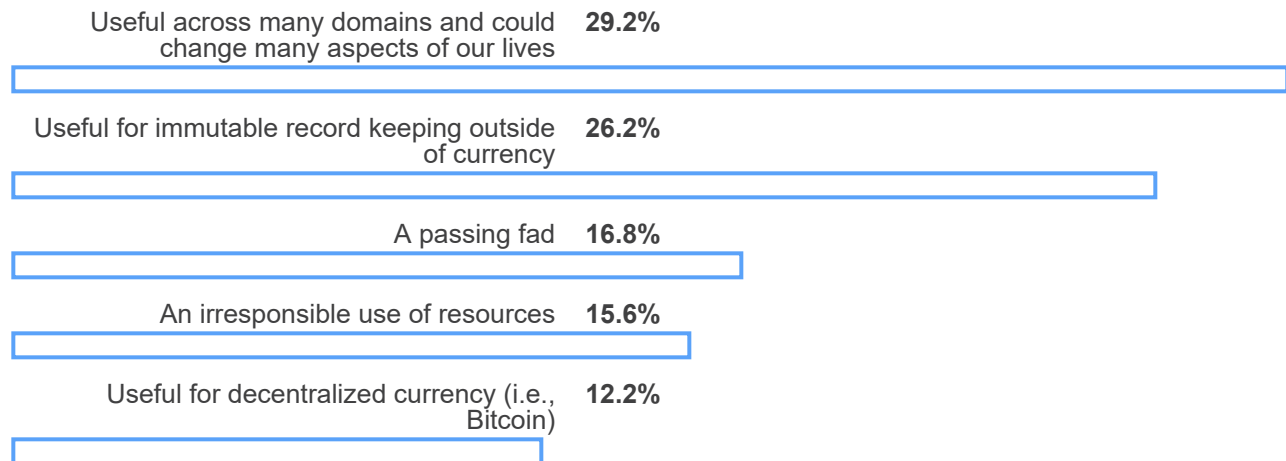
How Are Organizations Using Blockchain Technology?



48,175 responses

Most respondents on our survey say their organizations are not using or implementing blockchain technology, and the most common use reported is outside of currency. Developers in India are the most likely to say their organizations are using blockchain technology.

Developer Opinions on Blockchain Technology



60,165 responses

When asked what they primarily believe about blockchain technology, respondents on our survey are largely optimistic about its broad usefulness. This optimism is largely concentrated among young, less experienced developers, however. The more experienced a respondent is, the more likely they are to say blockchain technology is an irresponsible use of resources.



Top Paying Technologies

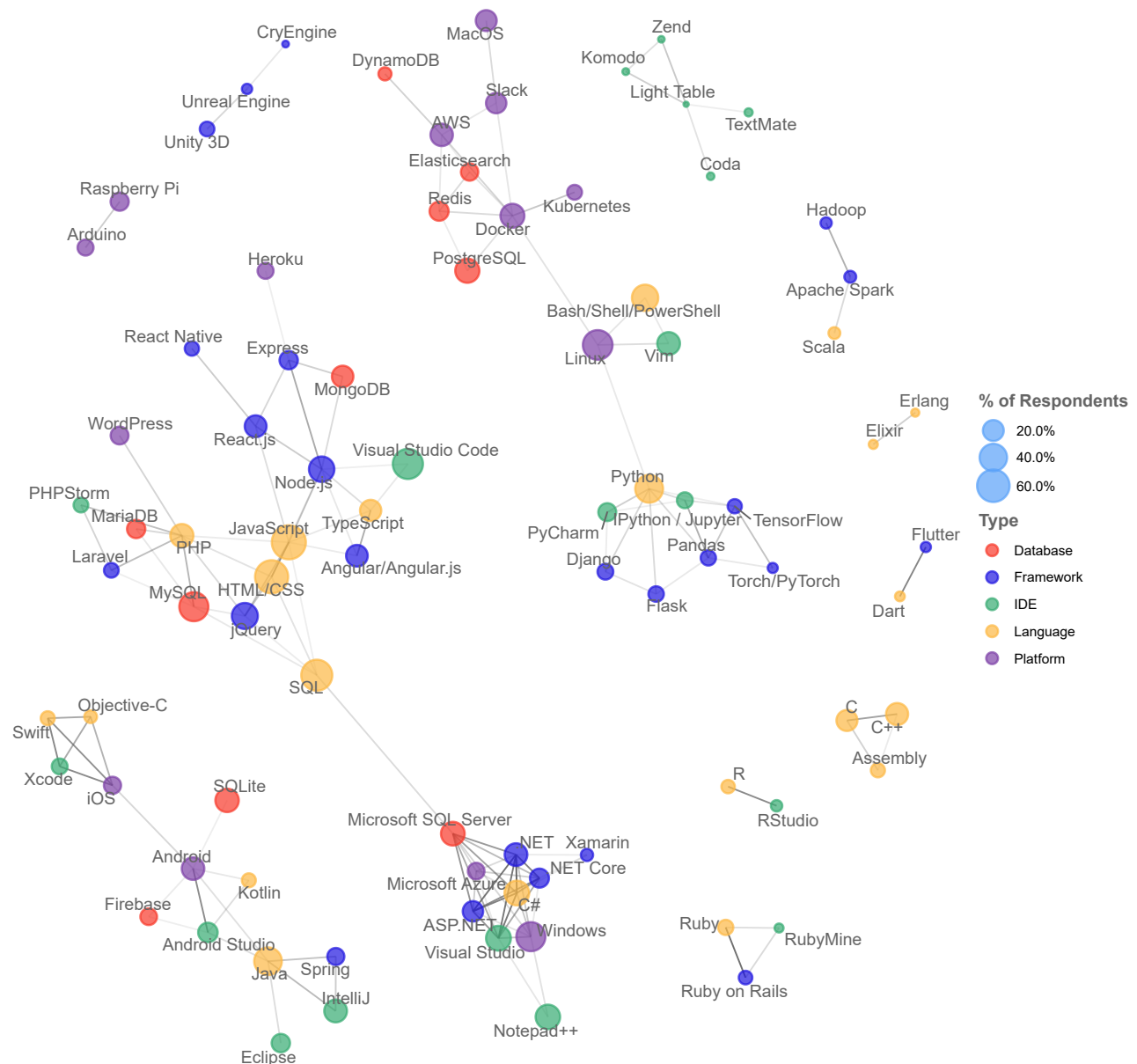
What Languages Are Associated with the Highest Salaries Worldwide?

Globally, respondents who use Clojure, F#, Elixir, and Rust earn the highest salaries, with median salaries above \$70,000 USD. There are regional variations in which languages are associated with the highest pay. Scala developers in the US are among the highest paid, while Clojure and Rust developers earn the most in India.



Correlated Technologies

How Technologies Are Connected



Technologies cluster together into related ecosystems that tend to be used by the same developers. This network graph demonstrates this by showing which technologies are most highly correlated with each other. We see a large cluster on the left for web development (with JavaScript, HTML/CSS, TypeScript, and React.js) connected via SQL to one for Microsoft technologies (with C#, Visual Studio, and .NET Core). Along the lower left we see a mobile constellation connecting Java, Kotlin, Android, and SQLite to iOS and Xcode. This year we observe a cluster of operations technologies with Docker, AWS, and PostgreSQL connected to the Python ecosystem network through Linux. Other smaller correlated clusters include Scala/Spark/Hadoop, C/C++/Assembly, and smaller technologies like language-specific IDEs or frameworks.



Work

How developers get down to the business of software



Employment

Employment Status

Over 90% of professional developers are employed at least part-time.

Employment Status by Geography

Germany has an unusually high proportion of developers working part-time. Developers in the United States are somewhat less likely to work as independent contractors or freelancers. In all of these locations, more than 70% of developers are employed full-time.



Looking for a new development job? Check out [Stack Overflow Jobs](#).

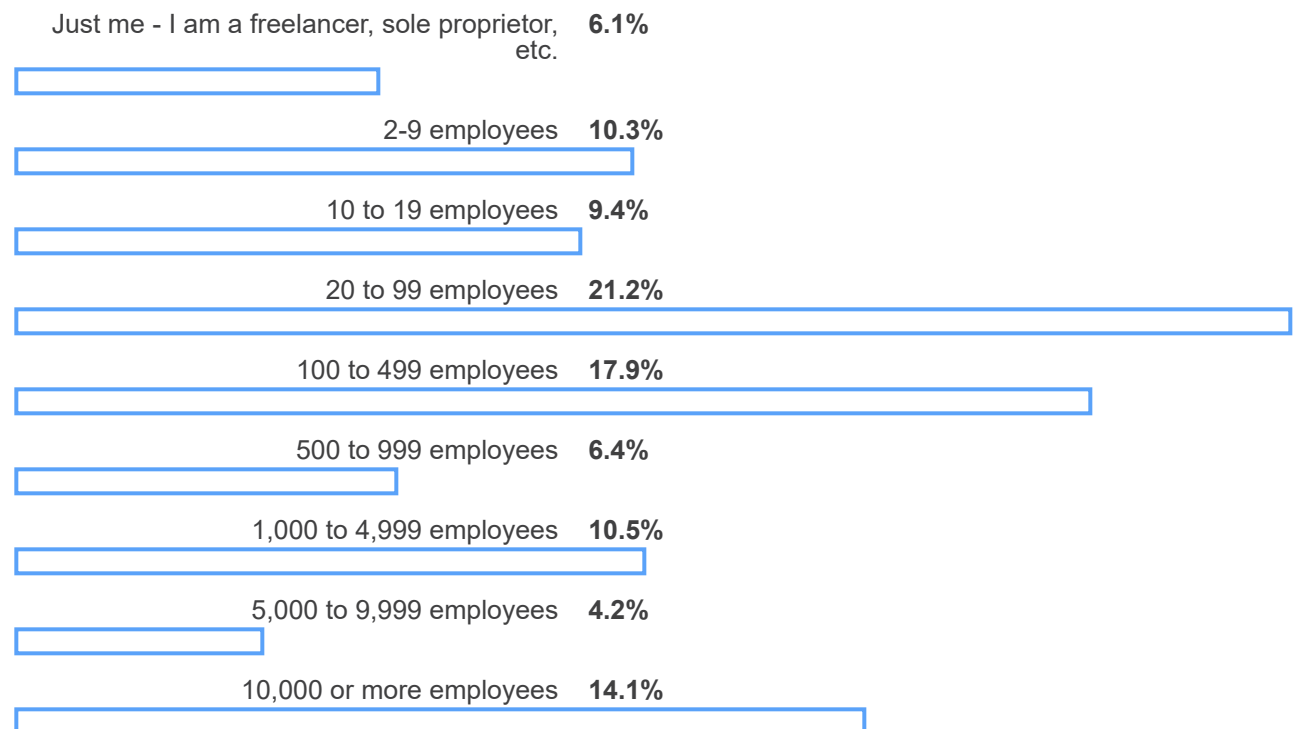


Company Type

Industry

Software developers work in a diverse range of industries, both inside and outside the technology sector. Of the industry options we used this year, more professional developers said they work for companies doing general software development (not otherwise specified), IT, and finance/banking. Developers working in industries such as consulting, government, and nonprofits have more years of professional coding experience, while those working in web development or SaaS have about half as many median years of coding experience overall.

Company Size



71,791 responses

Developers work in companies of all sizes, from small to large enterprise organizations. More software developers in the United States work at larger companies compared to the rest of the world, including Europe. The more experienced a developer is, the more likely they are to work at a larger company. On average, each additional year of professional coding experience is associated with a 30-person increase in a developer's organizational size.

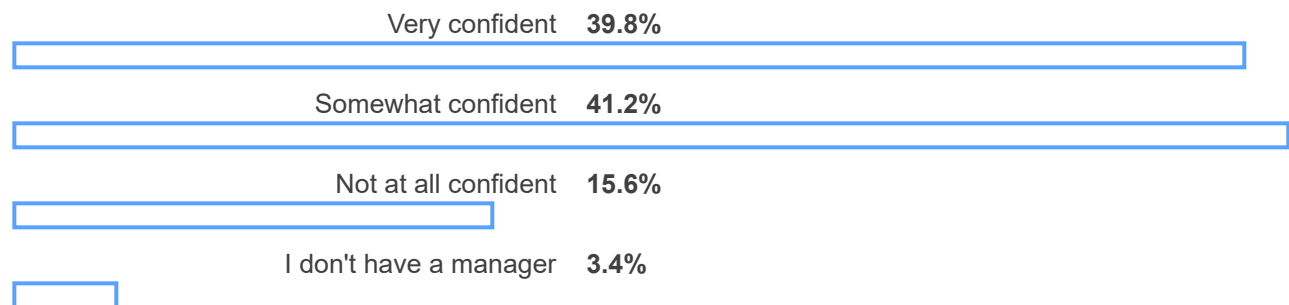


Career Values

How Do Developers Feel About Their Careers and Jobs?

As we've found in previous years, developers tend to be more satisfied with their career than with their current job. Job satisfaction is highest for engineering managers and senior engineering executives, along with SREs and DevOps specialists. Developers with the lowest job satisfaction include academic researchers, educators, scientists, and designers.

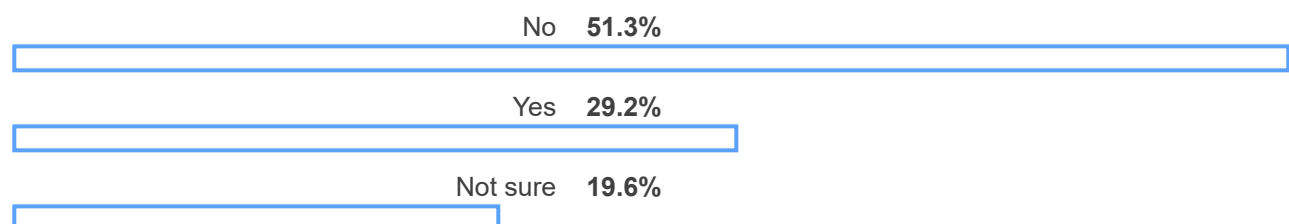
How Confident Are Developers in Their Managers?



61,159 responses

Engineering management is a technical discipline that impacts developers and the work that they do every day. Fortunately, over 80% of respondents are somewhat or very confident that their manager knows what they're doing.

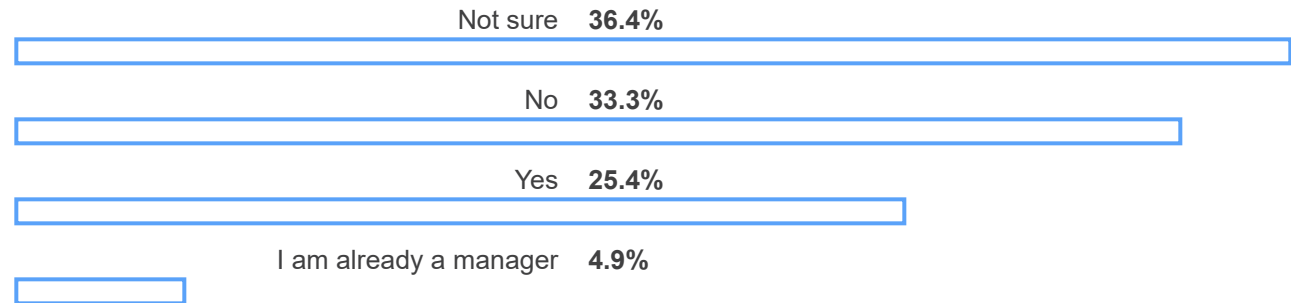
Do Developers Need to Become Managers to Make More Money?



61,157 responses

When it comes to their own perceptions of engineering management as a career, half of respondents don't think they necessarily need to move to people management to continue to grow their salary.

Do Developers Want To Become Managers in the Future?



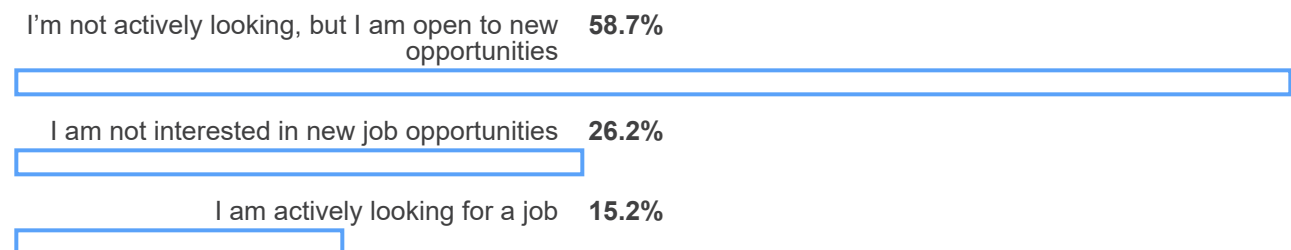
61,232 responses

Respondents are evenly divided about their own plans for such a career change, with no single response dominating. Those who say they do not want to be a manager have *more* years of experience than those who do, with twice as many years of professional coding experience. Developers who are interested today in entering a management path likely have such a career path ahead of them, or perhaps some will change their mind!



Looking for a Job

Job Search Status



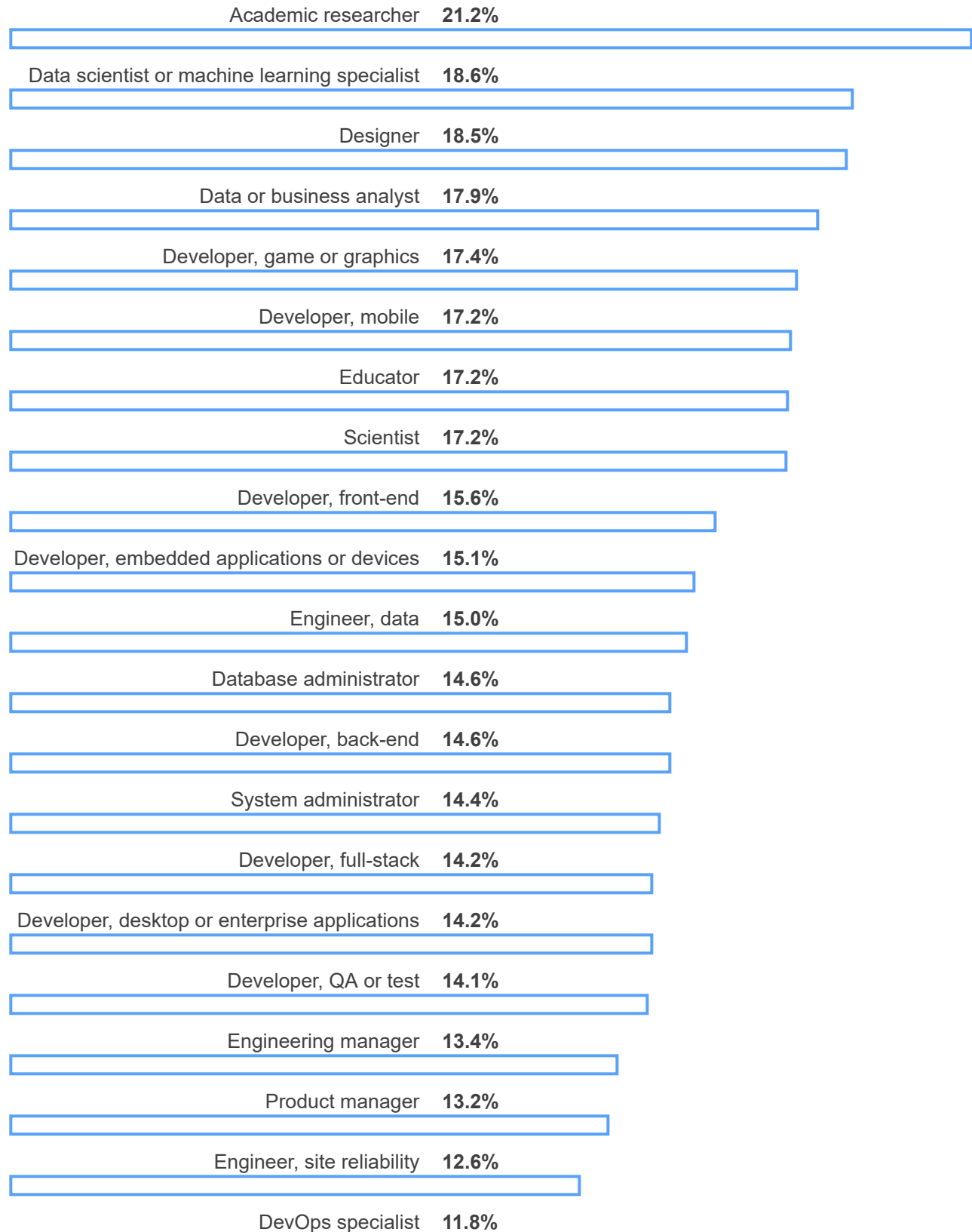
80,555 responses

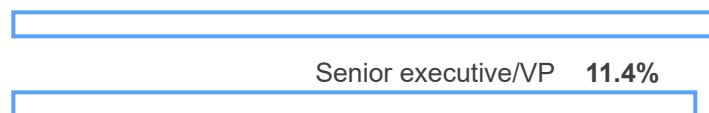
Only 15% of respondents are actively looking for a job, but almost three-fourths of developers are interested in hearing about new job opportunities.

Job Search Status by Geography

Job seeking status is largely consistent across these regions.

Who's Actively Looking for a Job?

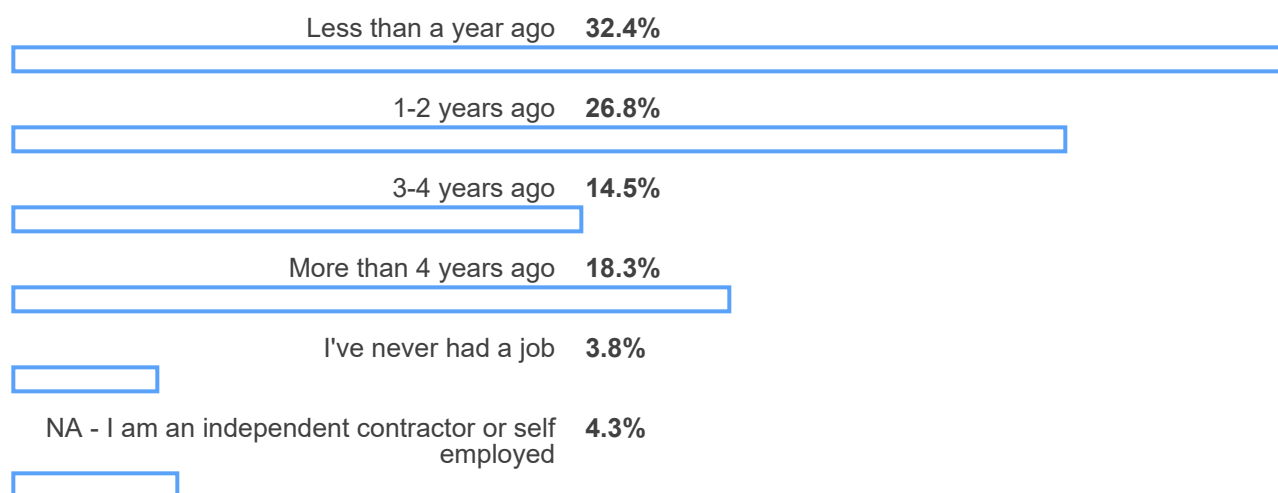




Mean of 76,778 responses

Among professional developers, those who work as senior engineering executives, DevOps specialists, and SREs are looking for work the least. Developers working in academia and data scientists (categories that we know often overlap) are looking for work at higher proportions.

How Long Ago Did Developers Last Change Jobs?



79,854 responses

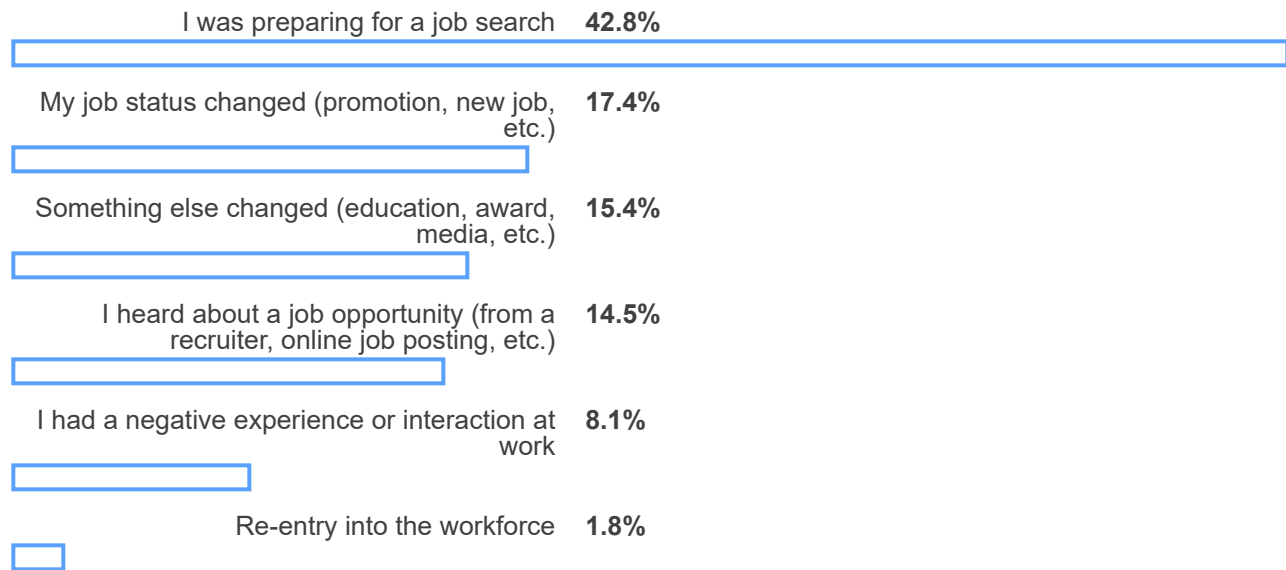
Over half of the respondents on our survey have taken a new job within the past two years; frequent job changes are the norm for software developers.

Interview Practices

We asked our professional developer respondents this year about their last successful interview process that resulted in a job offer, and what type of tasks or interviews they had experienced. The most common experience was being interviewed by senior folks and managers, and less than 40% of respondents report being asked to write any code at all. Women are more likely to report completing a take-home project and less likely to say they were asked to solve a brain-teaser puzzle than men, which is related to the types of roles they are applying for (more front-end and data science roles where take-home projects are prevalent).

We also asked respondents if they have ever been asked to solve [Fizz Buzz](#) during any interview; almost 15% of respondents have.

Updating That Resume



77,877 responses

When asked about the last time they updated their resume, our respondents were most likely to say it was motivated by starting a new job search. We asked respondents who said they had re-entered the workforce why, and reasons included career changes from other fields, retiring from the military, and years spent caring for children full-time.



Job Priorities

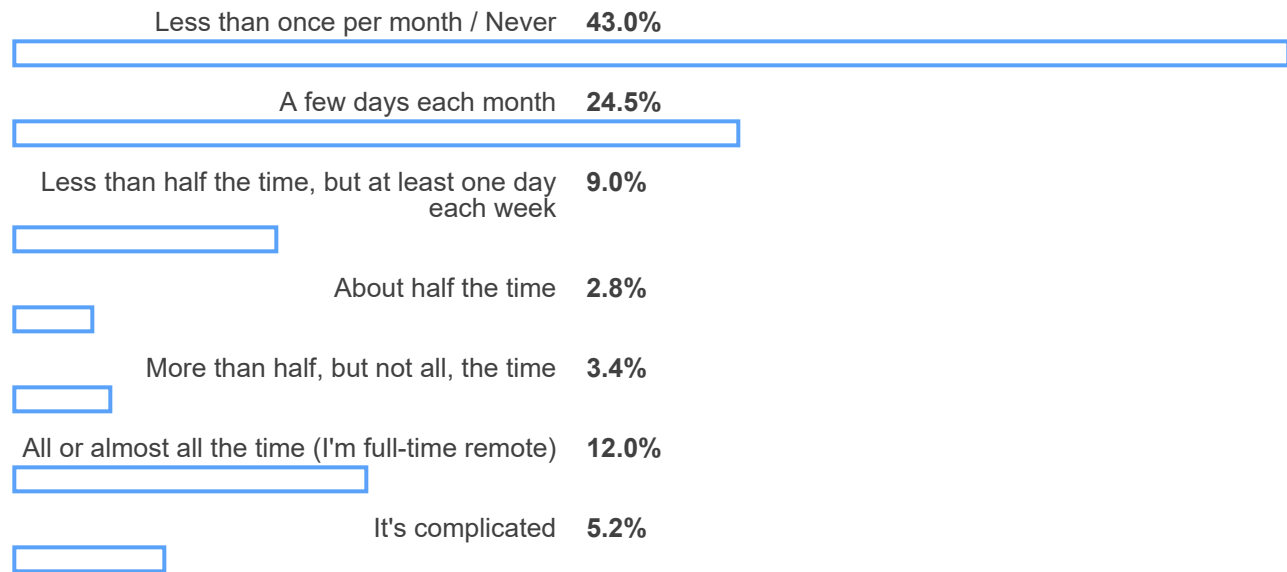
Most Important Job Factors

We asked respondents to picture themselves comparing two jobs with the same compensation, benefits, and location, and consider which characteristics would most influence their choice between the two. Different types of developers apply different sets of priorities when considering jobs. Developers who belong to gender minorities in tech rank the office environment and company culture as their highest concern when assessing a new job, and are more likely to say the diversity of an organization is a top concern for them.

Weighting Important Job Factors in the US

Since we know that there is difference in opinion about job priorities by gender, let's compare the overall opinion in our raw results with a weighted opinion. Using survey weighting doesn't change the results for most choices dramatically, but the diversity of an organization grows significantly more important.

How Often Do Developers Work Remotely?



70,284 responses

About 12% of respondents say they work remotely full-time, up a bit from the last time we asked this question two years ago. Developers who work remotely full-time have on average about 60% more years of professional coding experience than those who never do.

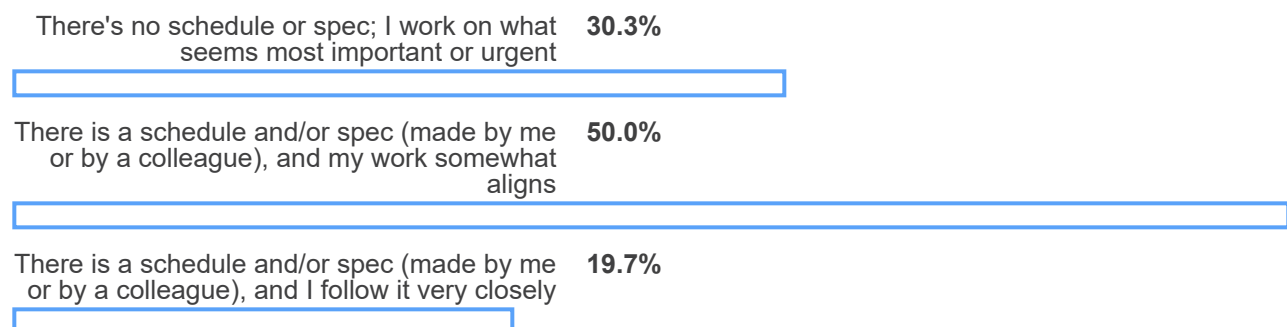
Where Do Developers Want to Work?

Almost 60% of developers say they prefer to work in an office, while over 30% (close to 40% in the United States) would prefer to work at their own homes. If that's you, check out [remote developer jobs](#) here on Stack Overflow.



Development Practices

How Structured Is the Work of Developers?



68,914 responses

We asked respondents if they use a schedule or spec to schedule and plan their work, and only 20% said their work closely aligns with such a planning doc. Those who adopt a more flexible approach or don't use any schedule or spec are more likely to have *more* years of professional coding experience; closely following a schedule or spec is associated with fewer years of experience.

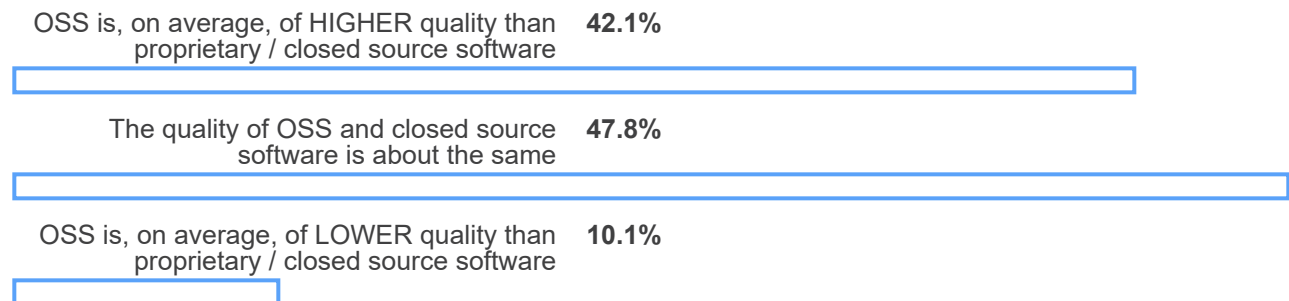
Greatest Challenges to Productivity

When asked what their greatest challenges to productivity are, developers' most common responses include a distracting work environment and meetings. Gender minority respondents are less likely to say that being tasked with non-development work is a problem for them, and more likely to say that toxic work environments are.

Weighting Productivity Challenges in the US

We can compare the overall opinion for the United States in our raw results with a weighted opinion. There are small shifts in some challenges to productivity like toxic work environments and meetings.

Quality of Open Source Software



86,842 responses

Few respondents think that OSS is typically worse than proprietary or closed source software, but opinions are about evenly split between those who say that OSS is typically of better quality and those who say that both models for developing software result in about the same quality. Unsurprisingly, developers who contribute to open source are more likely to say that OSS is of higher quality.

Code Review

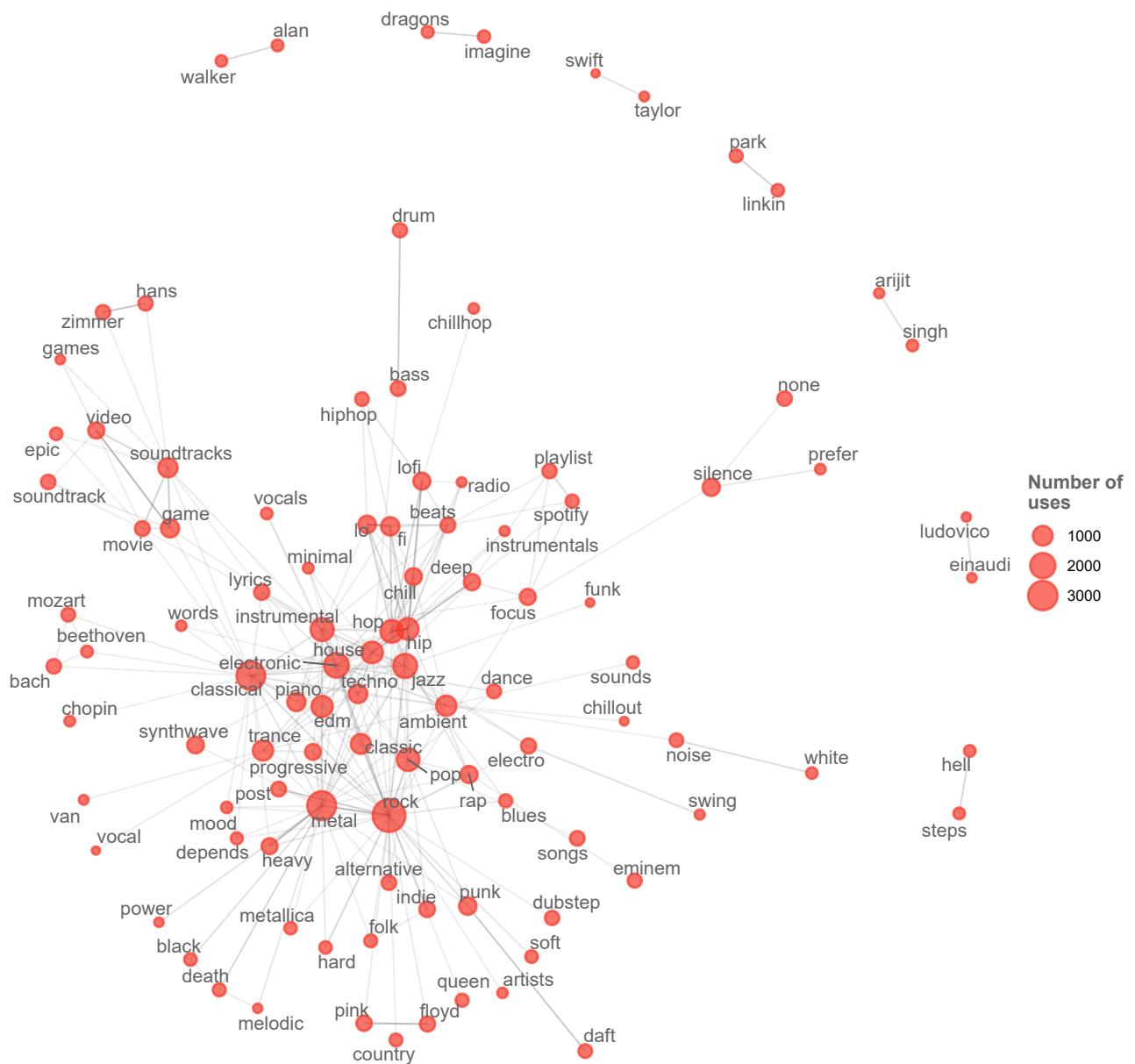
Most respondents say they review code as part of their work, because it is an important part of the software engineering process. It's not a dominant part of most developers' work week, though. About

three-fourths of developers say they spend five hours or less each week reviewing code.

Unit Tests

We asked respondents if their organization uses unit tests in development, and they are overwhelmingly in favor of unit testing, whether they currently use them or not. In fact, developers at companies who embrace unit testing also have slightly higher job satisfaction.

Music for Focus While Coding



Network shows words that cooccur most often among 56,643 responses; words with larger points are used more often and heavier connections indicate words used more often together

When asked what musical artist or genre helps them focus, respondents replied with an enormous variety of music, including classical music, video game or movie soundtracks, more kinds of metal than some of us knew existed, and music without lyrics or vocals. A few percent of respondents were clear that they prefer silence for concentrating.

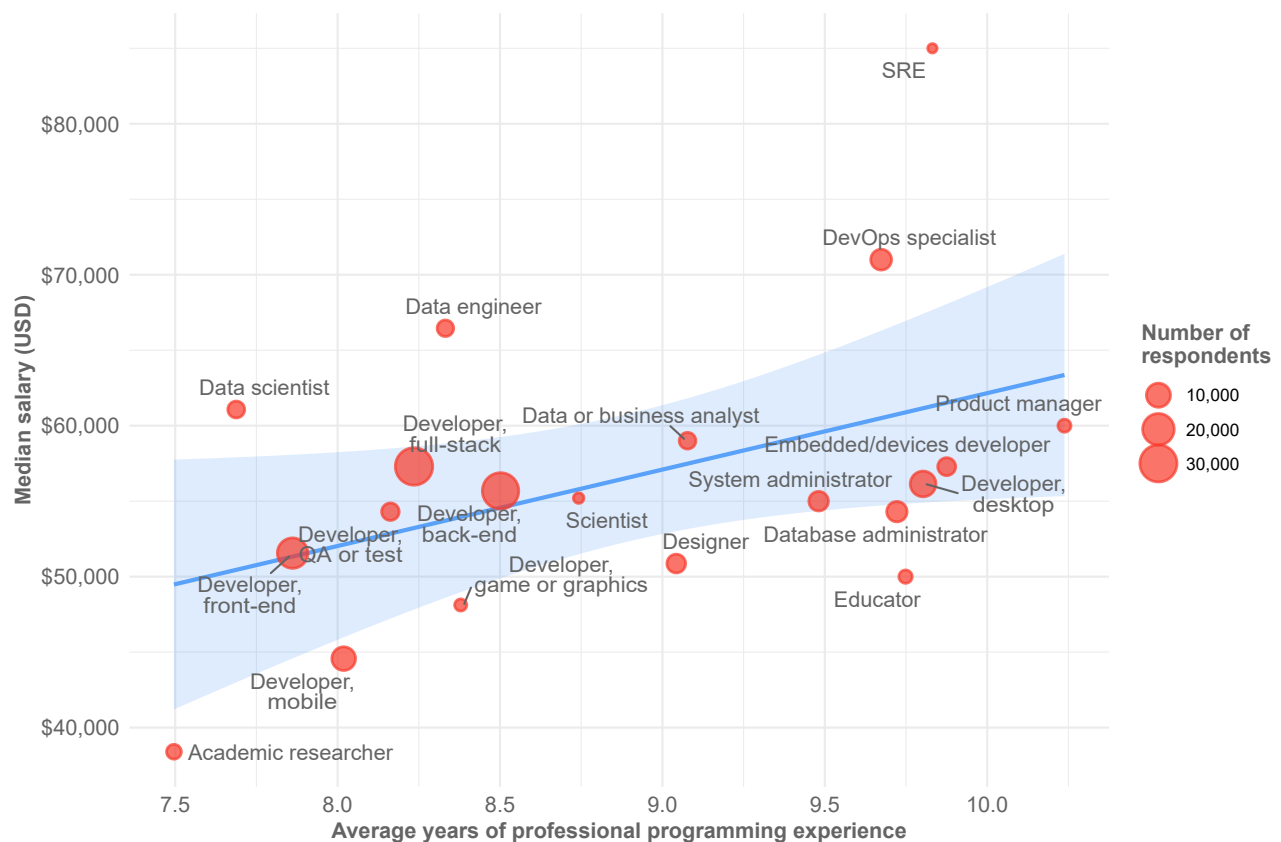


Salary

Salary by Developer Type

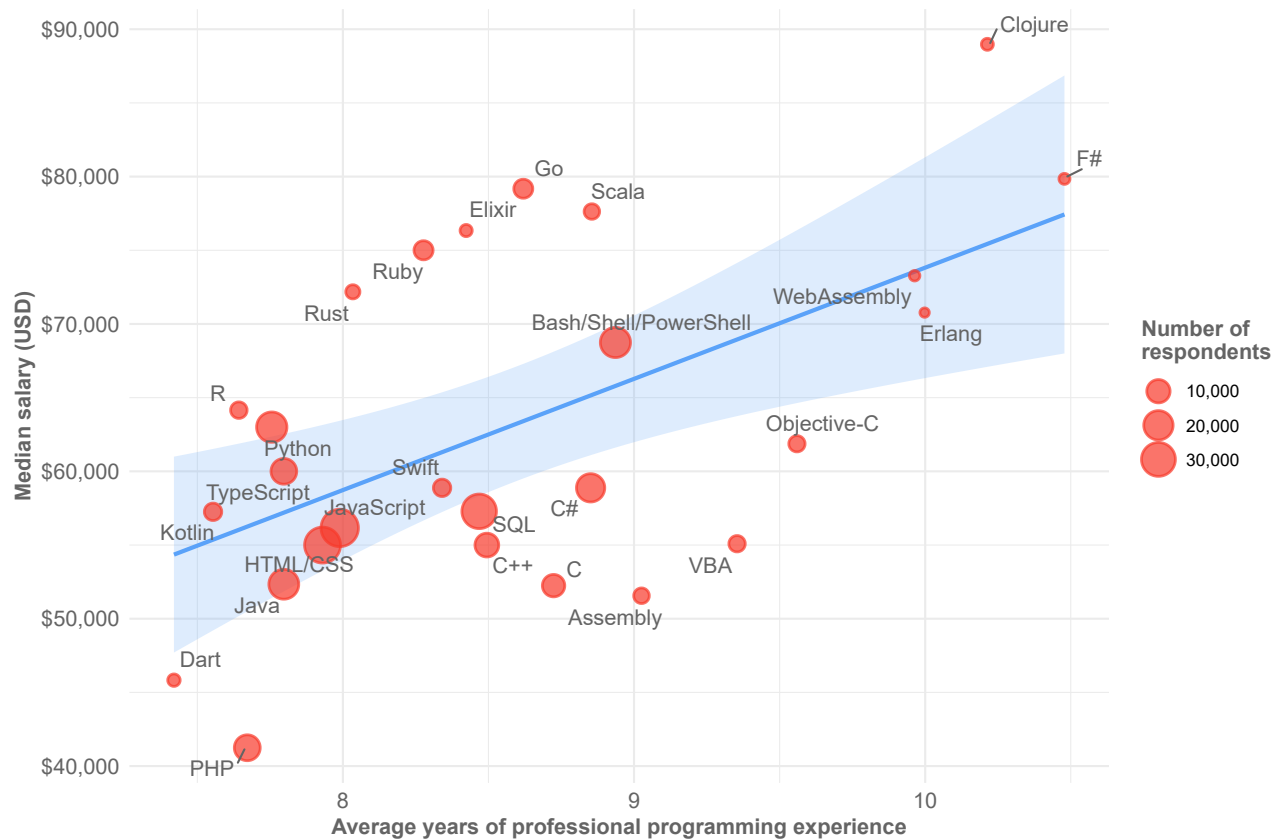
Engineering managers, SREs, DevOps specialists, and data scientists/engineers command the highest salaries. Average top earning roles are remarkably consistent across the globe, from India to Europe to the United States. See our [Methodology](#) section for information on how we converted local currencies used by respondents to U.S. dollars.

Salary and Experience by Developer Type



Naturally, developers with more years of experience are paid more. However, some types of coding work are paid more highly at the same level of experience. Developers who work with data (data scientists and engineers) and those who work in DevOps and site reliability are high earners for their level of experience, while academic researchers and educators are paid less at their experience levels.

Salary and Experience by Language



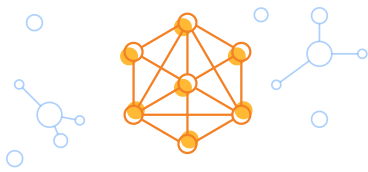
Developers using languages that appear above the line in this chart, such as Clojure, Scala, Go, Rust, and R, are being paid more even given how much experience they have. Developers using languages below the line, like PHP, Assembly, and VBA, however, are paid less even given years of experience. The size of the circles in this chart represents how many developers are using that language compared to the others.

Hours Worked Per Week

For the first time this year, we asked respondents how many hours they work each week, and three-fourths say they work less than 45 hours per week. Senior executives, product managers, and engineering managers are more likely to work longer hours, as well as developers in Eastern Europe, India, and the United States.



Looking to hire developers? Learn how with [Stack Overflow Talent](#).



Community

Where developers come to learn, share knowledge, and build their careers

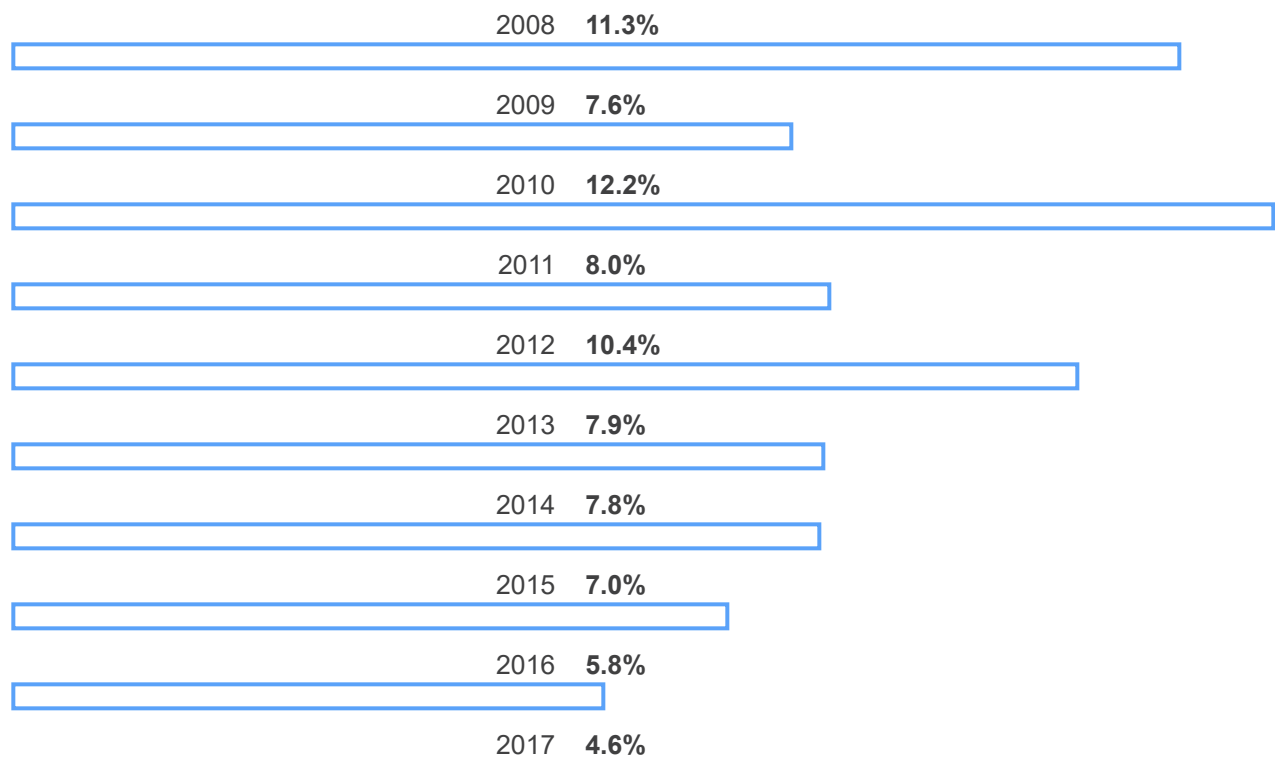


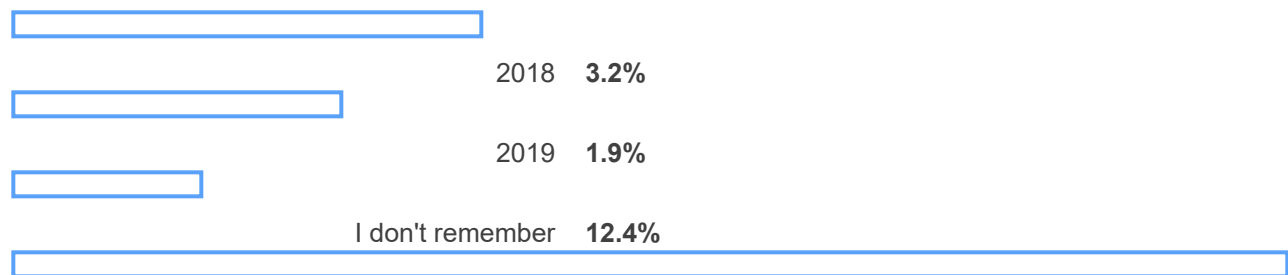
Site Use

Visiting Stack Overflow

Developers visit Stack Overflow. A lot. Our survey respondents likely visit even more than the average developer, since a majority of respondents found the survey from Stack Overflow emails, notifications, and banners. Over 85% of respondents visit Stack Overflow at least a few times per week, with over 60% visiting every day. In the United States, there are only slight shifts between the results weighted by gender and unweighted results on visit frequency.

When Did You First Visit Stack Overflow?

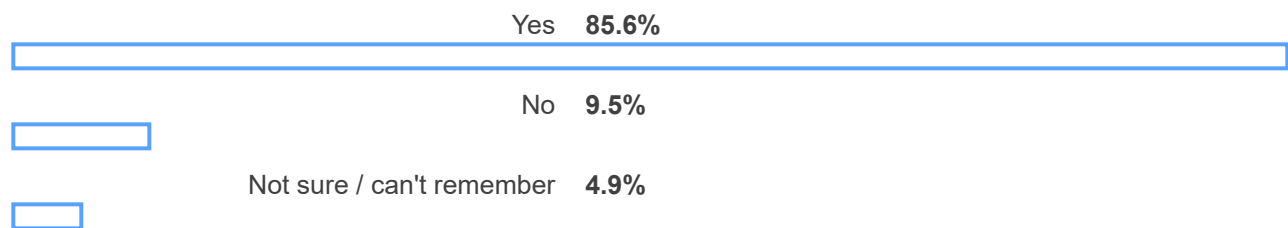




83,877 responses

Many respondents can't remember when they first visited Stack Overflow. Of those willing to make an estimate, about half say they first visited in the first four years of Stack Overflow's existence, in 2012 or before. This is important background for interpreting our survey results, as our survey sample contains proportionally more long-time community members than the population of Stack Overflow users in general.

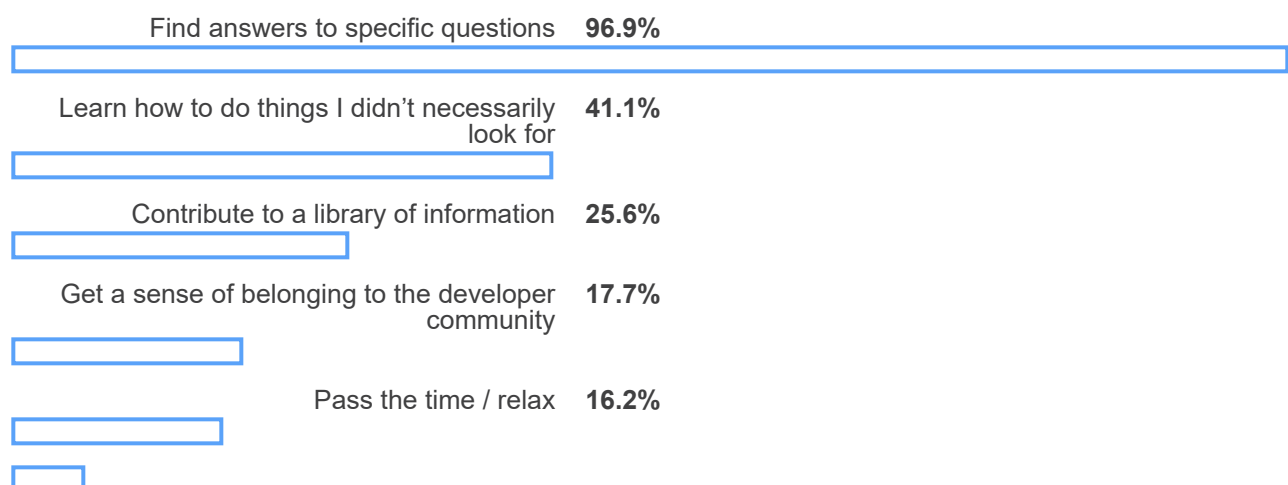
How Many Participants Have a Stack Overflow Account?



87,828 responses

About 85% of the participants in our survey say they are registered users with accounts. This is important context for interpreting our survey results, because most Stack Overflow traffic is anonymous, unregistered users.

Why Do Developers Visit Stack Overflow?

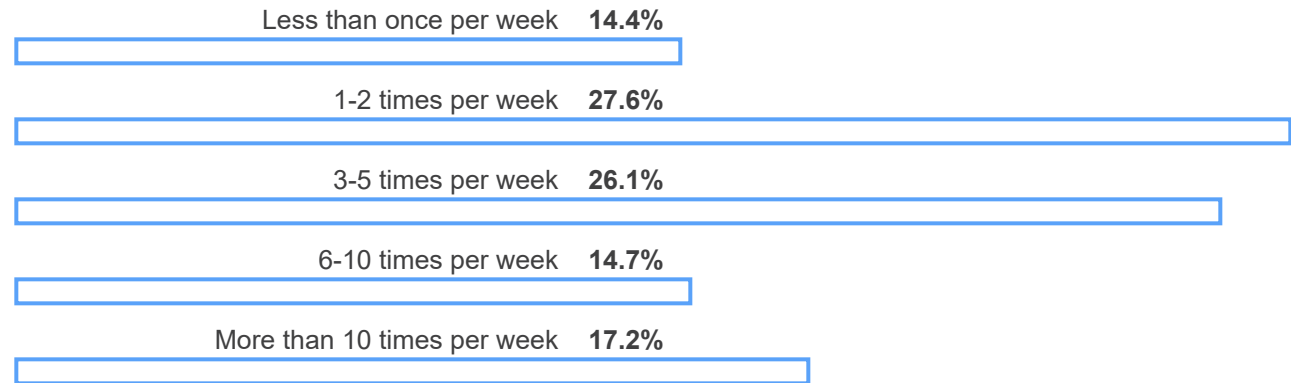


Meet other people with similar skills or interests **5.7%**

88,086 responses; select all that apply

Overwhelmingly, developers come to Stack Overflow to find specific answers to specific questions that they have, with almost every respondent selecting this option. Other motivations for visiting are chosen much less often, and by highly engaged members of our community.

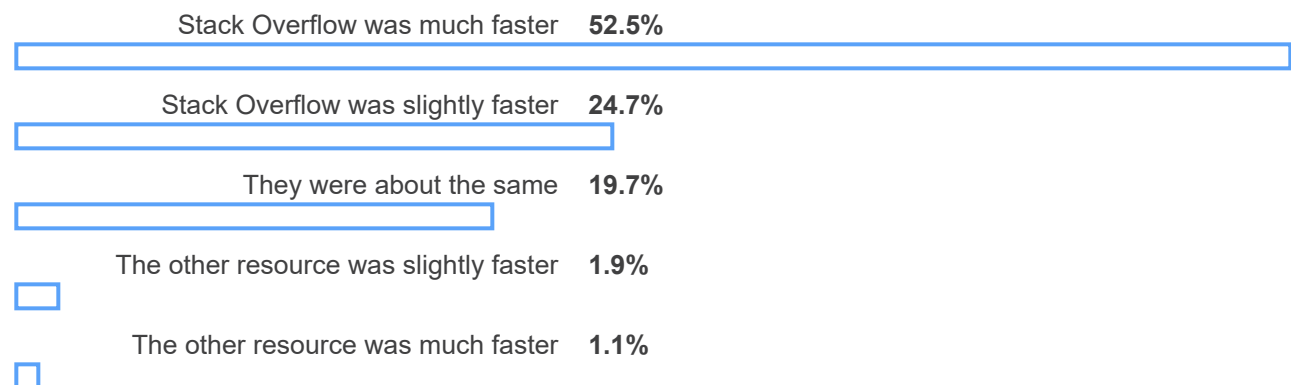
Finding Answers on Stack Overflow



87,816 responses

We asked respondents how many times a week they find answers on our site, on average, and about 60% of respondents say they find answers on Stack Overflow three times a week or more often.

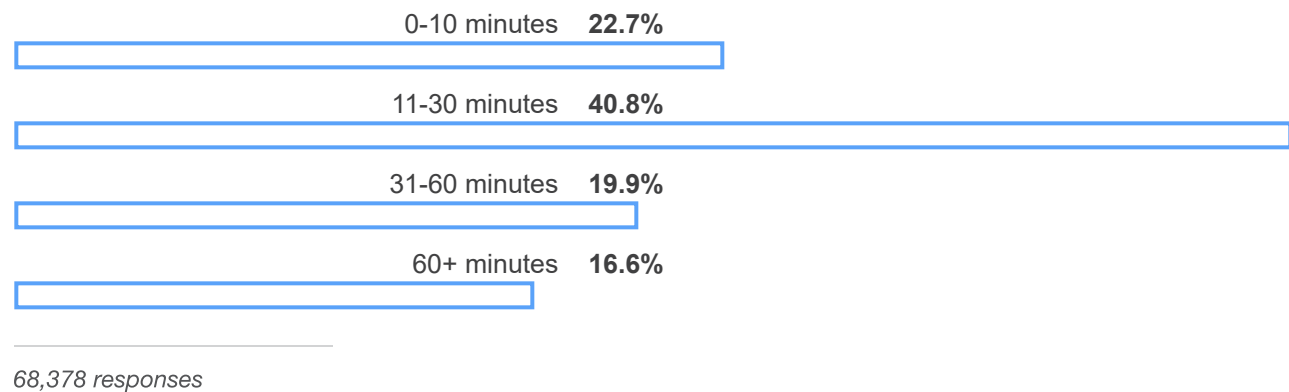
Comparing Stack Overflow to Other Resources



86,344 responses

Over three-fourths of respondents say that using Stack Overflow is faster for solving coding problems than using other resources. If you'd like to speed up your organization's ability to solve problems, learn more about [Stack Overflow for Teams](#).

How Much Time Does Stack Overflow Save Developers?



When asked to compare the last time they solved a problem using Stack Overflow and the last time they used another resource, about 40% of developers say they save 30 minutes or more, and three-quarters of developers agree that they save more than 11 minutes. Combined with the previous results, we can estimate that, conservatively, Stack Overflow saves 30 to 90 minutes of time per developer per week.

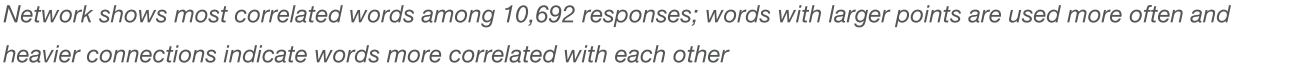


Engaging Together

How Often Do Developers Participate on Stack Overflow?

Some developers come to Stack Overflow only to find answers to their questions, while others participate in the community by asking, answering, voting for, or commenting on questions. Over 30% of survey respondents participate on Stack Overflow a few times per month or more often. When comparing United States weighted to unweighted results, we see more representation from those who have never participated on Stack Overflow.

Why Don't Developers Participate on Stack Overflow?



Do Developers Consider Themselves Part of the Stack Overflow Community?

Is Stack Overflow More Welcoming Than Last Year?



Somewhat more welcome now than last year **10.3%**



Just as welcome now as I felt last year **73.0%**



Somewhat less welcome now than last year **5.0%**



A lot less welcome now than last year **3.0%**



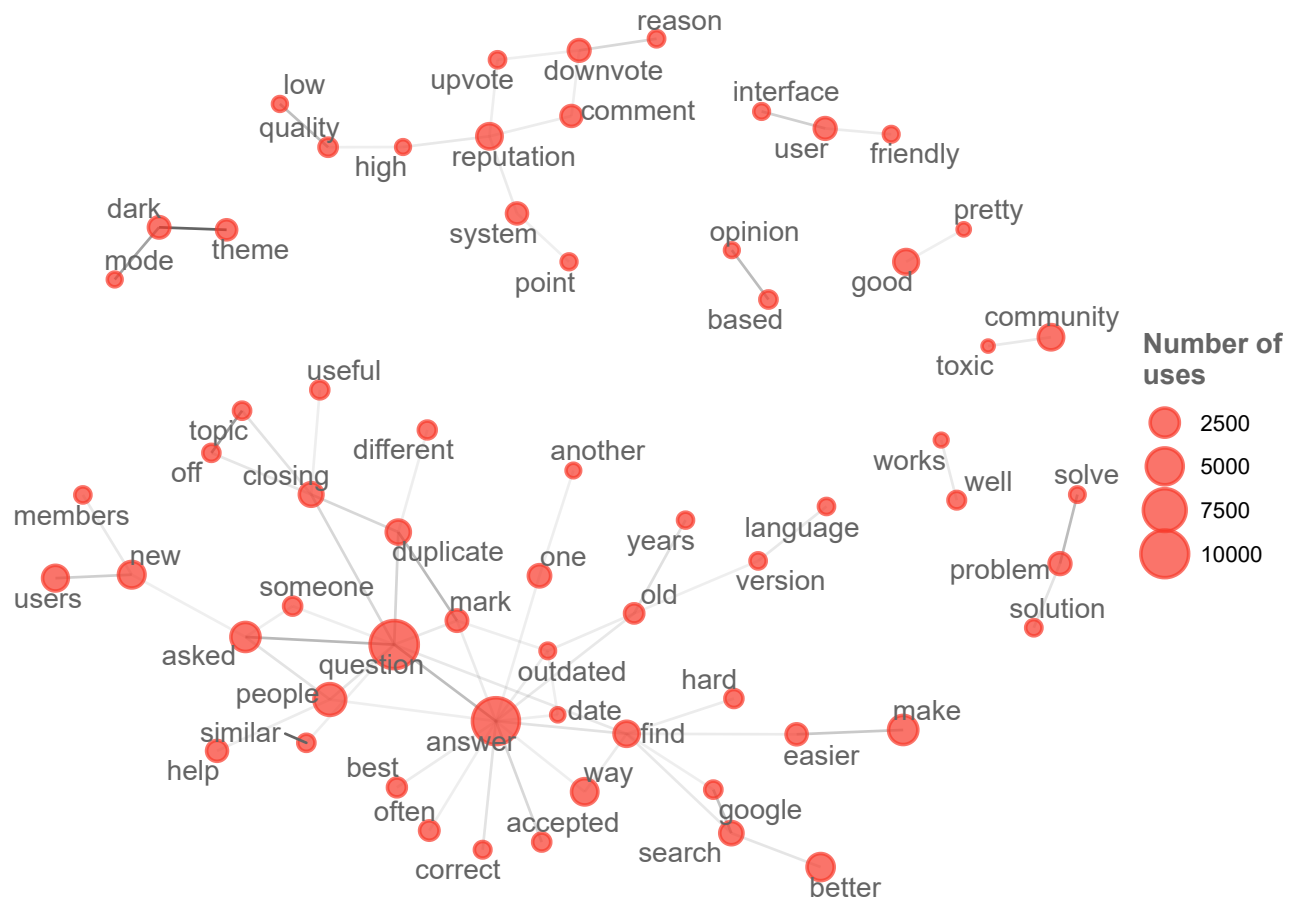
Not applicable - I did not use Stack Overflow last year **3.1%**



85,855 responses

This year, we at Stack Overflow have been working to [publicly acknowledge](#) challenges we face on our site, and to [make choices](#) addressing those challenges. Most respondents say they feel about the same as last year, but respondents are twice as likely to say they feel more welcome than less welcome. Respondents who are people of color, especially black or of African descent, South Asian, and Hispanic or Latino/Latina, are especially likely to say they feel more welcome this year, both in the United States and worldwide.

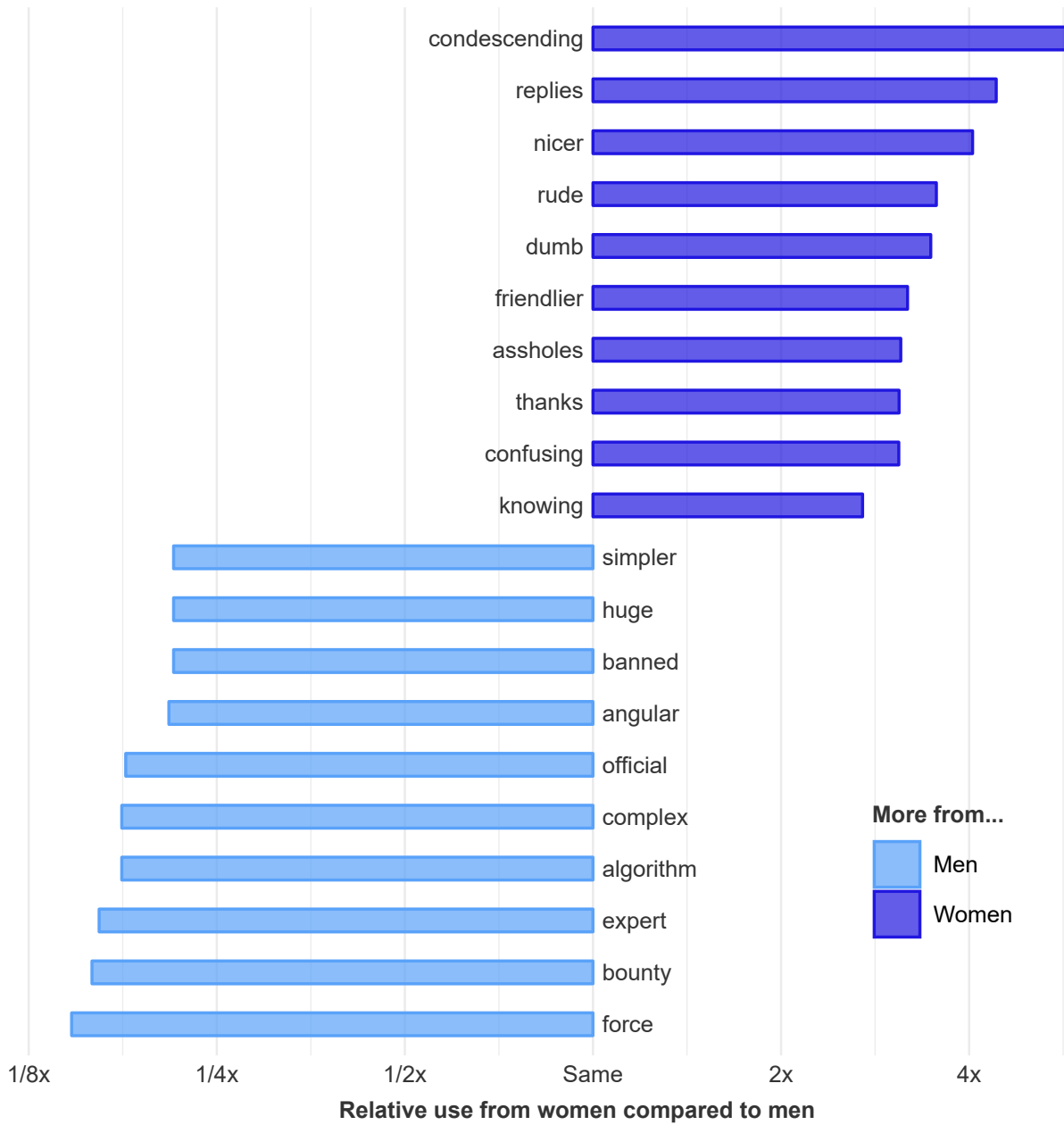
What Would Developers Change About Stack Overflow?



Network shows most correlated words among 33,481 responses; words with larger points are used more often and heavier connections indicate words more correlated with each other

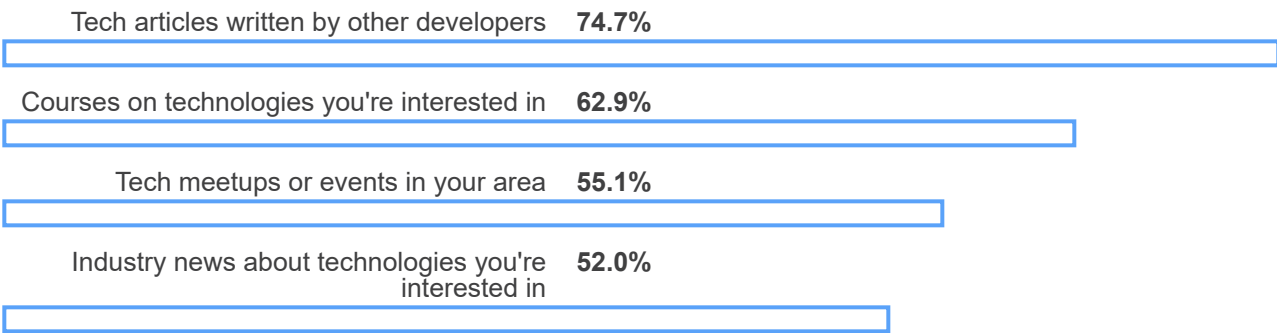
We asked respondents in a free text question what *one* thing they would change about Stack Overflow if they had the chance. Respondents shared ideas including comment privileges at lower reputation, identifying and removing outdated answers, frustrations with duplicate question handling, and issues with community culture.

Developers' Perspectives By Gender



The aspects of Stack Overflow that respondents would like to change exhibit differences across demographic groups. For example, developers who are men are more likely to want change in official site rules (from the algorithms behind them to how they are enforced), while developers who are women are more likely to want to change norms for communication on our site.

Opinions on New Content Types

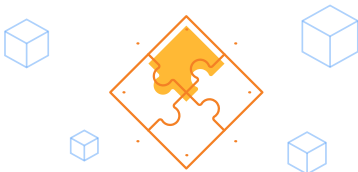


69,560 responses

When presented with new possible types of content for Stack Overflow, respondents are most interested in tech articles from developers and least interested in industry news. We also got feedback around this question that some respondents were not interested in any of these kinds of changes for Stack Overflow.



Looking for a place for you and your technical team to ask and answer questions in a secure environment? Learn more about [Stack Overflow for Teams](#). Want an on-premise or private cloud version? Check out [Stack Overflow for Enterprise](#).



Methodology

How we planned and analyzed our survey

This report is based on a survey of 88,883 software developers from 179 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 400 responses were submitted but not included in the analysis because respondents spent less than three minutes on the survey.

Qualified Responses Worldwide

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Location	Amount
Europe	36,073
North America	25,526
Asia	18,273
South America	3,459
Africa	2,850
Australia/Oceania	2,434
Other (country not listed)	268

- The survey was fielded from January 23 to February 14.
- The median time spent on the survey for qualified responses was 23.3 minutes.
- Respondents were recruited primarily through channels owned by Stack Overflow. The top 5 sources of respondents were onsite messaging, blog posts, email lists, Meta posts, 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 links for the survey and click to begin it.
- As an incentive, respondents who finished the survey could opt in to a “Census” badge if they completed the survey.
- Unfortunately, our survey wasn't accessible to the entire world this year. Traffic from Crimea, Cuba, Iran, North Korea, and Syria was blocked by our third party survey software due to recent United States transport/export sanctions, although some respondents used VPNs to avoid this. This unanticipated limitation of our survey should be kept in mind when interpreting survey results.
- Our estimate of professional developers comes from the things people [read and do](#) when they visit Stack Overflow. We collect data on user activity to help surface jobs we think you might find interesting and questions we think you can answer. You can [download](#) and clear this data at any time.
- 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.
 - We converted salaries from user currencies to USD using the exchange rate on 2019-02-01, and also converted to annual salaries assuming 12 working months and 50 working weeks.
 - This question, like most on the survey, was optional. There were 55,945 respondents (62.9% of qualified respondents) who gave us salary data.
 - 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.

- 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.
- The questions were organized into several blocks of questions, which were randomized in order. Also, the answers to most questions were randomized in order.
- We used data from last year's survey and trends in tags on Stack Overflow to identify which technologies to include on the survey this year. We prioritized popular and fast growing technologies, considering which smaller or shrinking technologies we could remove this year.

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