



Overview

Developer Profile

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- Python has risen in the ranks of programming languages on our survey, surpassing C# in popularity this year, much like it surpassed PHP last year.
- When assessing a prospective job (https://www.stackoverflow.com/jobs), different kinds of developers apply different sets of priorities. Women say their highest priorities are company culture and opportunities for professional development, while men say their highest priorities are compensation and working with specific technologies.

Want to dive into the results yourself? We made the anonymized results (/survey) of the survey available for download under the Open Database License (ODbL) (https://opendatacommons.org /licenses/odbl/1.0/). We look forward to seeing what you find!



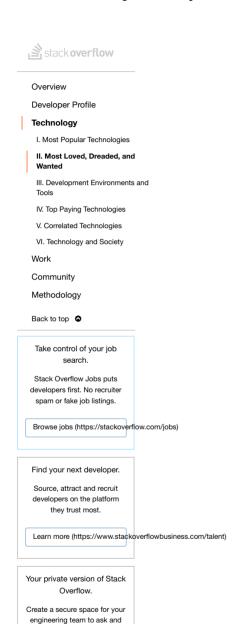
Developer Profile

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.



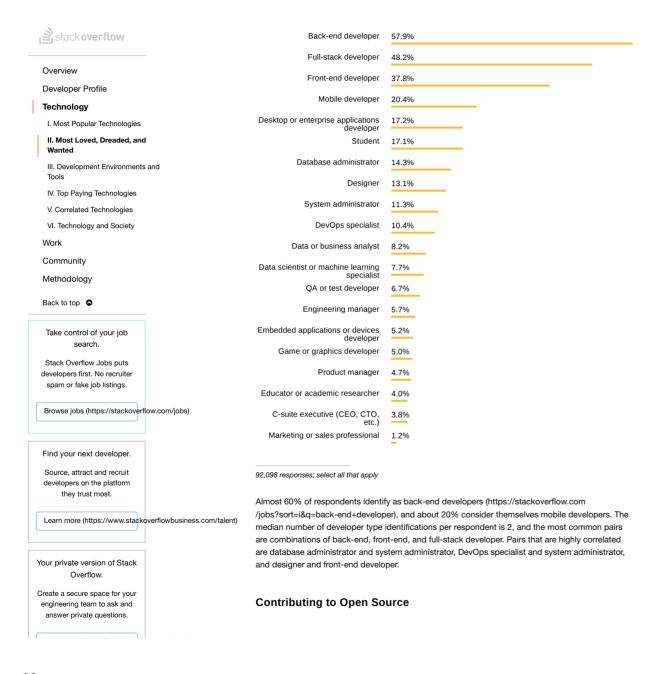
Our estimate of professional developers comes from the things people read and do (https://kevinmontrose.com/2015/01/27/providence-machine-learning-at-stack-exchange/) when they visit Stack Overflow. We collect data on user activity to help surface jobs we think you might find interesting and questions we think you can answer. You can download (https://stackoverflow.com/users/prediction-data) and clear this data at any time.

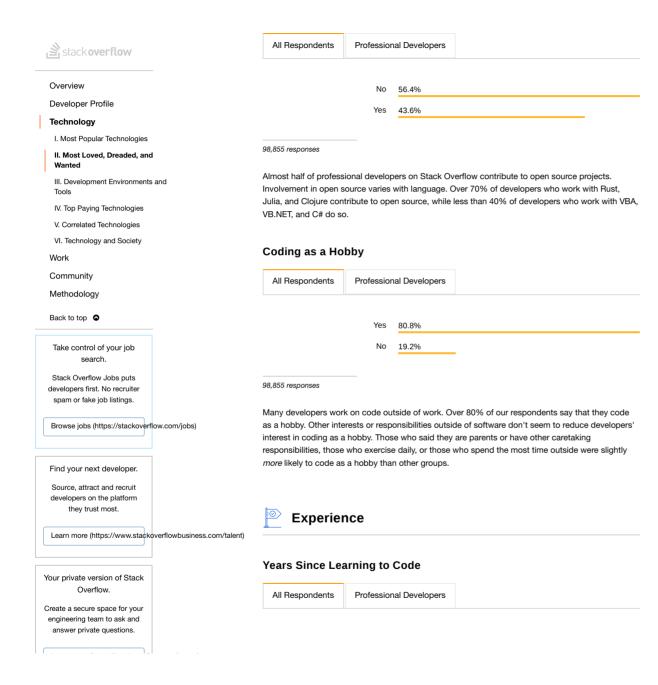


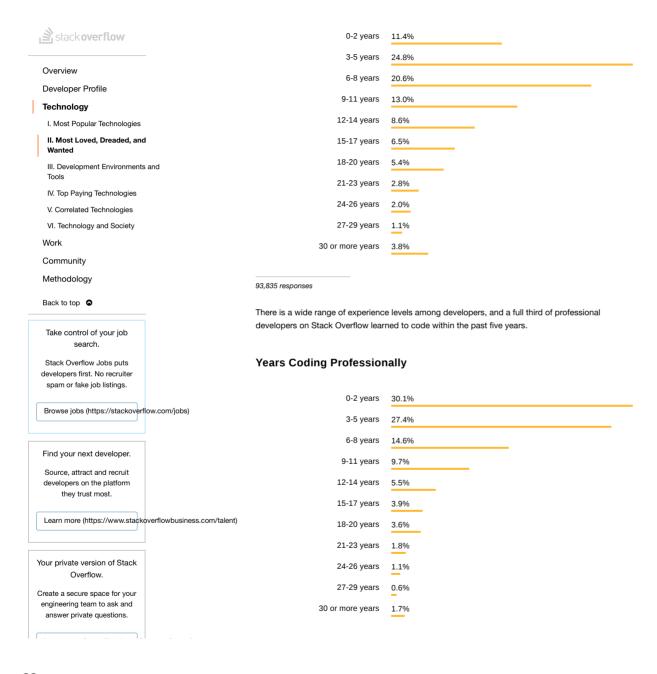
Developer Roles

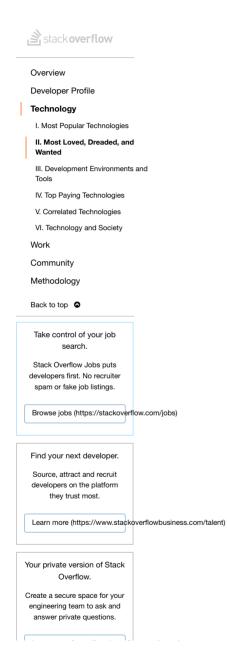
Developer Type

answer private questions.









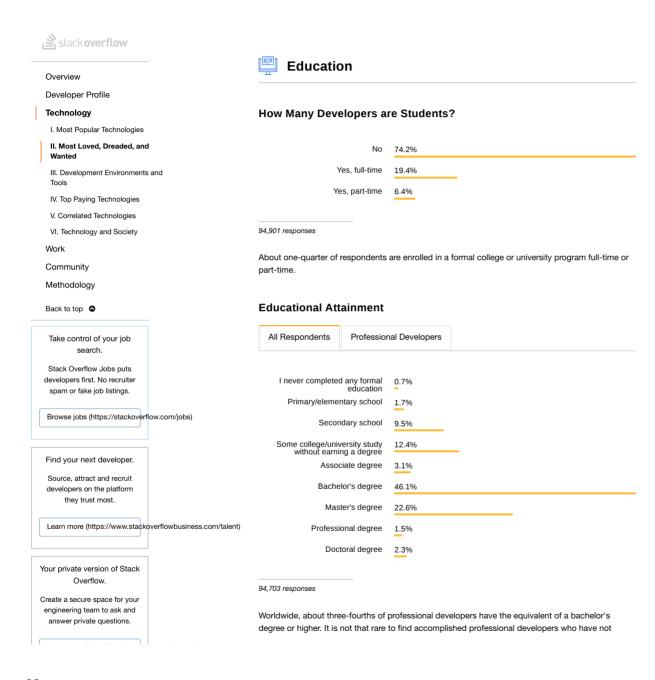
77,903 responses

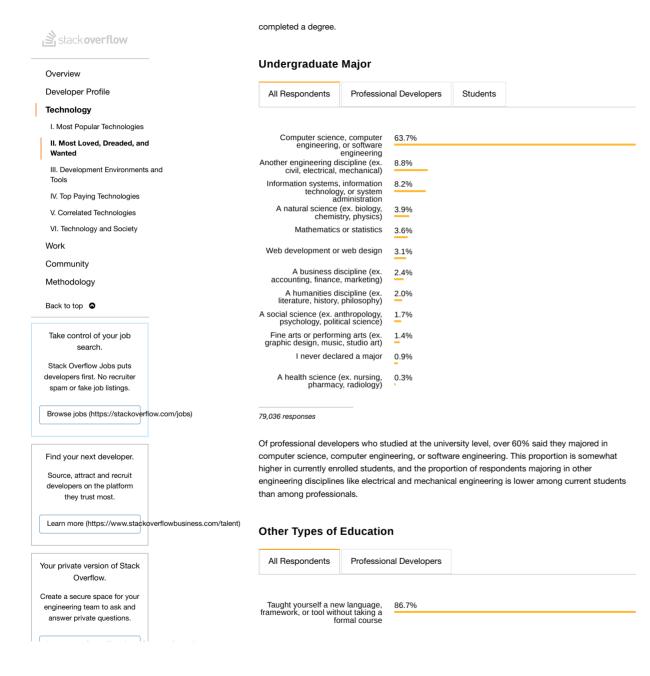
Over half of respondents have five years of professional coding experience or less. Developers who work with languages such as Cobol and Perl have the most years of professional coding experience, while developers who work with languages like Matlab, Haskell, and Kotlin have the fewest.

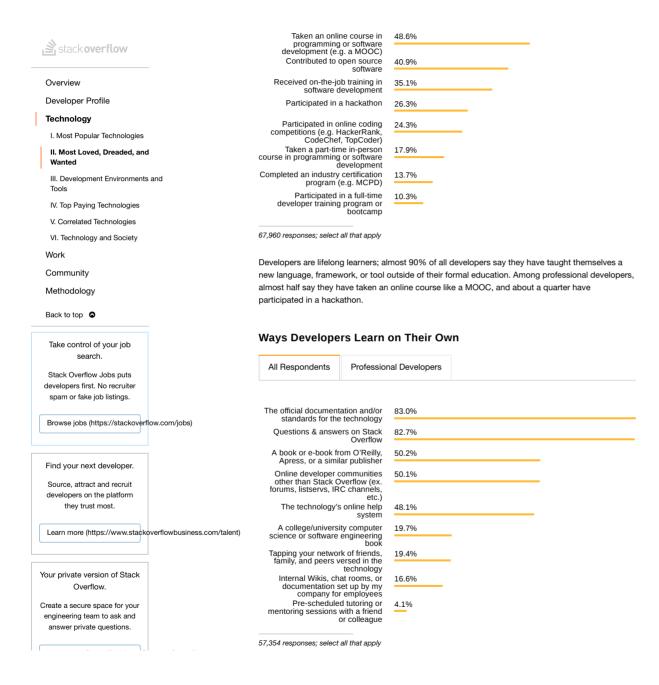
Years of Professional Coding Experience by Developer Type

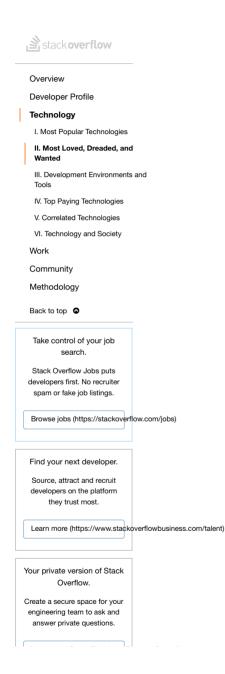
Engineering manager	10.2
DevOps specialist	8.0
Desktop or enterprise applications developer	7.7
Embedded applications or devices developer	7.5
Data or business analyst	7.2
System administrator	7.0
Database administrator	6.9
Full-stack developer	6.3
Back-end developer	6.2
Educator or academic researcher	6.2
Designer	6.0
QA or test developer	5.8
Front-end developer	5.5
Data scientist or machine learning specialist	5.5
Mobile developer	5.2
Game or graphics developer	4.6
Mean of 77,078 responses	

Developers who work in different areas of software development have different average amounts of experience. DevOps specialists and developers who code for desktop and enterprise applications have the most experience. DevOps as a discipline and professional identity is relatively new, but the people working in this field are highly experienced. Game/graphics developers and mobile developers have the fewest years of experience.



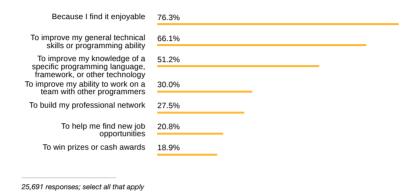






Over 80% of respondents rely on Stack Overflow Q&A when learning something new. Additionally, developers understand the value of good documentation, as over 80% also use documentation as a resource when learning.

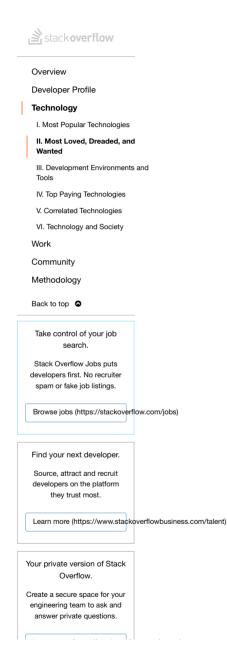
Why Do Developers Participate in Hackathons?



Among the respondents who said they have participated in hackathons or online coding competitions, their number one reason for engaging is that they find them enjoyable. These are also opportunities for learning, both general and specific.

Finding a Job After Bootcamp

I already had a full-time job as a developer when I began the program Immediately after graduating	16.3%
Less than a month	7.5%
One to three months	10.0%
Four to six months	5.2%
Six months to a year	3.6%
Longer than a year	3.2%
I haven't gotten a developer job	8.7%

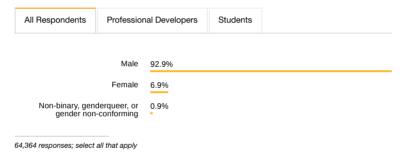


6,652 responses

Bootcamps are typically perceived as a way for newcomers to transition into a career as a software developer, but according to our survey, many participants in coding bootcamps were already working as developers. Almost half of our respondents who said they went to a coding bootcamp said they were already working as developers; these developers are likely updating their skills and moving to new areas of the tech industry. Of other bootcamp participants, the most common outcome is to find a job immediately or soon after graduating.

Demographics

Gender

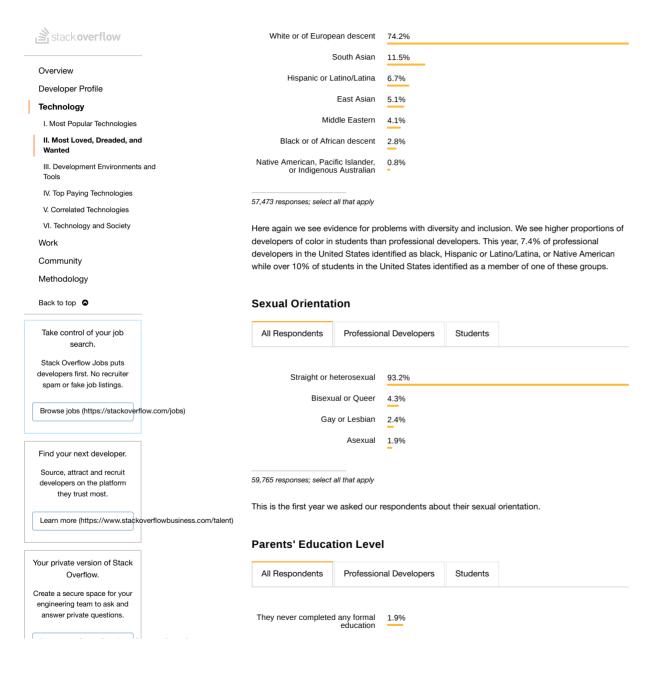


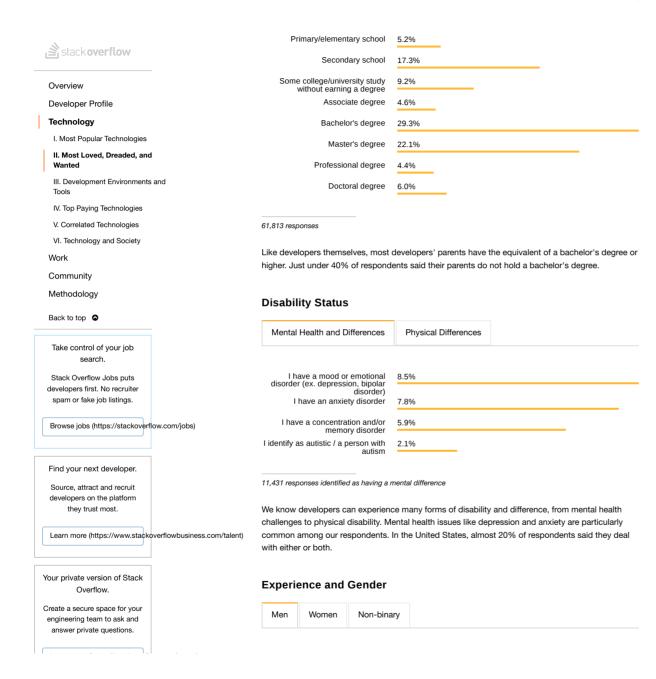
We asked our respondents about their gender identity, and found that over 90% of our respondents are male. According to Quantcast, women account for about 10% of Stack Overflow's US traffic; this year 9% of US survey respondents are women. We had survey participation at almost the rate we would expect from our traffic, although such a low percentage points to problems with inclusion in the tech industry in general and Stack Overflow in particular. In regions including the United States, India, and the UK, women are represented at higher levels among students than among professional developers.

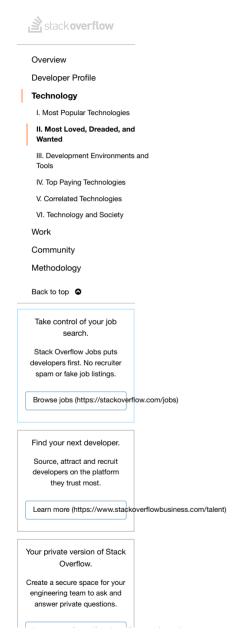
This year, 0.7% of respondents identified as transgender men or women. The gender identifications are select all that apply, so transgender men and women are included in the categories shown here.

Race and Ethnicity

Respondents Professional Developers Students	Professional Developers Studen
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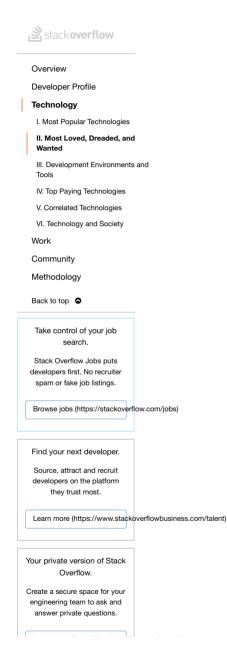


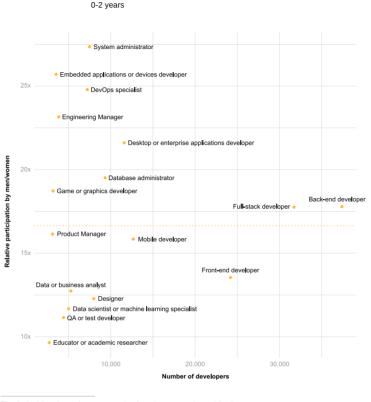
3-5 years	21.9%
6-8 years	20.7%
9-11 years	13.9%
12-14 years	9.7%
15-17 years	7.5%
18-20 years	6.3%
21-23 years	3.4%
24-26 years	2.4%
27-29 years	1.4%
30 or more years	4.7%

59,749 responses; gender categories were select all that apply

We find differences among developers by gender in our survey responses. For example, twice as many women than men have been coding two years or less, evidence for the shifting demographics of coding as a profession. Also, developers who identify as transgender men or women or of non-binary gender contribute to open source at higher rates (58% and 60%, respectively) than developers who identify as men or women overall (45% and 33%.)

Developer Role and Gender





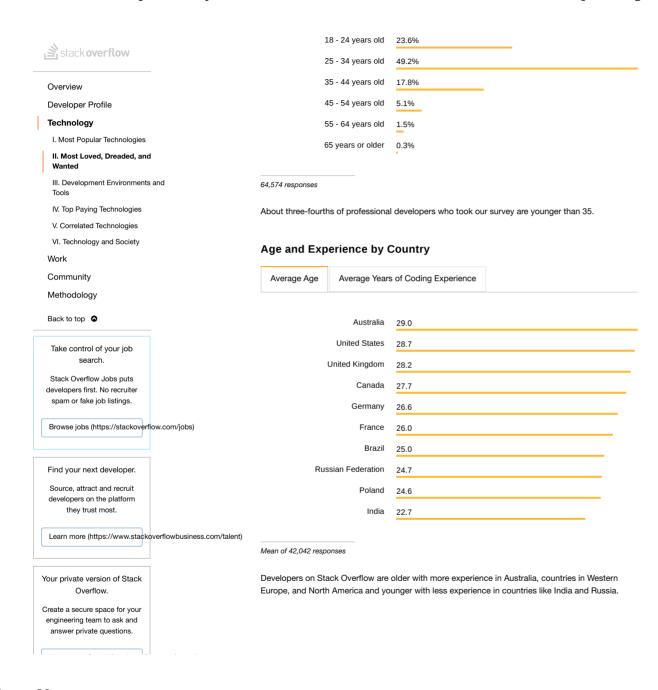
The dashed line shows the average ratio of men's to women's participation

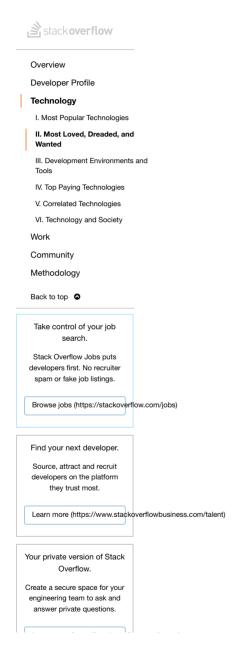
We see varying representation by men and women in different developer roles on our survey. All categories have dramatically more developers who identify as men than women but the ratio of men to women varies. Developers who are educators or academic researchers are about 10 times more likely to be men 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 academics, QA developers, data scientists, and designers.

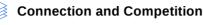
Age

All Respondents Professional Developers

Under 18 years old 2.5%







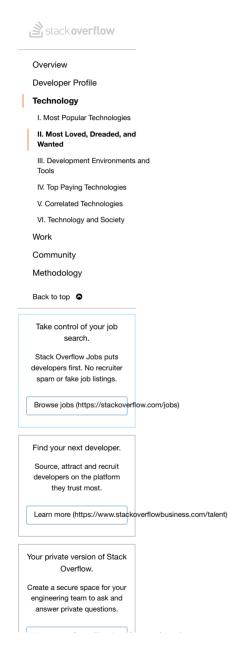
Kinship, Competition, and Self-Evaluation

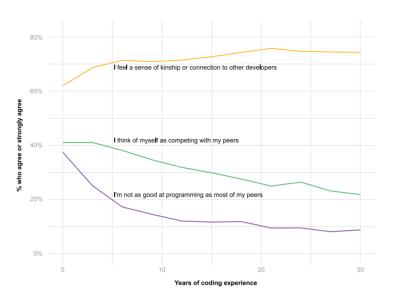
I feel a sense of kinship or connection to other developers	3.6
I think of myself as competing with	2.7
my peers	
I'm not as good at programming as most of my peers	2.2
most of my peers	

68,577 responses; agreement on a 1-5 scale, from strongly disagree to strongly agree

We asked how much respondents agree or disagree with several statements about their place in the developer community. Overall 70% of developers agree or strongly agree that they feel a sense of connection with other developers. Developers are overall confident about their own skills compared to their peers, with only 18% agreeing or strongly agreeing that they are not as good at programming as their colleagues.

Experience and Belonging





Respondents' feelings on how much they belong and how they stack up to their peers change with how much experience they have. More experienced developers feel more connected, more confident, and less competitive. Notice that feeling less skilled drops quickly with experience while feeling less competitive drops more gradually and continues to drop into the second decade of coding experience.

Life Outside Work

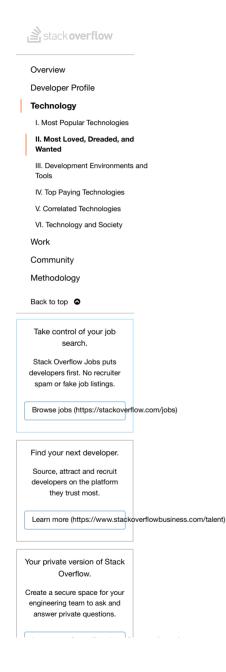
Children and Other Dependents

No 71.1%

Yes 28.9%

62,596 responses

This year we asked respondents if they have children or other dependents that they care for, and about a quarter of respondents say that they do. We asked in a free response question what these developers do for dependent care during work hours, and our respondents talked about options like school, their spouses/partners, and daycare.



The developers who said they do not have dependents to care for are younger on average than those who do. Over 30% of the developers without dependents are younger than 25, while only 5% of those with dependents are younger than 25. Almost 60% of developers with 10 or more years of professional coding experience have children or other dependents.

What Time Do Developers Wake Up?

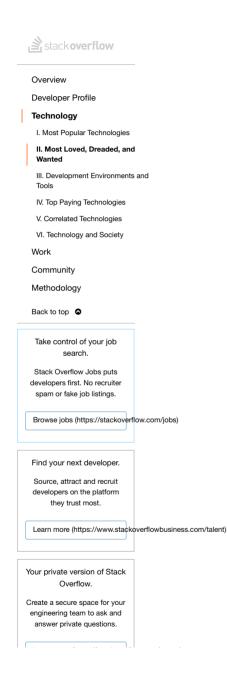
Before 5:00 AM	2.4%
Between 5:00 - 6:00 AM	12.4%
Between 6:01 - 7:00 AM	28.2%
Between 7:01 - 8:00 AM	29.5%
Between 8:01 - 9:00 AM	14.7%
Between 9:01 - 10:00 AM	4.8%
Between 10:01 - 11:00 AM	1.4%
Between 11:01 AM - 12:00 PM	0.5%
After 12:01 PM	0.4%
I work night shifts	0.5%
I do not have a set schedule	5.3%
72,146 responses	

72,146 responses

We are confident that most developers have pulled a late night here and there, but most of our respondents say they are up by 8am.

How Much Time Do Developers Spend on a Computer?

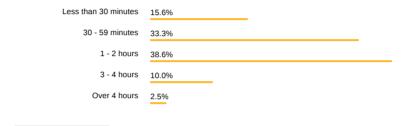




72,133 responses

Our respondents include people who code as professionals, students, and hobbyists. The overwhelmingly majority spend large fractions of their waking hours on a typical day with their desktops and laptops.

How Much Time Do Developers Spend Outside?



Developers get outside for recreation, commuting, or other reasons. About half of our respondents spend an hour or more outside a day.

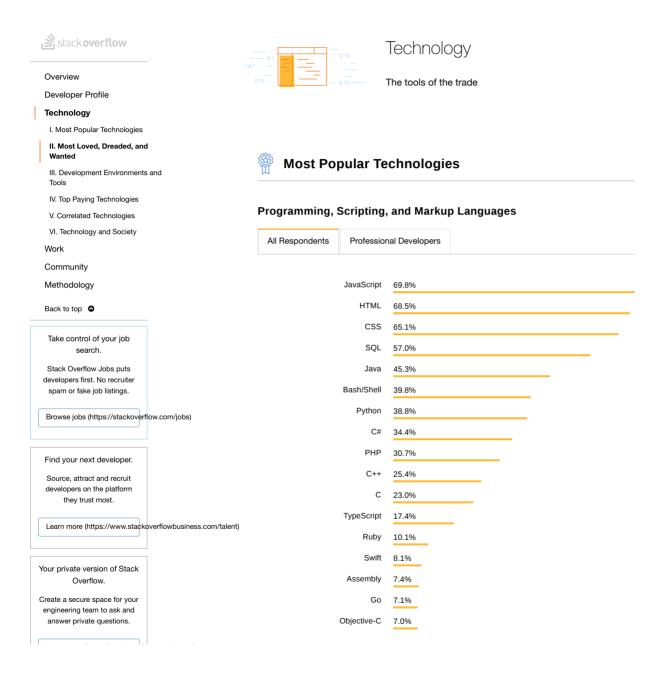
Healthy Habits

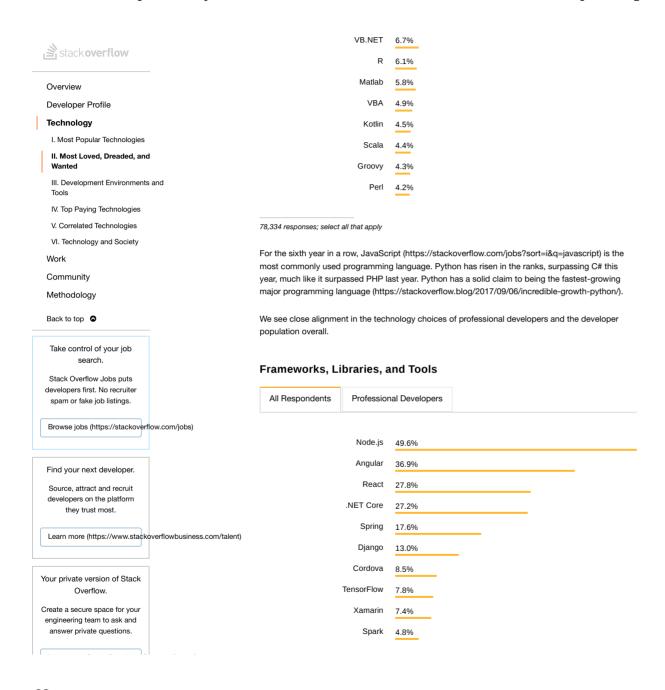
72,024 responses

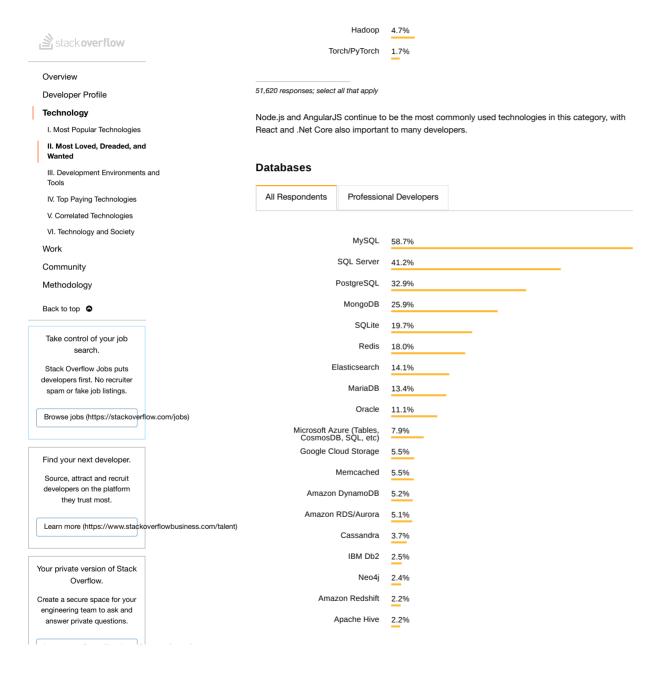
How Often Do Developers Skip Meals To Be Productive?	
How Often Do Developers Exerc	cise?
Never	63.6%
1 - 2 times per week	25.2%
3 - 4 times per week	6.0%
Daily or almost every day	5.2%

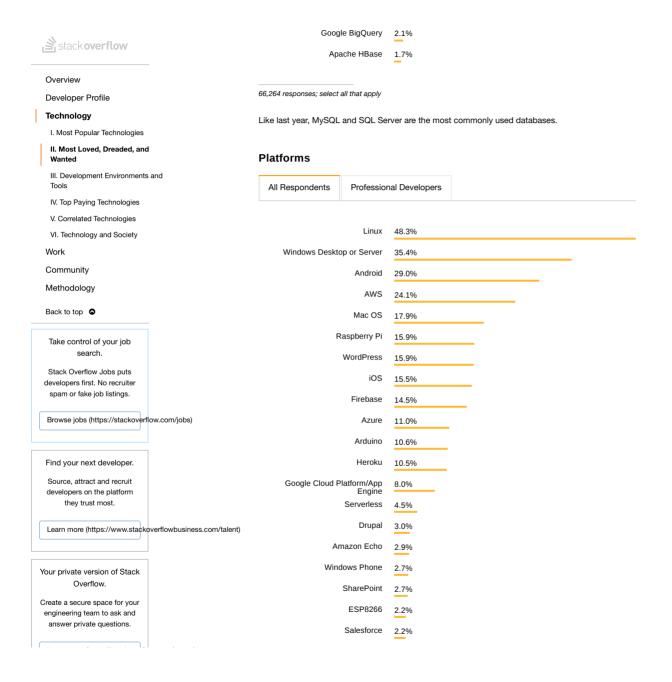
71,946 responses

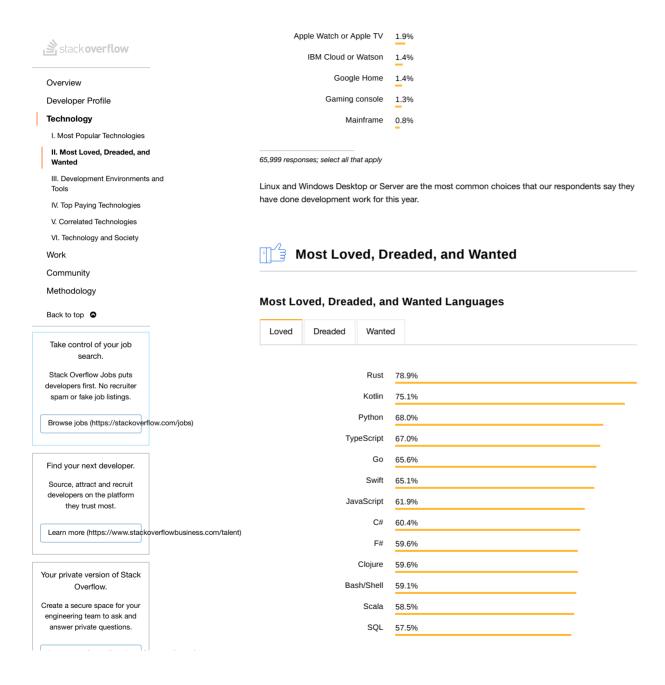
Developers tell us they do not often skip meals because of their workload, and a majority say they exercise at least some. Over 60% of respondents exercise at least weekly, but the most often chosen exercise frequency is 'never'.

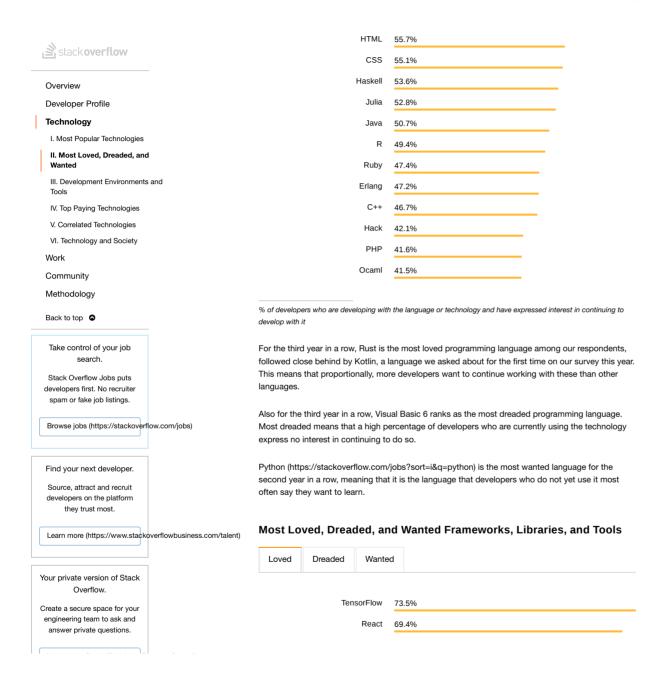


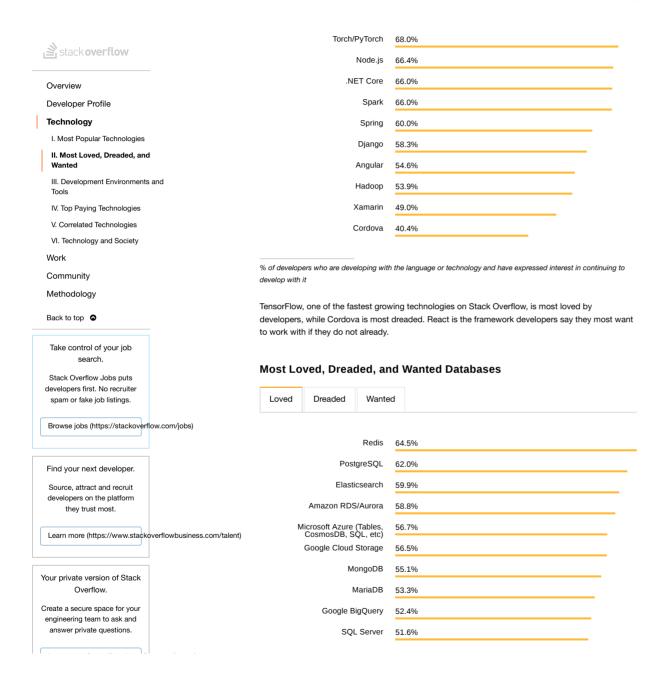


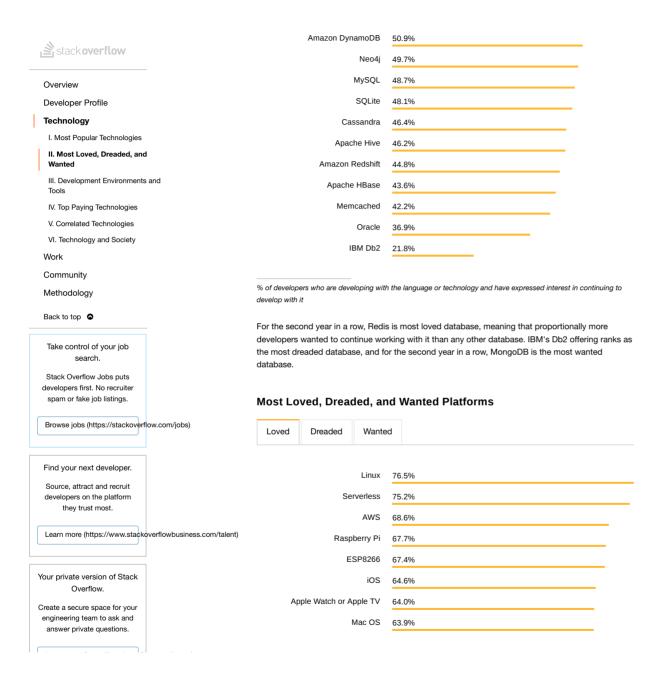


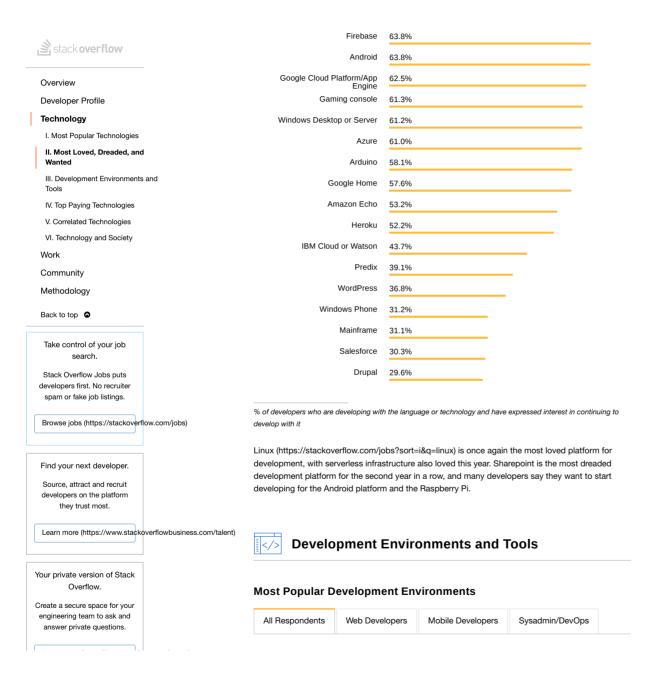


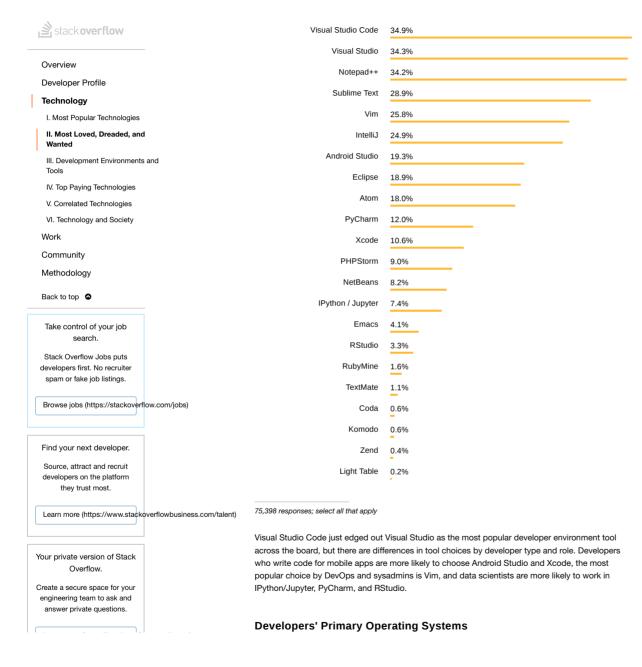


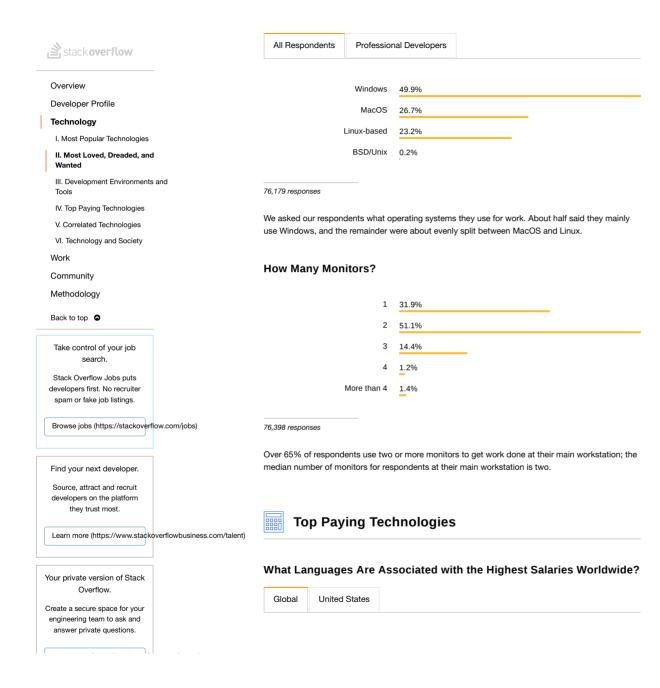


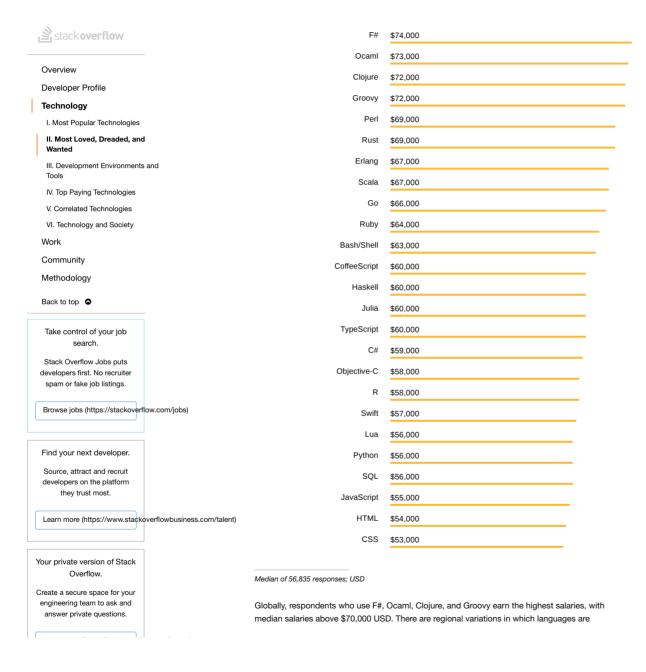


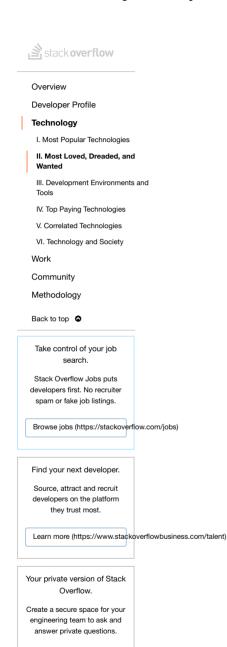








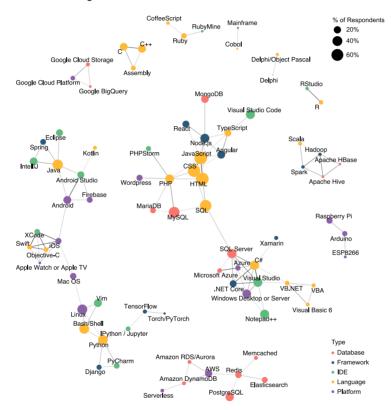




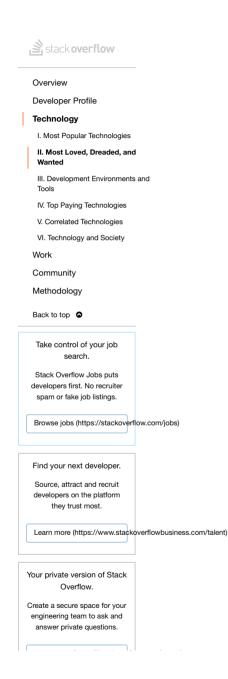
associated with the highest pay. Erlang and Scala developers in the US are among the highest paid, while Clojure, Erlang, and Haskell developers earn the most in India.

Correlated Technologies

How Technologies Are Connected



Technologies cluster together into related ecosystems that tend to be used by the same developers. In this chart we see a large central cluster for web development (with JavaScript, HTML, and CSS) connected via SQL to one for Microsoft technologies (with C#, Visual Studio, and .NET Core). Along the left we see a constellation connecting Java, Android, and iOS across to Linux, bash/shell, and Python. Other smaller correlated clusters include Scala/Spark, C/C++, and other smaller



technologies that include language-specific IDEs.



Technology and Society

What Do Developers Think Is Dangerous and Exciting About AI?

Dangerous	Exciting	
Algorithms making important decisions		
Artificial intelligence surpassing human intelligence ("the singularity") Evolving definitions of "fairness" in algorithmic versus human decisions Increasing automation of jobs		()
		n S

63,115 responses

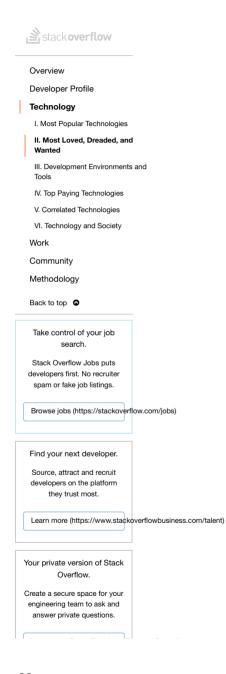
Some types of developers are involved in the increasing role of machine learning and artificial intelligence in the world today, so we asked developers what they think is dangerous and exciting about these technologies. There is not much consensus among developers about what is most dangerous; each answer was chosen roughly equally. The top choice for what is exciting about increasing Al is that jobs can be automated.

Who is Primarily Responsible for Considering the Ramifications of AI?

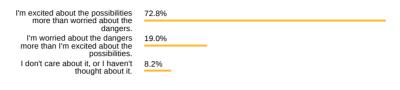
The developers or the people creating the Al	47.8%
A governmental or other regulatory body	27.9%
Prominent industry leaders	16.6%
Nobody	7.7%

65,553 responses

Developers are most likely to think that the creators and technologists behind the machine learning and AI algorithms are the ones who are ultimately most responsible for the societal issues surrounding artificial intelligence. About a quarter of respondents think that a regulatory body should be primarily responsible.



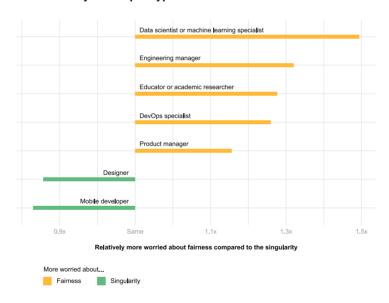
How Do Developers Feel About the Future of AI?



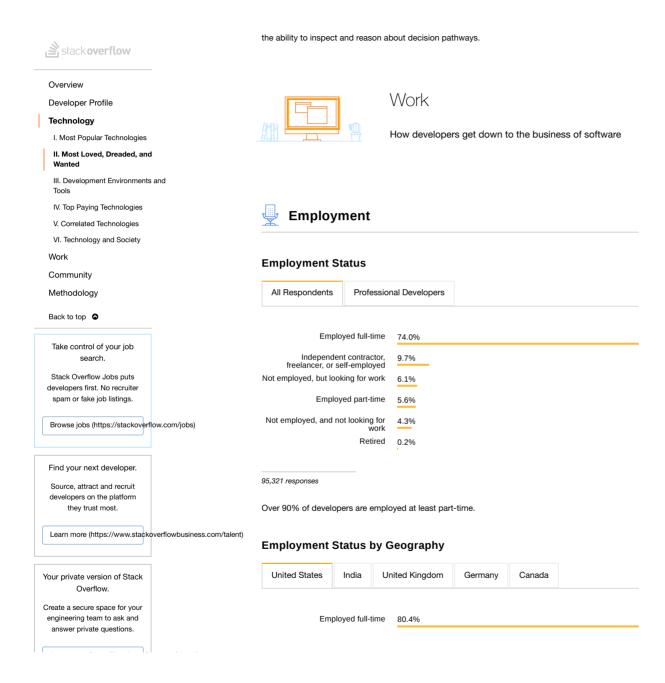
69,728 responses

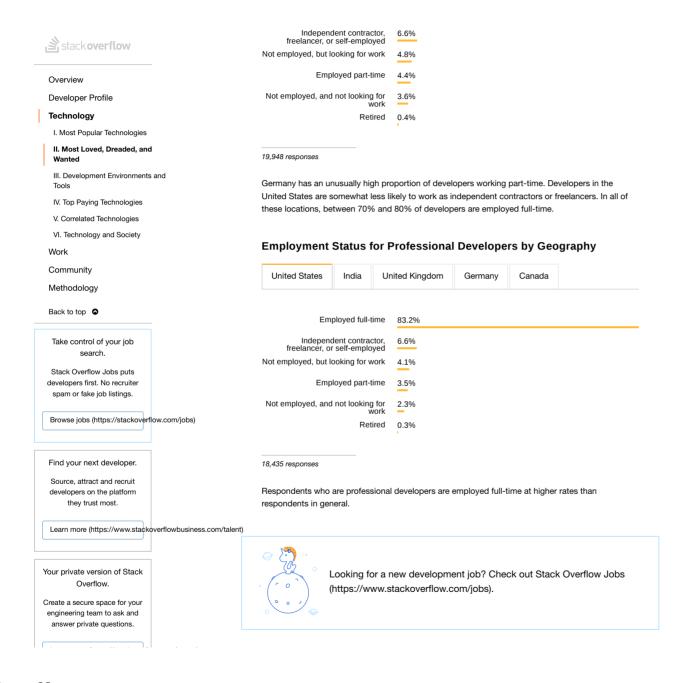
Developers are mostly optimistic about the possibilities that artificial intelligence offers our world, with almost three-fourths of respondents saying that they are overall more excited than worried about the Al future.

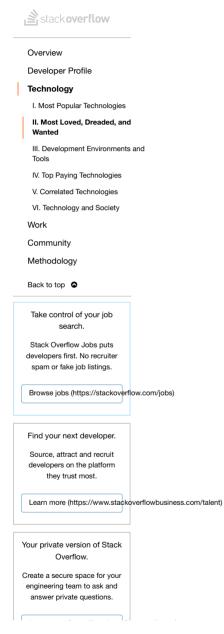
Al Concerns by Developer Type

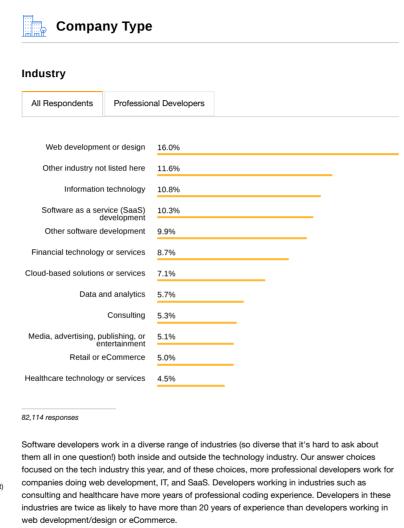


The concerns that developers bring to issues around artificial intelligence depend on the kind of coding work they do. For example, data scientists are 1.5 times more likely to consider issues around algorithmic fairness dangerous than any upcoming singularity when computers become more intelligent than people, the most of any kind of developer. We included a free response option on this question; there was not much serious worry about Skynet, but many developers discussed systemic bias being built into algorithmic decision making and the danger of Al being used without

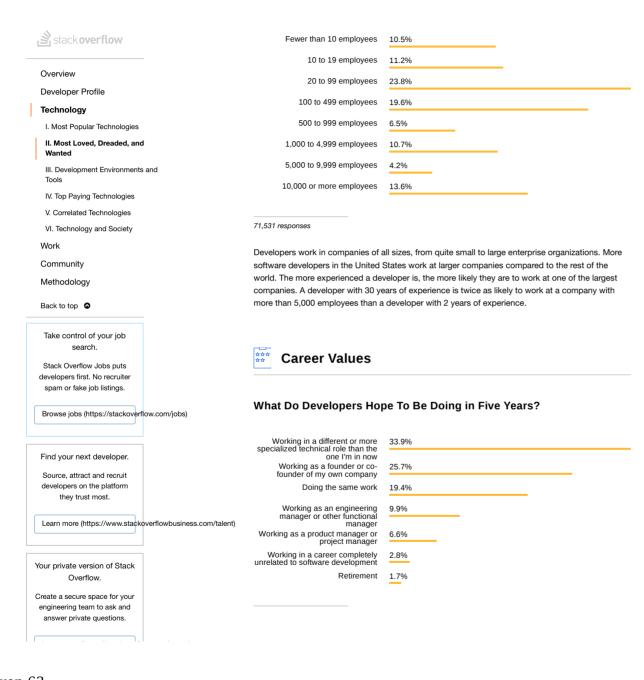


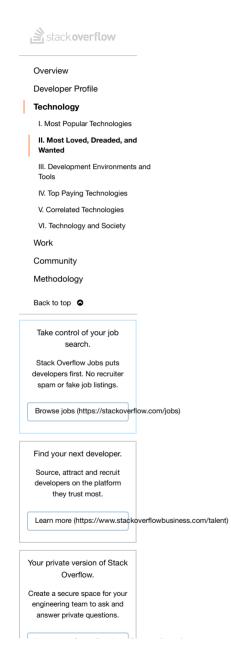






Company Size

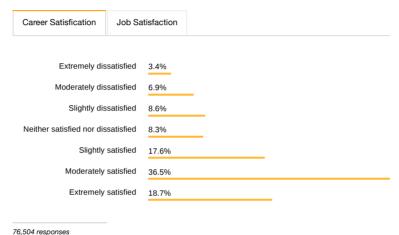




75,718 responses

Developers' career goals are largely focused on technical work, with just over half of respondents saying they want to be in the same or a different technical role in the future. About a quarter of our respondents say they want to start their own company, but this is most common among developers who are younger than 25 years old.

How Do Developers Feel About Their Careers and Jobs?



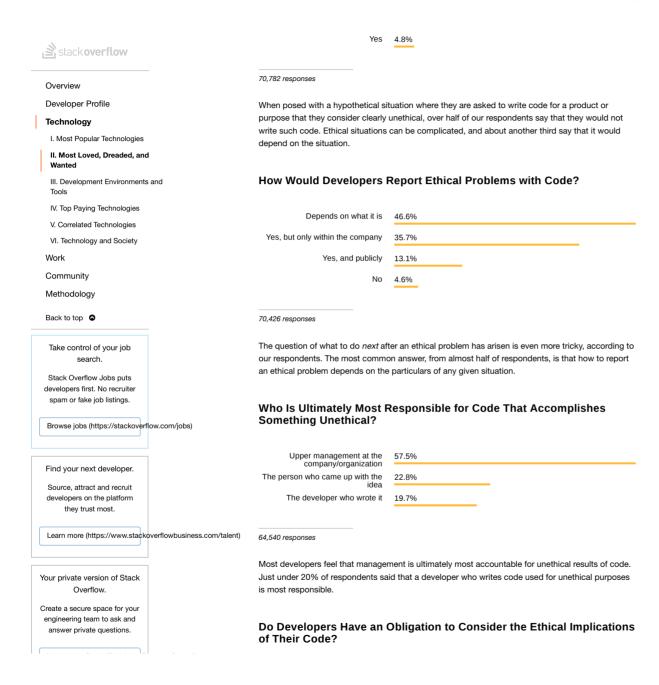
Developers tend to be more satisfied with their career than with their current job. Overall, career satisfaction does not vary significantly by industry. However, current job satisfaction is significantly lower for developers working in financial services and IT. Career satisfaction is highest for older developers, with ages of 50 or higher, and those with 20, 30, or more years of professional experience. Job satisfaction, by contrast, is highest for developers between 35 and 44 years old.

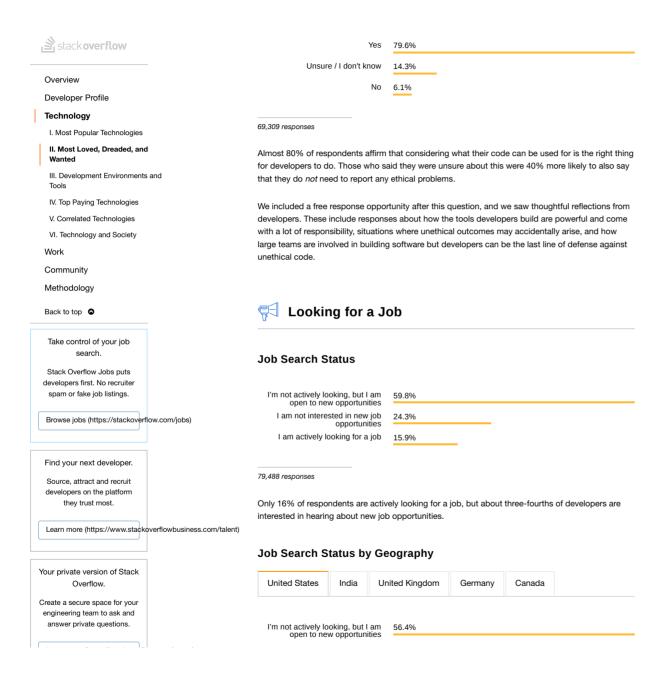


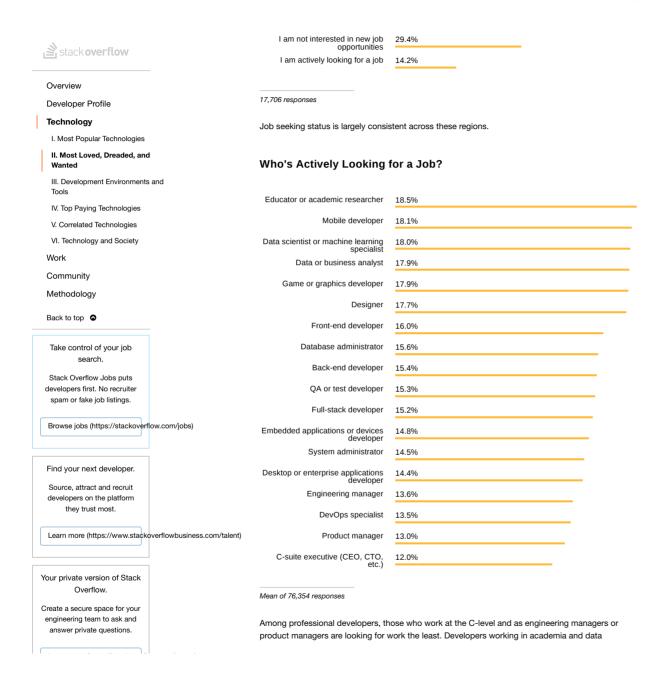
Ethics

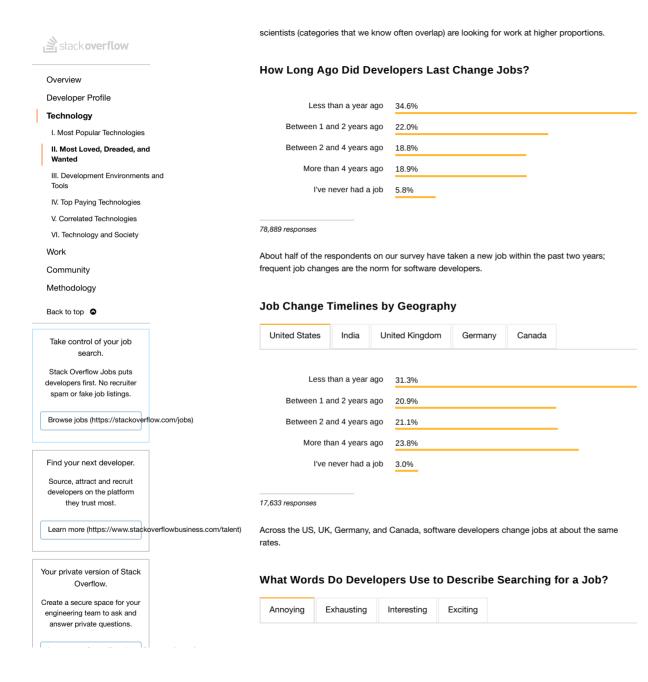
What Would Developers Do If Asked to Write Code for an Unethical Purpose?

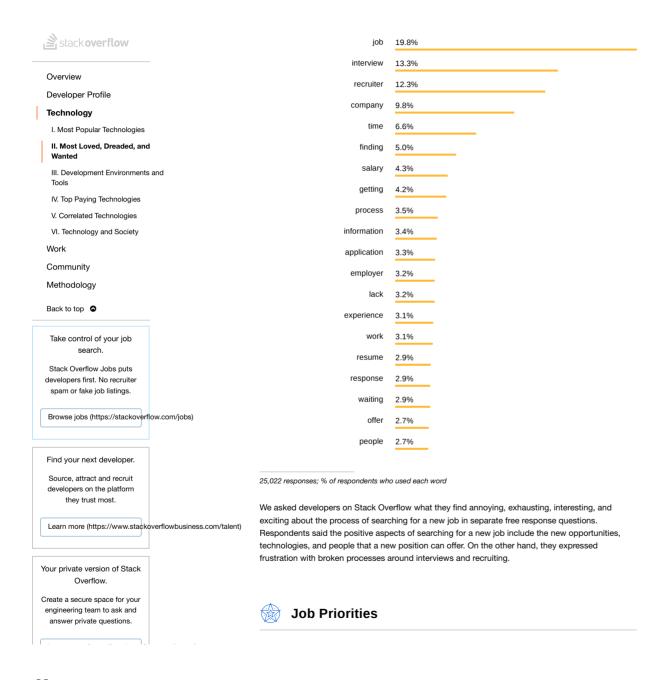
No 58.5% Depends on what it is 36.6%

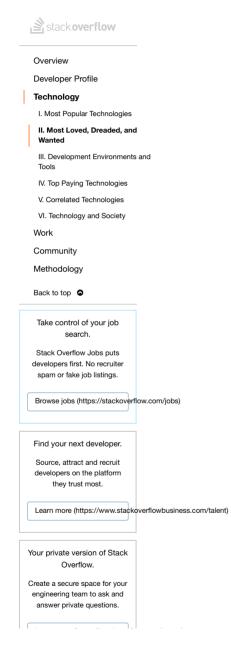








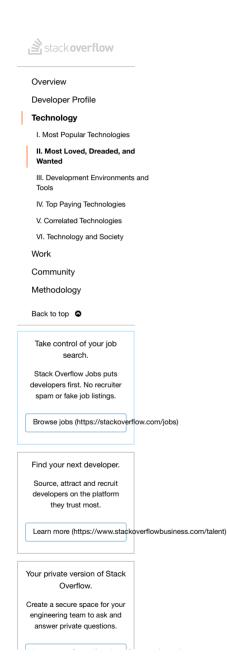




How Do Developers Assess Potential Jobs?

The industry that I'd be working in 7.3%

Highest P	riority	Lowest Price	prity
The comp	pensation	and benefits offered	18.3%
The languages, frameworks, and other technologies I'd be working			17.3%
with Opportunities for professional development		professional	16.0%
The office environment or company culture			13.6%
The op		to work from me/remotely	10.3%
The industry	y that I'd b	e working in	7.4%
How widely used or impactful the product or service I'd be working			6.5%
on is The specific department or team I'd be working on			5.5%
The financial performance or funding status of the company or			3.4%
organization The diversity of the company or organization			1.6%
echnologies iversity, and	s that they d individu	y will work wi al developers	in assessing a job is compensation, followed by the specific th. The tech industry is struggling overall with issues around are not making it a priority when looking for a job. g Jobs by Gender
The comr	nensation	and henefits	19.0%
		and benefits offered	19.0%
The langua	ages, fram		19.0% 17.6%
The langua	ages, fram nologies l'o unities for	offered eworks, and I be working	
The langua other techn	ages, fram nologies I'd unities for c e office en	offered eworks, and d be working with professional	17.6%



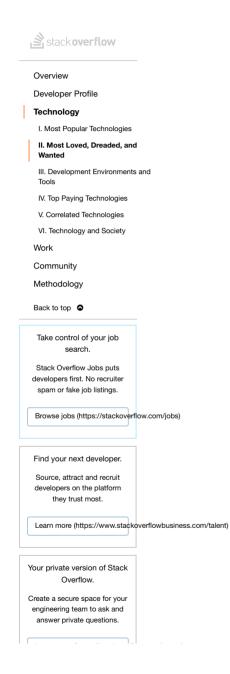
How widely used or impactful the product or service I'd be working on is	6.6%
The specific department or team I'd be working on	5.5%
The financial performance or funding status of the company or organization	3.3%
The diversity of the company or organization	1.3%

54,536 responses; % of respondents who chose each option as their highest priority

Different types of developers apply different sets of priorities when considering jobs. Developers who belong to gender minorities in tech rank the company culture and office environment as their highest concern when assessing a new job. The gender identification question allowed respondents to select all that apply.

What Developers Value in Compensation and Benefits

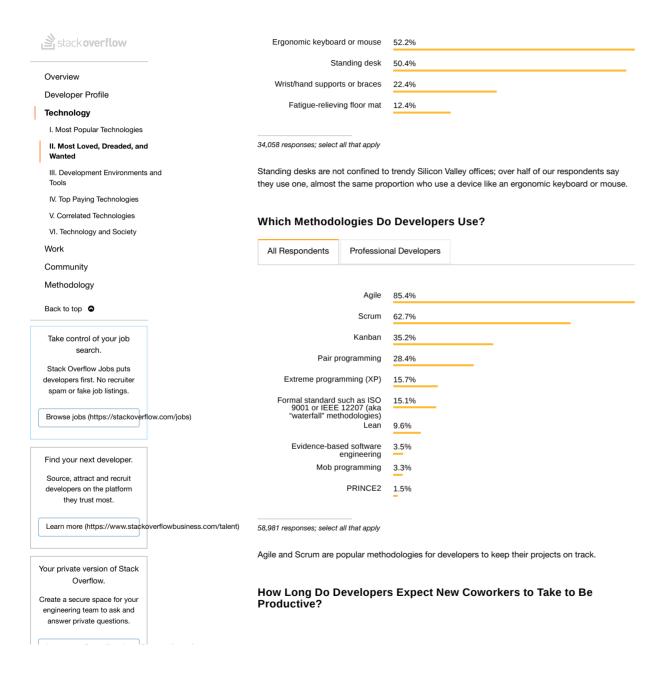
Highest Priority Lowes	t Priority
Salary and/or bonus	ses 70.2%
Health insurar	nce 8.6%
Computer/office equipm allowar	
Conference or education bud	get 3.6%
Stock options or sha	res <u>3.2%</u>
Retirement or pension savir match	ngs 2.1% ing —
Parental lea	ave 2.0%
Fitness or wellness benefit (gym membership, nutrition	
Transportation benefit (company-provided transportati public transit allowan	on, =
Company-provided meals sna	
Childcare ben	efit 1.1%
4,918 responses; % of responden	ts who chose each option as their highest priority

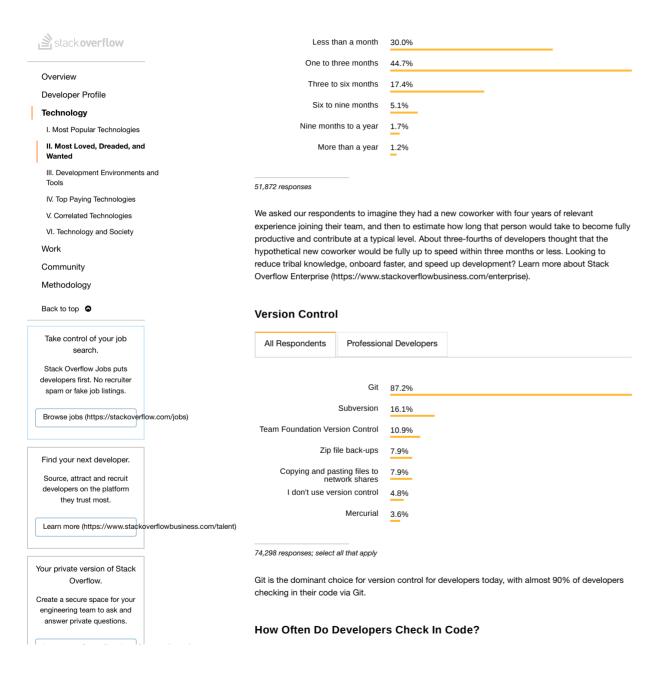


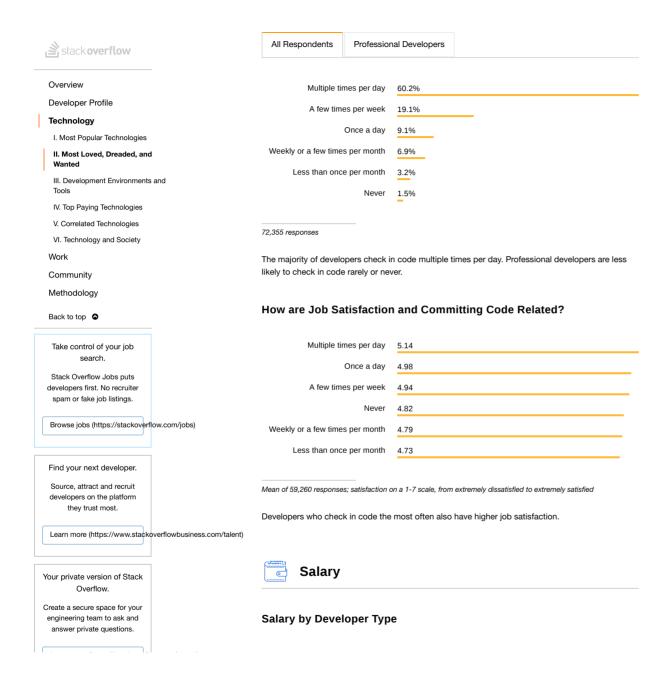
Valuing Compensation and Benefits by Geography

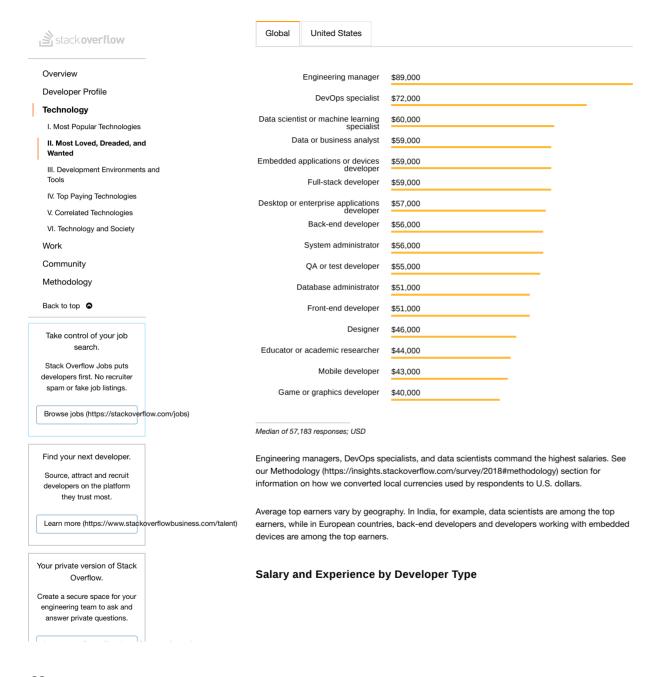
United States	India	United Kingdom Germany Canada
Salary a	and/or bonu	ses 78.2%
H	ealth insura	nce <u>11.5%</u>
Retirement or p	ension savi matcl	
Stock op	tions or sha	2.3%
Computer/o	ffice equipn allowa	
Conference or ed	lucation bud	dget 1.0%
	Parental le	ave 1.0%
Company-pro		s or 0.6% icks •
mpany-provided public tra	ınsit aİlowar	ion, i control in the
Fitness or wellngym members		(ex. 0.4%
782 responses; %	of responder	nts who chose each option as their highest priority
world, so deve	loper respo healthcare	ers are compensated with salary and benefits work differently acro onses vary by geography. Health insurance is prioritized in countries system (like the United States), and computer equipment allowance velopers in India and the UK.

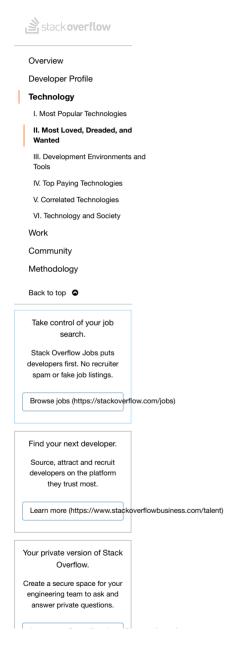
What Do Developers Use to Stay Comfortable While Working?

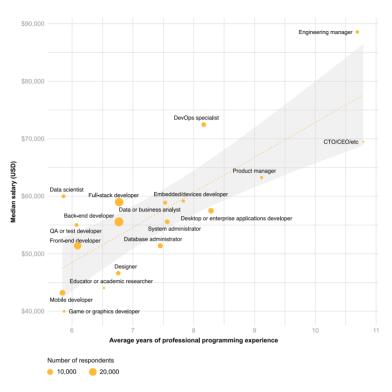






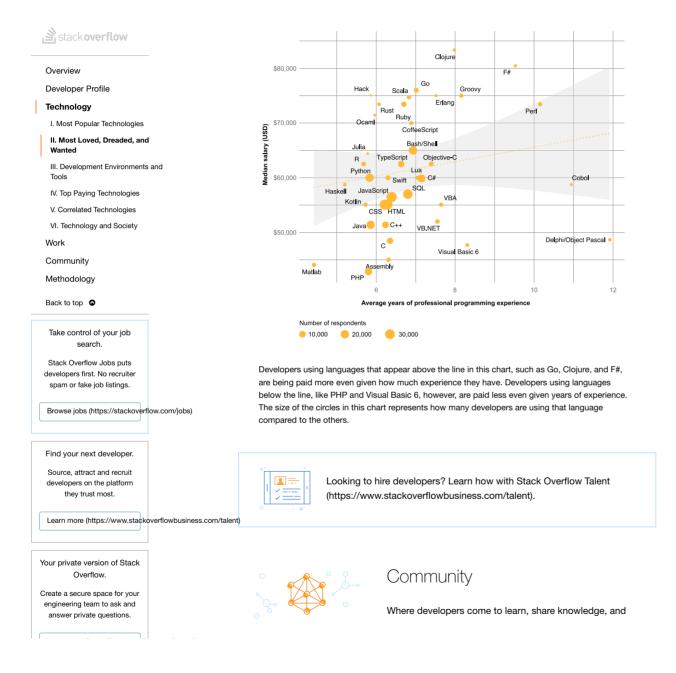


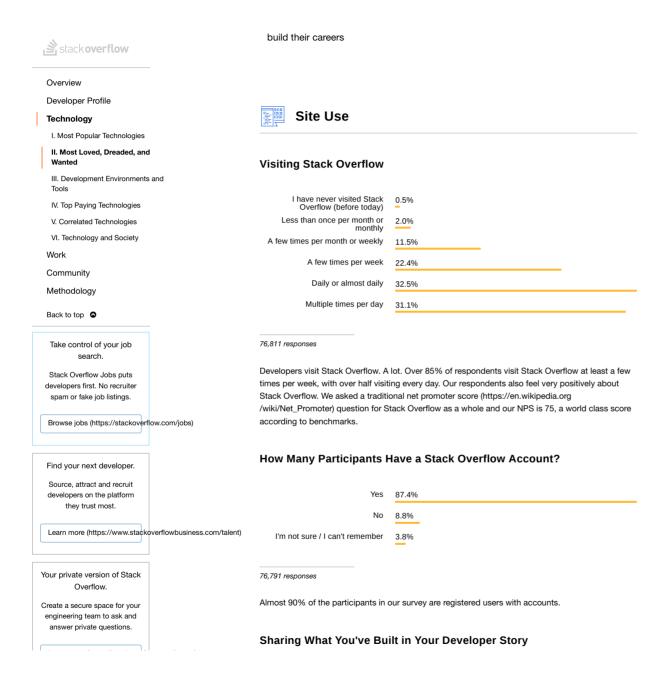


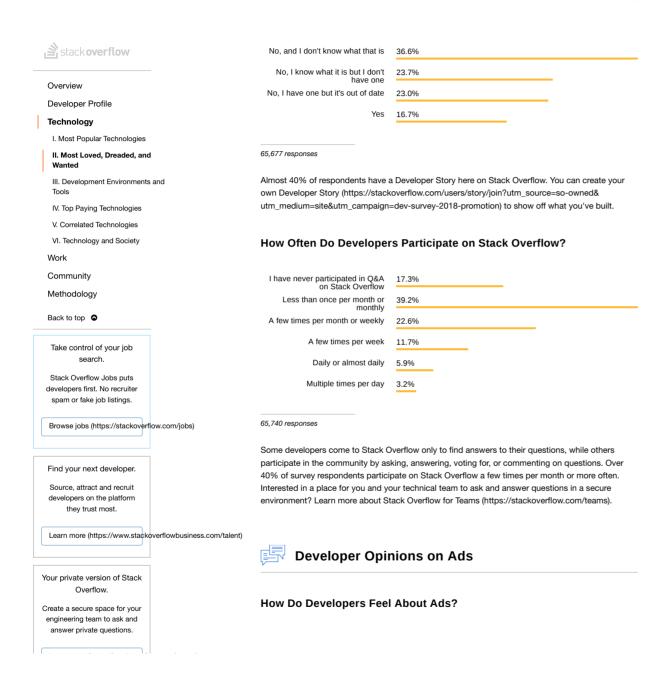


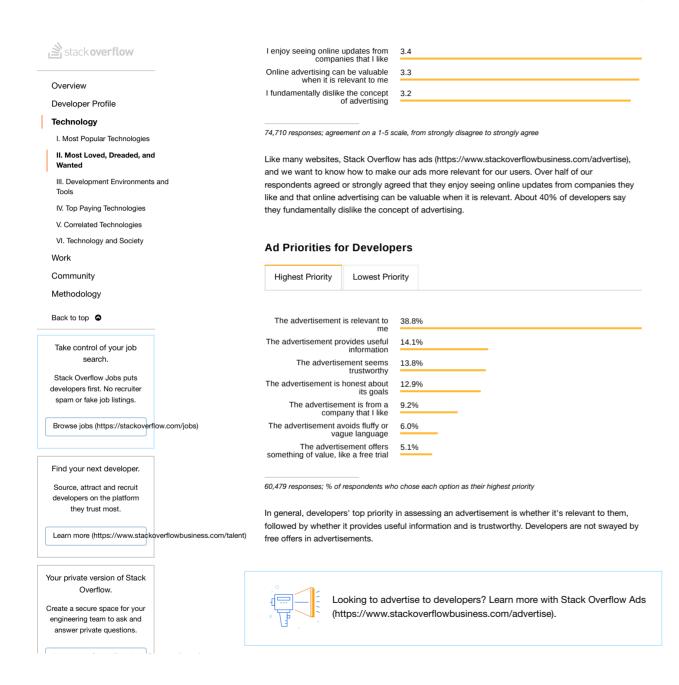
Naturally, developers with more years of experience are paid more. However, we also see that some type of coding work is paid more highly at the same level of experience. Data scientists and DevOps specialists are high earners for their level of experience.

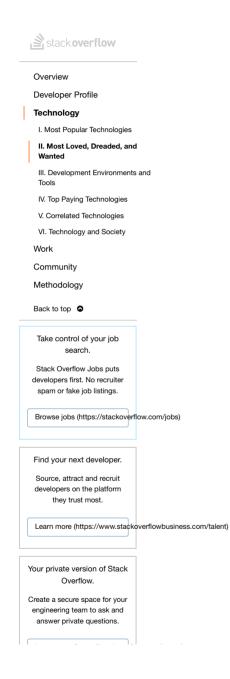
Salary and Experience by Language

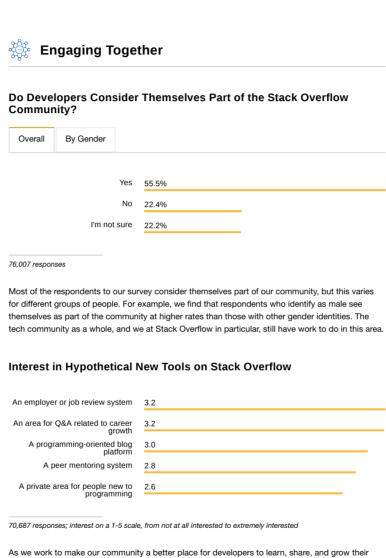






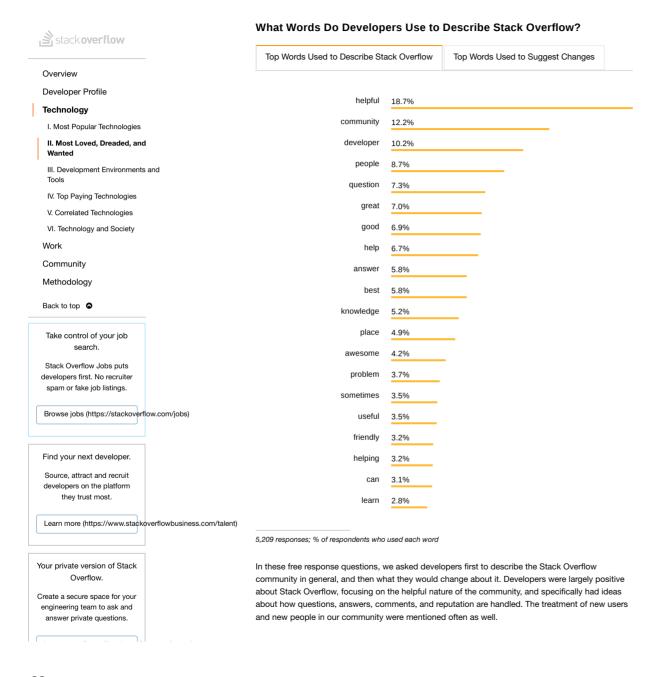






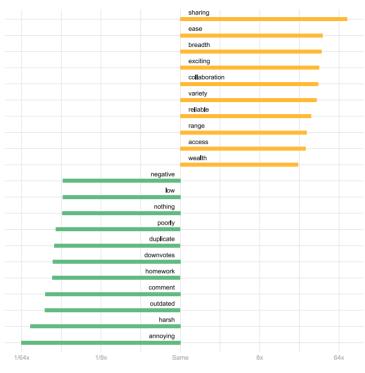
As we work to make our community a better place for developers to learn, share, and grow careers, we asked our survey respondents about their interest in possible new tools (https://stackoverflow.com/teams). An employer review system and help with career growth

garnered the most interest.



stack overflow Overview Developer Profile Technology I. Most Popular Technologies II. Most Loved, Dreaded, and Wanted III. Development Environments and IV. Top Paying Technologies V. Correlated Technologies VI. Technology and Society Work Community Methodology Back to top . Take control of your job search. Stack Overflow Jobs puts developers first. No recruiter spam or fake job listings. Browse jobs (https://stackoverflow.com/jobs) Find your next developer Source, attract and recruit developers on the platform they trust most. Learn more (https://www.stackoverflowbusiness.com/talent) Your private version of Stack Overflow. Create a secure space for your engineering team to ask and answer private questions.

Developers' Perspectives About Our Community



Relative use in positive/negative responses

This year, our survey included questions about what developers think the best, worst, most annoying, and most exciting things about Stack Overflow are. (These questions were randomized so that each respondent got one positive and one negative version.) In the positive versions of these questions, respondents were more likely to talk about the wealth of sharing and collaboration on our site. In the negative versions, respondents reflected on harsh interactions they've witnessed, downvotes, and handling of duplicate questions.



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 (https://stackoverflow.com/teams). Want an on-premise or private cloud version? Check out Stack Overflow Enterprise

stackoverflow

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Methodology

How we planned and analyzed our survey

This report is based on a survey of 101,592 software developers from 183 countries around the world. This number of responses are what we consider "qualified" for analytical purposes based on completion and time spent on the survey; another approximately 20,000 responses were started but not included in the analysis because respondents did not answer enough questions. Of the qualified responses, 67,441 (66,4%) completed the entire survey.

Qualified Responses Worldwide

Europe	39,001
North America	25,016
Asia	24,700
South America	4,162
Africa	2,869
Australia/Oceania	2,591
Other (country not listed)	84

- The survey was fielded from January 8 to January 28.
- The median time spent on the survey for qualified responses was 25.8 minutes, and the median time for those who finished the entire survey was 29.4 minutes.
- Respondents were recruited primarily through channels owned by Stack Overflow. The top 5 sources of respondents were banner ads, email lists, house ads, blog posts, and Twitter.
 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. Respondents who finished the survey were awarded a "Census" badge as a motivation to complete the survey.
- We treated responses as qualified for analysis if the user spent a certain amount of time relative to how far they got into the survey. Most survey responses that spent less than 5 minutes were excluded from the final sample.
- 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.
 - For a short time on the first day, there was a bug that left out the last part of the question (weekly vs. monthly vs. yearly); those salary responses are not included here.
 - We converted salaries from user currencies to USD using the exchange rate on 2018-01-18, and also converted to annual salaries assuming 12 working months and 50 working weeks.



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- This guestion, like most on the survey, was optional. There were 58,650 respondents (57.7% of qualified respondents) who gave us salary data.
- The top approximately 1% 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
- 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
- The questions were organized into several blocks of questions, which were randomized in order. Also, the answers to most questions were randomized in order.
- Due to an error, Oracle and SQLite were excluded from the question about databases for the first day of the survey. We carefully examined whether the results for the other databases changed from the first day compared to the rest of the survey fielding period and they did not. The results shown here for database use and most loved/dreaded/wanted databases only use responses from after Oracle and SQLite were added to the possible answers.
- On 2018-3-19, we made some edits to this site based on community feedback to address two issues: a) how we handled the responses of transgender developers, to avoid implying that being a transgender man or woman is a separate gender and b) a higher level of clarity throughout the discussion about our survey sample and its limitations.







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