



User & Developer Survey 2023

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Methodology

We conducted 1,329 interviews online among Julia users and developers May 27 – July 4, 2023

Margin of error is +/- 2.7 percentage points

We recruited respondents online using Slack, Discourse, Forem, Twitter, LinkedIn, email, JuliaLang.org and JuliaHub.com

The survey was administered in 6 languages: English, Chinese (Simplified and Traditional), Japanese, Korean and Spanish

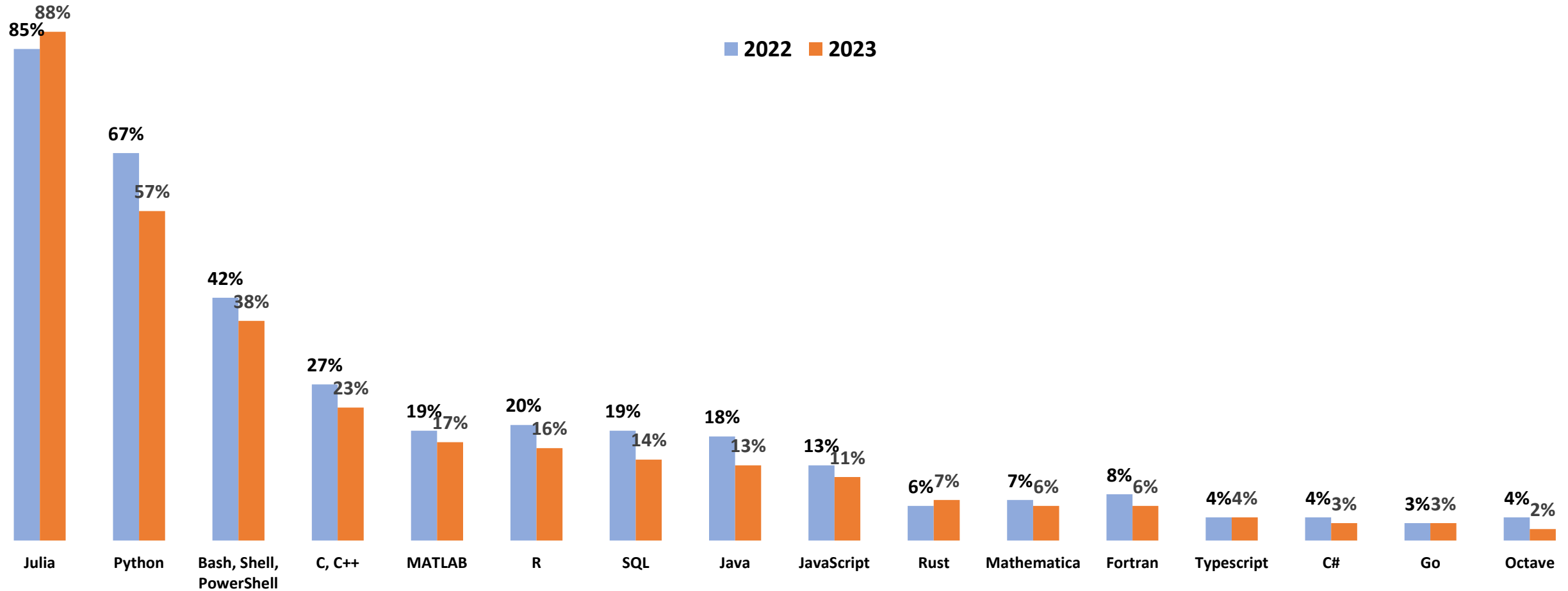
This is the fifth annual Julia User & Developer Survey we have conducted

Many of the questions and answer choices are the same from year-to-year so we have shown tracking data from previous years where that is the case

Many of the questions and answer choices are new or updated based on new developments, previous results or feedback from the community. This is identified where it is relevant to the interpretation of results.

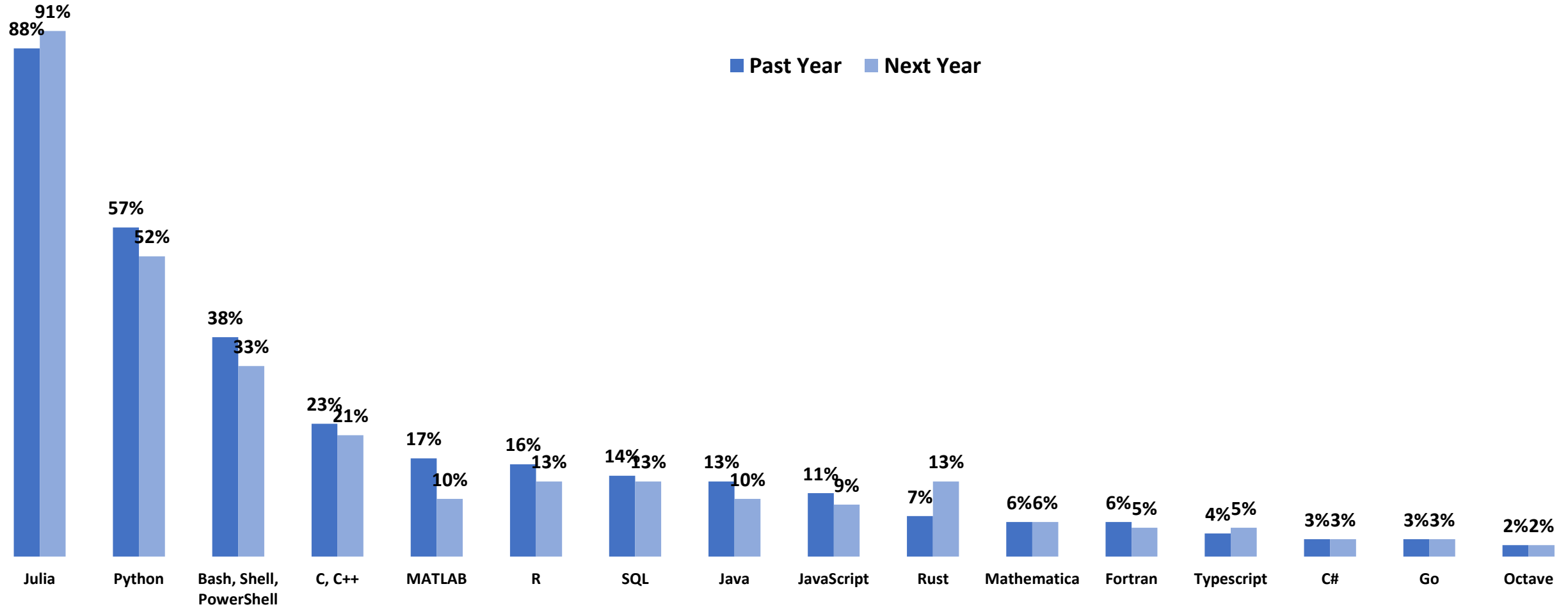
Julia Use Has Increased Among Julia Users & Developers This Year; Most Other Languages Are Down

Which of the following languages have you used regularly or frequently during the past year?



Julia Users Plan to Use More Julia and Rust Next Year and Less Python, MATLAB and Other Languages

*Which of the following languages have you used regularly or frequently during the past year?
Which of the following languages do you plan to use regularly or frequently during the next year?*



80% Say Julia Is 'One of My Favorite Languages' – Highest Ever

Python Has Been Declining Among Julia Users Since 2019

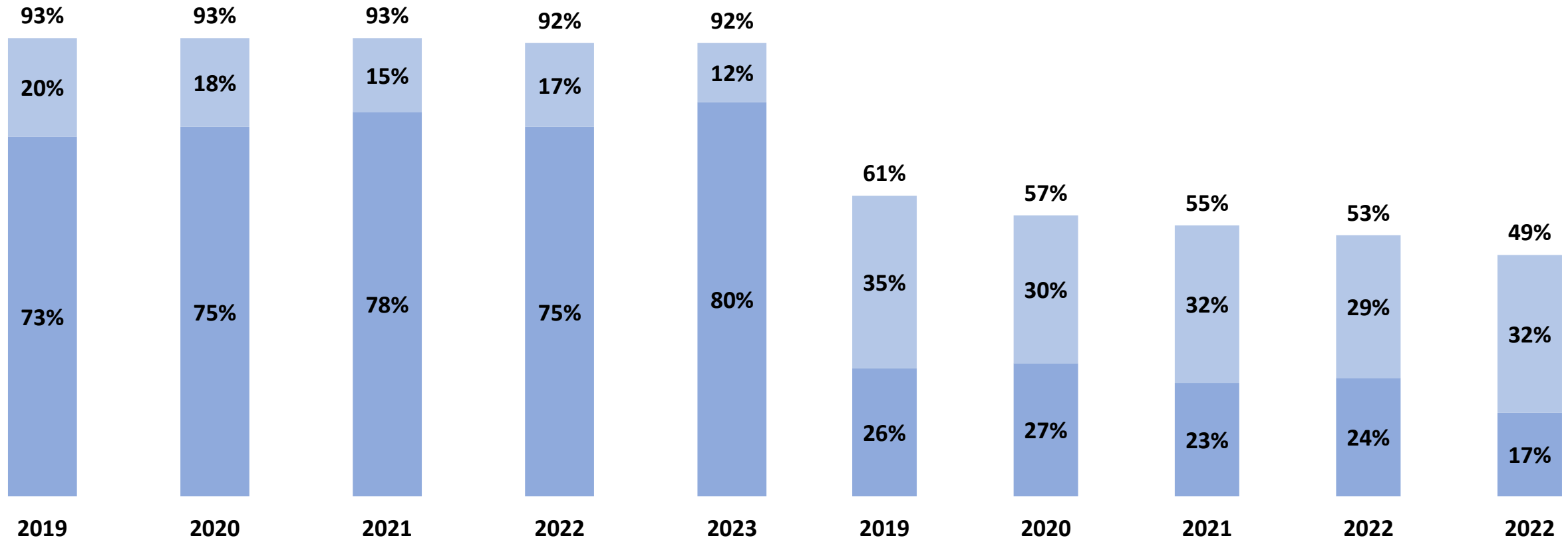
How much do you like each of the following languages?

Julia

Python

■ One of my favorite languages ■ Like

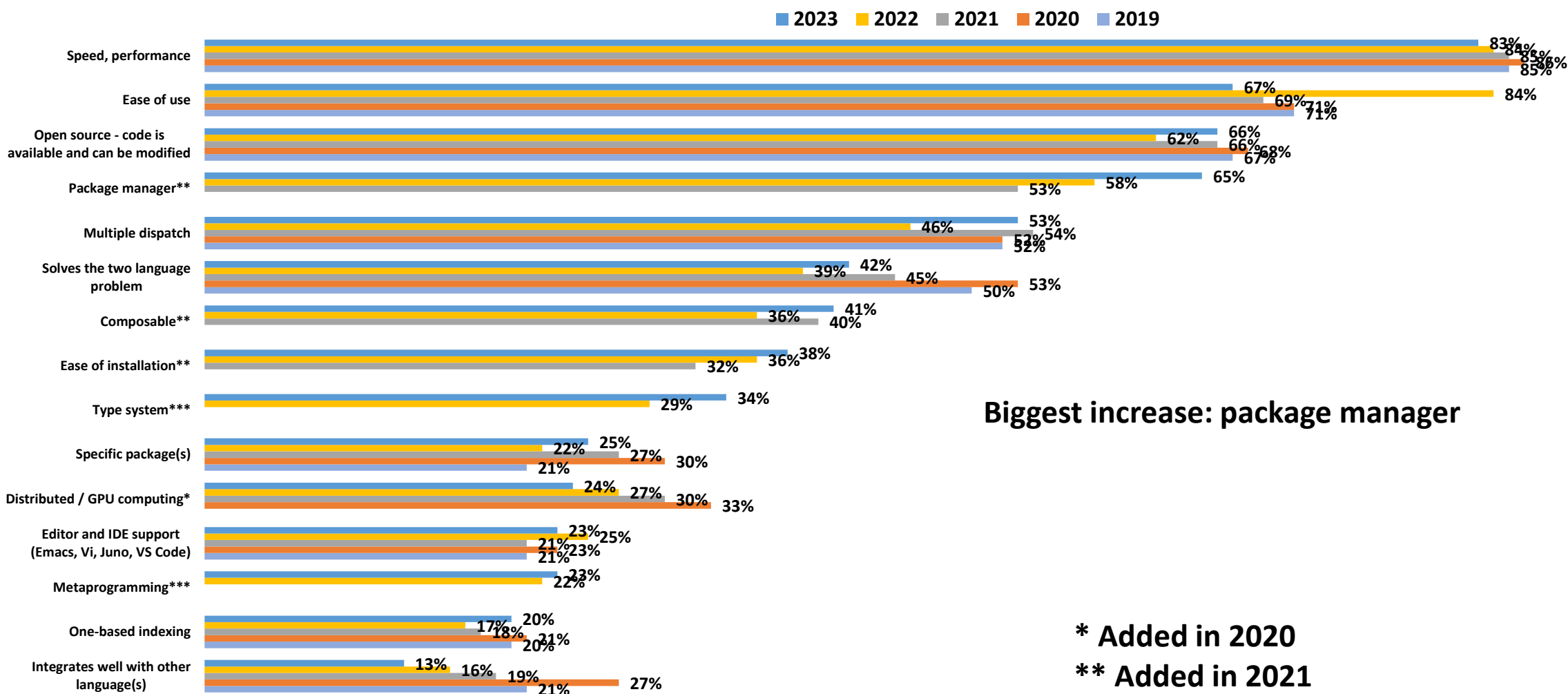
■ One of my favorite languages ■ Like



Other languages not shown include C/C++ (27% 'one of my favorite languages' + 'like'), Rust (22% 'one of my favorite languages' + 'like'), Bash/Shell/PowerShell (17% 'one of my favorite languages' + 'like'), Rust (17% 'one of my favorite languages' + 'like'), MATLAB (16% 'one of my favorite languages' + 'like'), R (15% 'one of my favorite languages' + 'like'), and SQL (14% 'one of my favorite languages' + 'like')

The MOST Popular TECHNICAL Features of Julia Are Speed/Performance, Ease of Use, Open Source, Package Manager, Multiple Dispatch, Solves Two Language Problem, Composable

Thinking only about the TECHNICAL aspects or features of Julia, what are the TECHNICAL aspects or features you like MOST about Julia?



Biggest increase: package manager

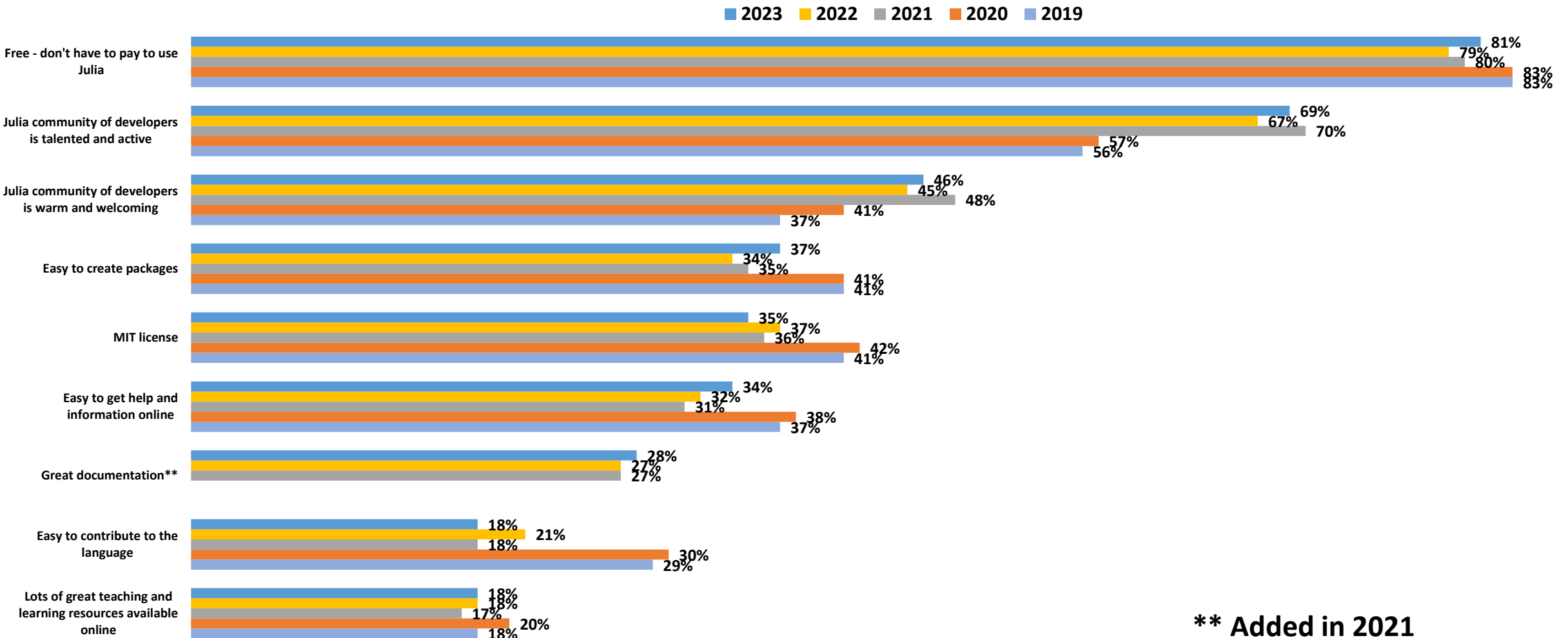
* Added in 2020

** Added in 2021

*** Added in 2022

The MOST Popular NON-TECHNICAL Features of Julia Are Free (Don't Have to Pay) and the Julia Community

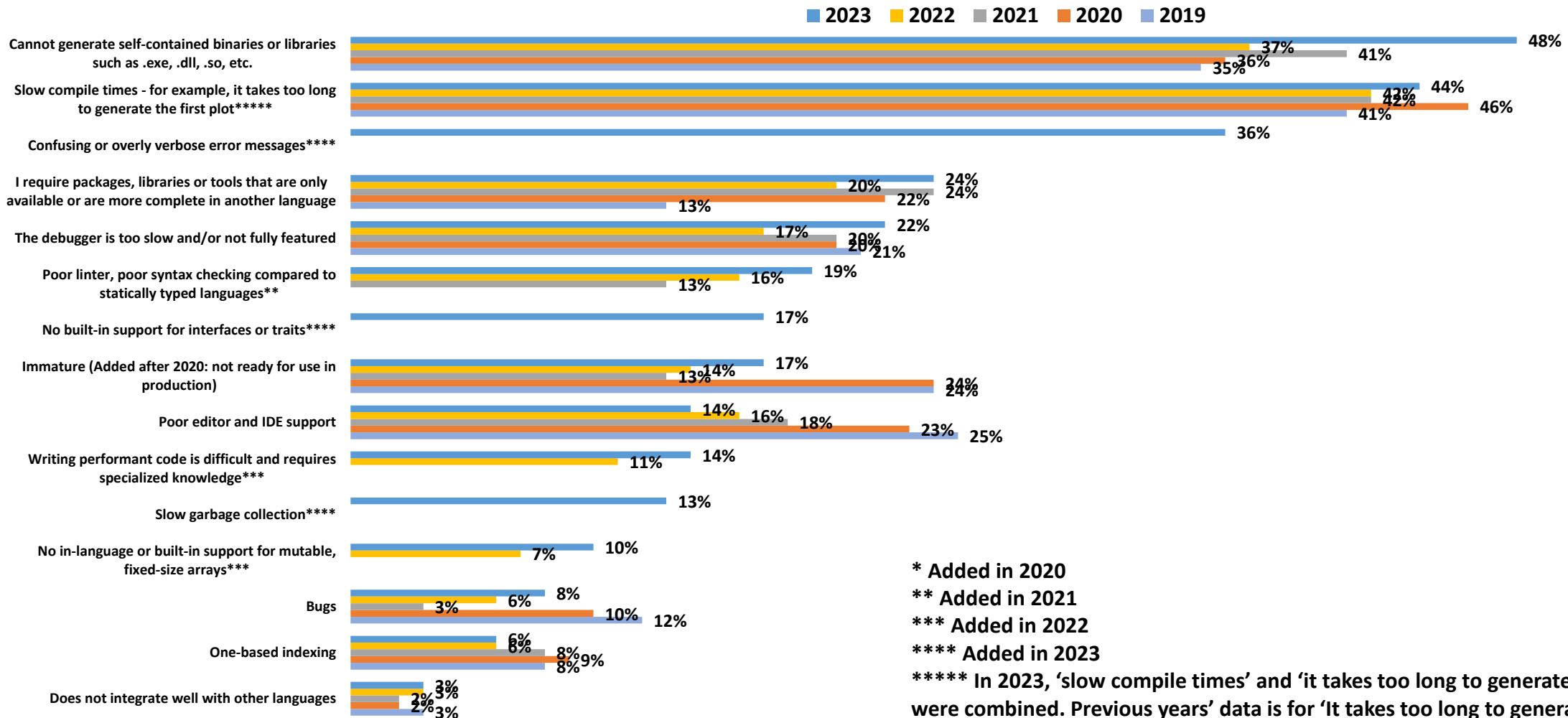
Thinking only about the NON-TECHNICAL aspects or features of Julia, what are the NON-TECHNICAL aspects or features you like MOST about Julia?



** Added in 2021

The Biggest TECHNICAL PROBLEMS with Julia Are Cannot Generate Self-Contained Binaries or Libraries and Slow Compile Times – Too Long to Generate First Plot

Thinking only about the TECHNICAL aspects or features of Julia, what are the TECHNICAL aspects or features you like LEAST about Julia?



* Added in 2020

** Added in 2021

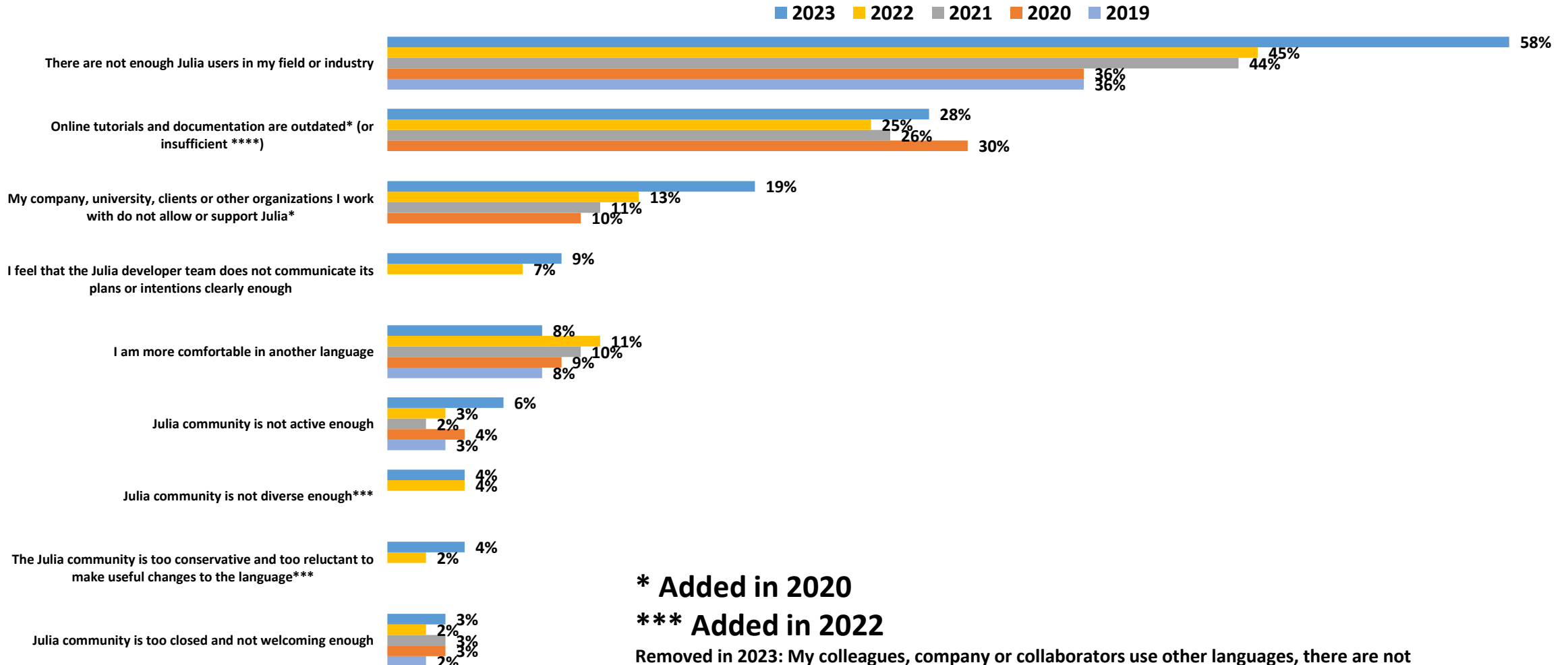
*** Added in 2022

**** Added in 2023

***** In 2023, 'slow compile times' and 'it takes too long to generate the first plot' were combined. Previous years' data is for 'It takes too long to generate the first plot'.
 Removed in 2023: Packages aren't as mature or as well-maintained as I need, doesn't have all the packages I need, not well-suited to certain tasks, not stable enough, package manager is confusing, difficult or doesn't do what I expect

The Biggest NON-TECHNICAL PROBLEM with Julia Is Related to Adoption: Not Enough Julia Users

Thinking only about the NON-TECHNICAL aspects or features of Julia, what are the NON-TECHNICAL aspects or features you like LEAST about Julia?



* Added in 2020

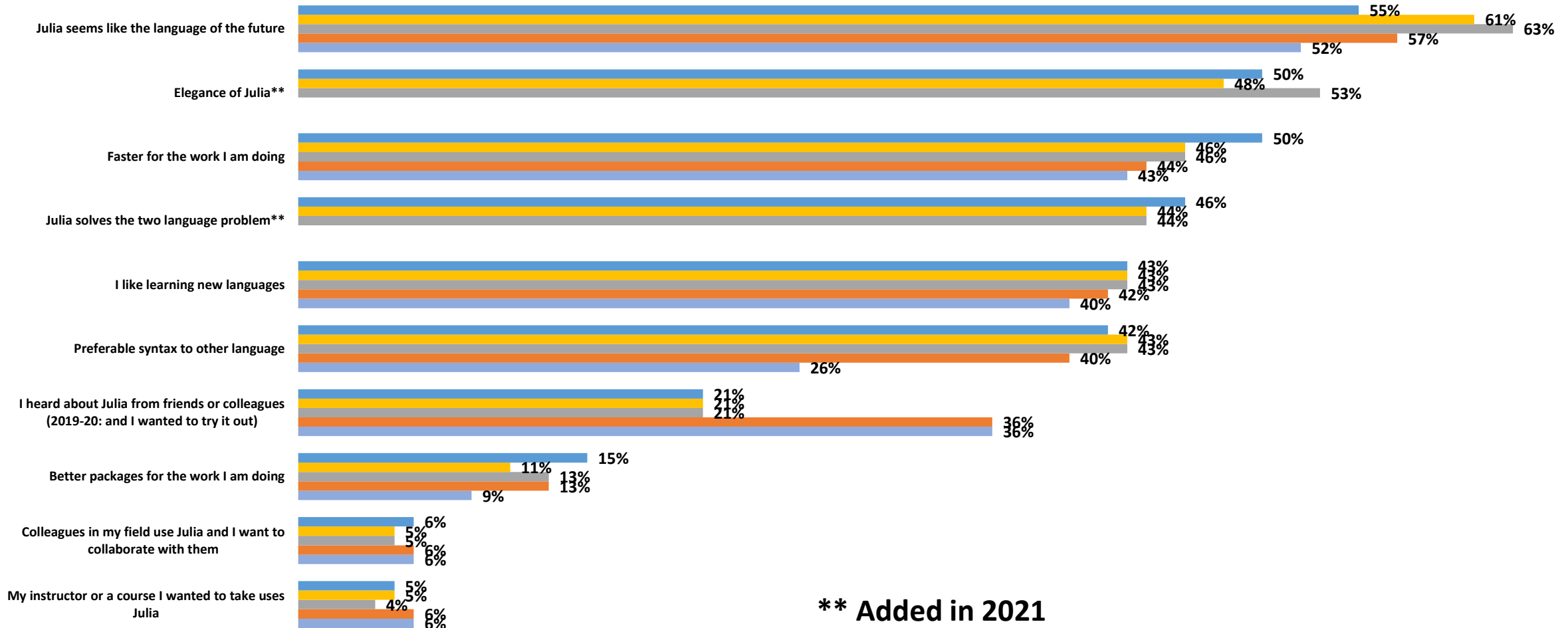
*** Added in 2022

Removed in 2023: My colleagues, company or collaborators use other languages, there are not enough Julia users in general, insufficient documentation, there are not enough teaching and learning resources available online, there are too many things I don't know how to do in Julia

Reasons for Choosing Julia: Seems Like the Language of the Future, Elegance, Speed, Solves the Two Language Problem, Like Learning New Languages, Preferable Syntax

Why did you start using Julia?

2023 2022 2021 2020 2019



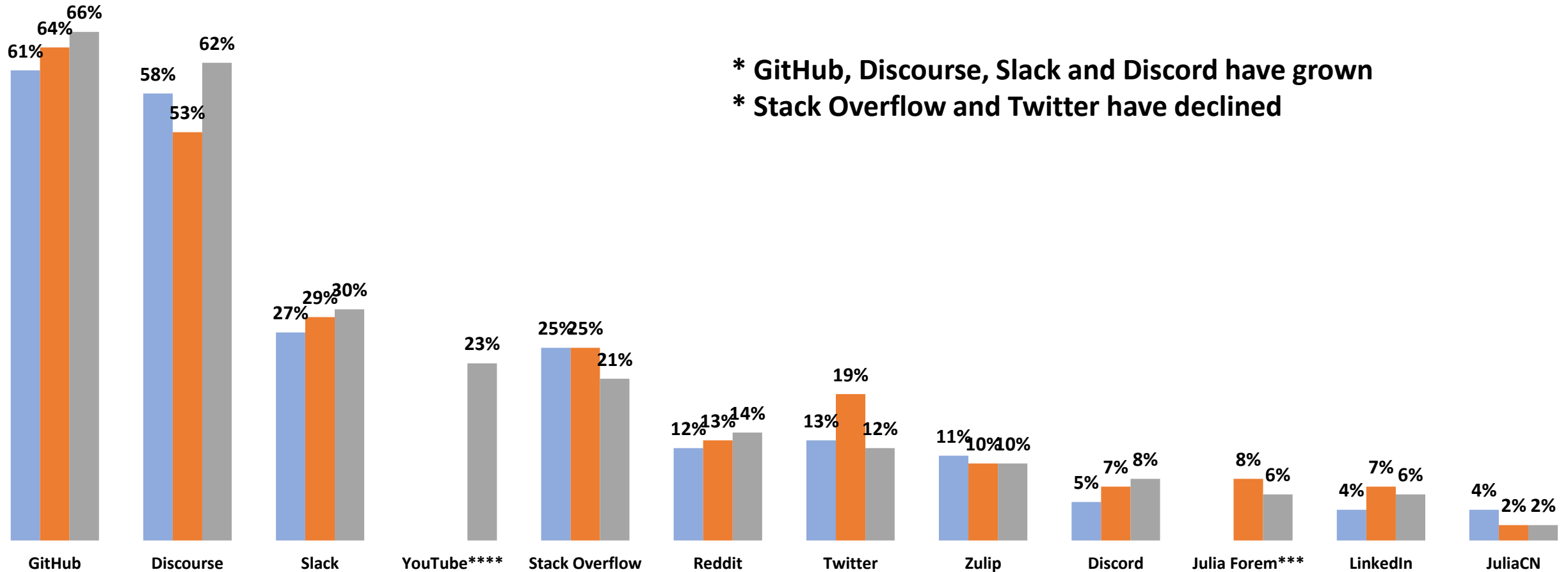
** Added in 2021

Removed in 2023: I need or want a specific feature

Julia Users & Developers Interact on GitHub, Discourse, Slack, YouTube and Stack Overflow

Where do you interact with the Julia community?

2021 2022 2023



* GitHub, Discourse, Slack and Discord have grown
* Stack Overflow and Twitter have declined

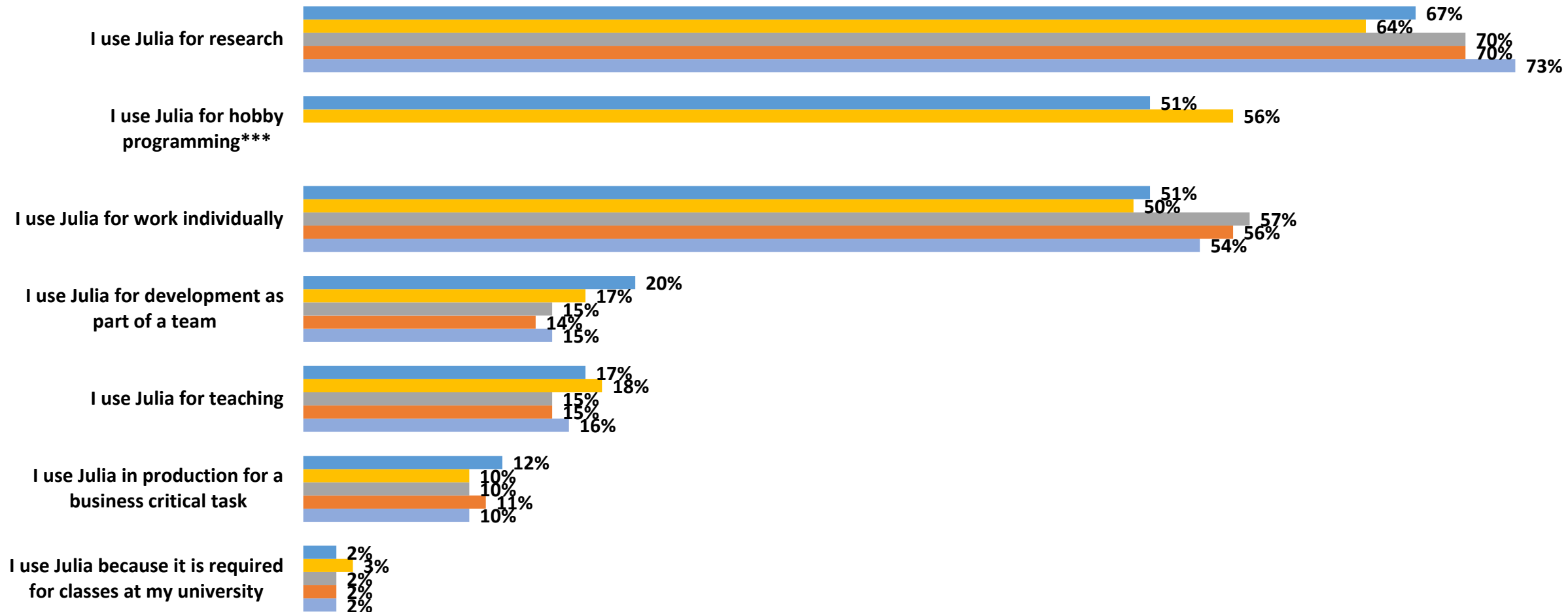
*** Added in 2022

**** Added in 2023

Most Use Julia for Research, Hobby Programming and Individual Work

Which of the following best describe your use of Julia?

■ 2023 ■ 2022 ■ 2021 ■ 2020 ■ 2019



*** Added in 2022

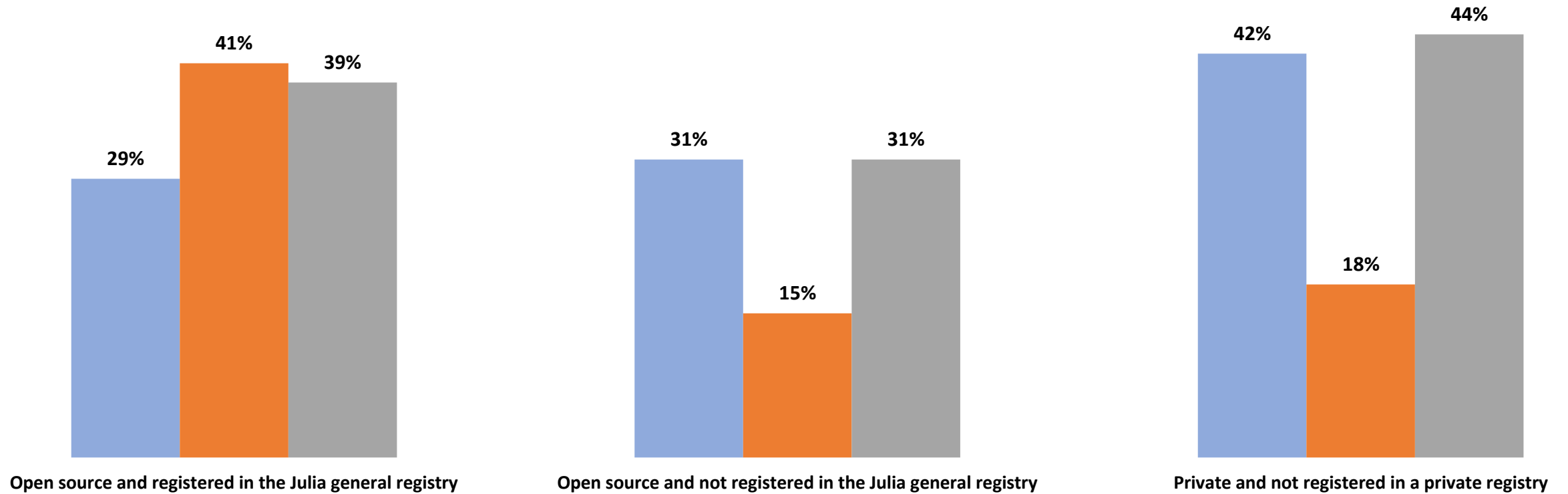
Users and Developers Are Most Likely to Create or Contribute to Private Packages

2023: Which of the following types of Julia packages have you created or contributed to?

(2022: Which of the following types of Julia packages have you created?)

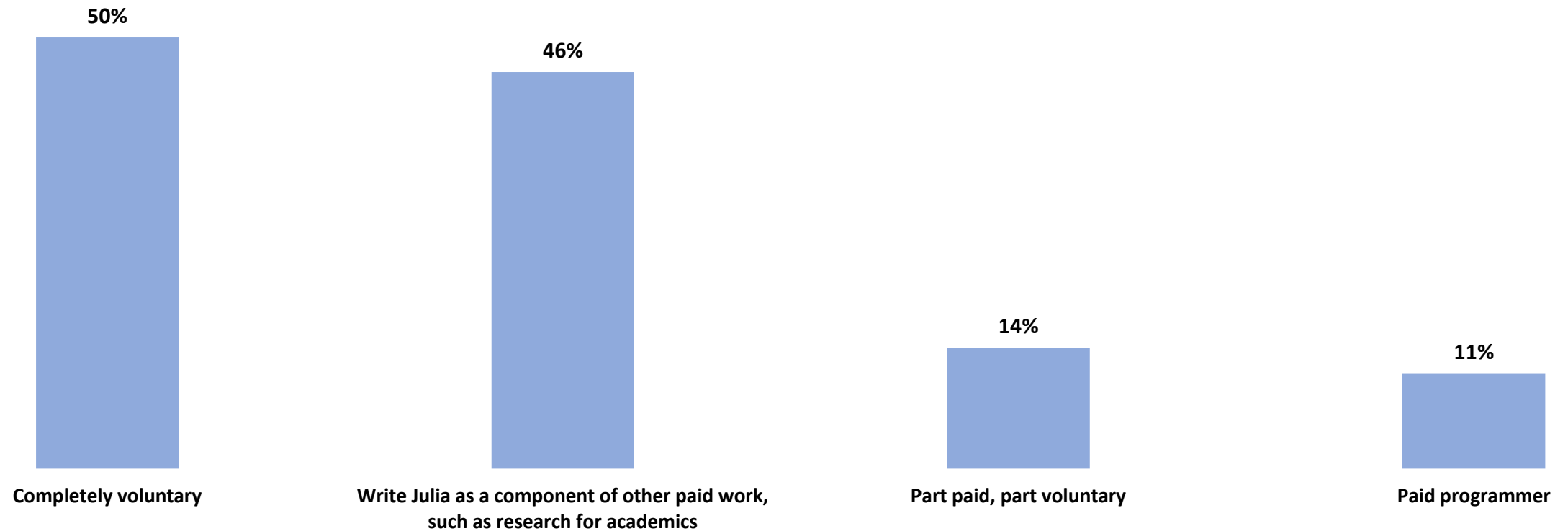
Which of the following types of Julia packages have you contributed to, including documentation or filing issues, but not created?)

■ 2022: Created ■ 2022: Contributed to ■ 2023: Created or Contributed to



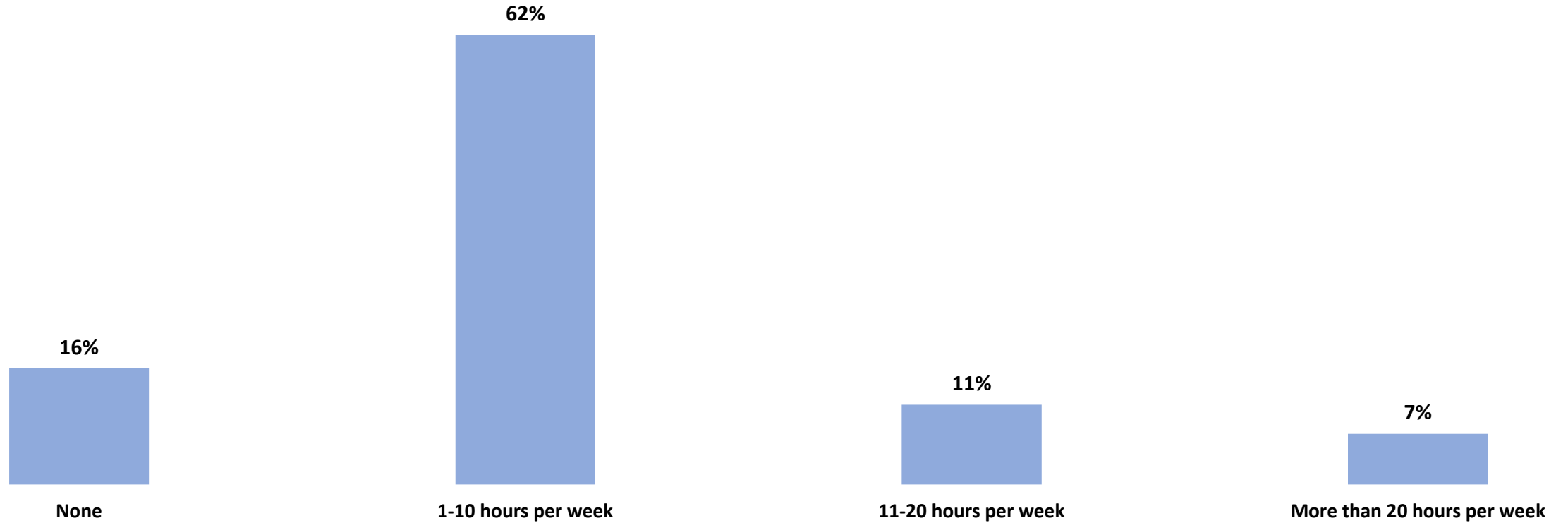
Open-Source Creators and Contributors Are Most Likely to Contribute on a Voluntary Basis or as a Component of Other Paid Work

IF OPEN SOURCE CREATOR OR CONTRIBUTOR: In which of the following capacities do you contribute to Julia?



Most Open-Source Creators and Contributors Spend 1-10 Hours Per Week Working on Open Source Julia Projects or the Julia Community

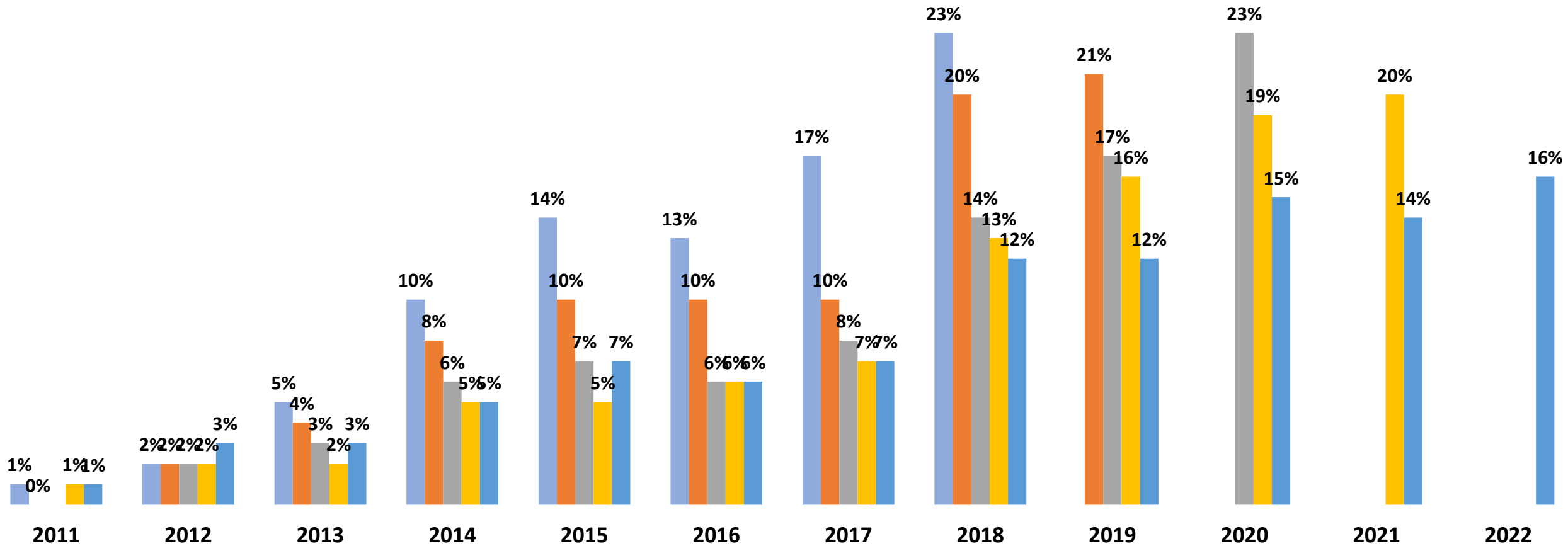
IF OPEN SOURCE CREATOR OR CONTRIBUTOR: How many volunteer hours do you spend working on open source Julia projects or the Julia community per week?



Most Started Using Julia in the Last 5 Years

When did you first start using Julia?

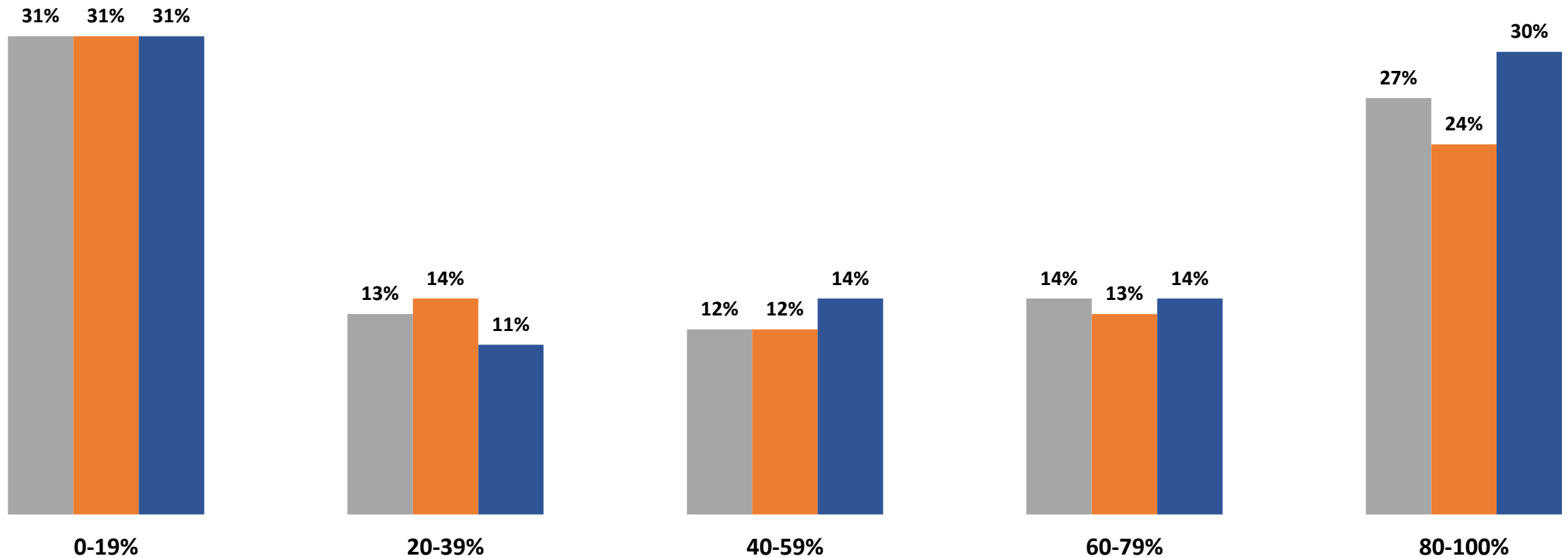
2019 2020 2021 2022 2023



Most Julia Users & Developers Do At Least 40% of Their Programming Work in Julia; 30% Do At Least 80% of Their Programming Work in Julia

What percentage of the programming work you do is in Julia?

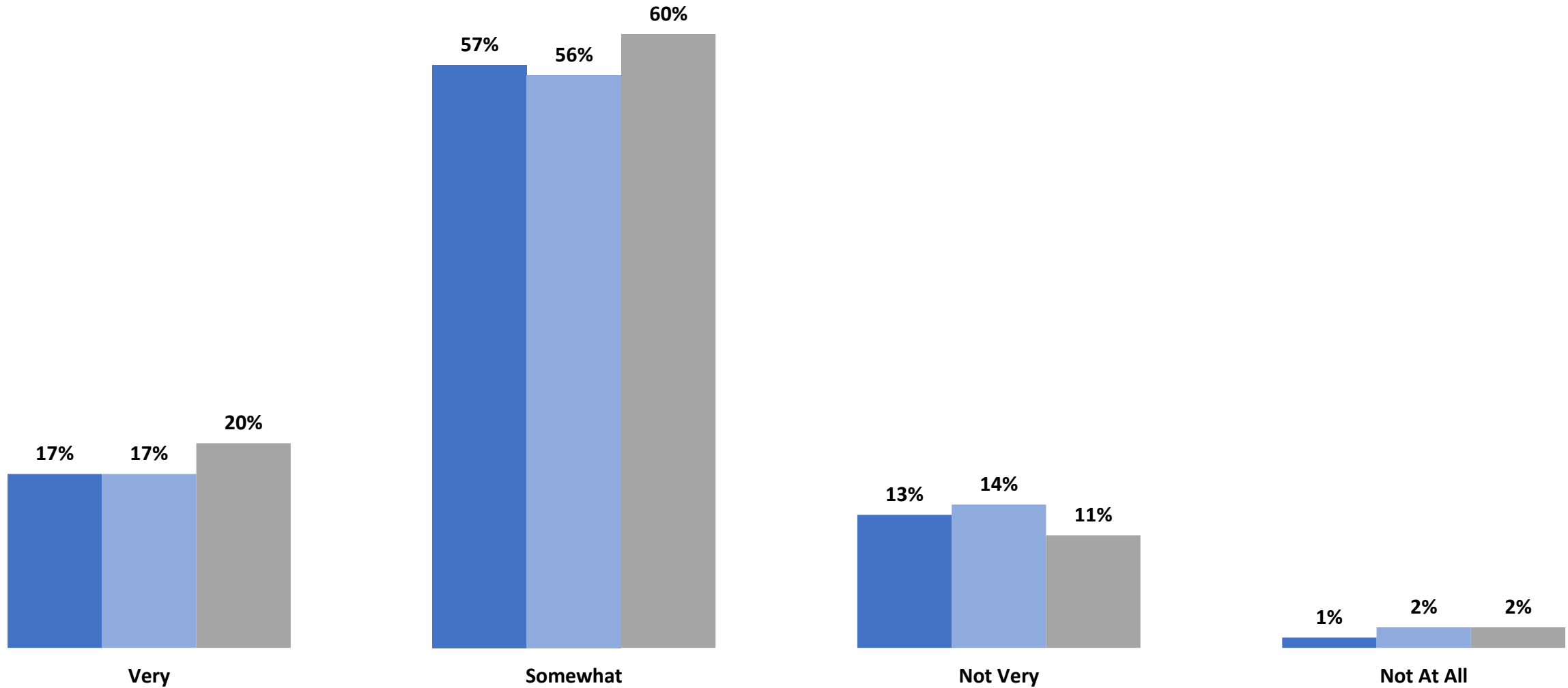
■ 2021 ■ 2022 ■ 2023



80% Say the Julia Package Ecosystem Is ‘Very’ or ‘Somewhat’ Robust – Up from 73% Last Year

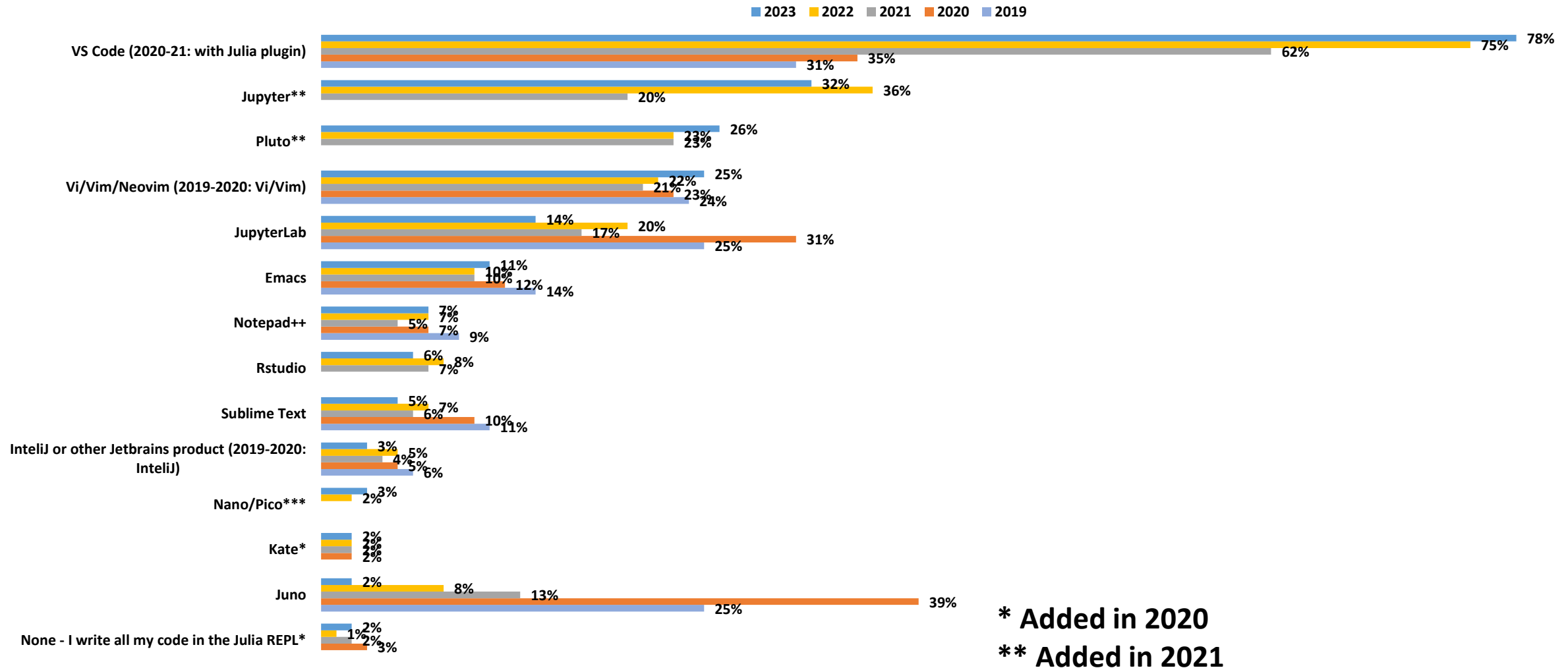
How robust is the current Julia package ecosystem?

■ 2021 ■ 2022 ■ 2023



VS Code, Jupyter, Pluto and Vi/Vim/Neovim Are the Leading Editors or IDEs for Julia Users & Developers

Which editors or IDEs do you use frequently?

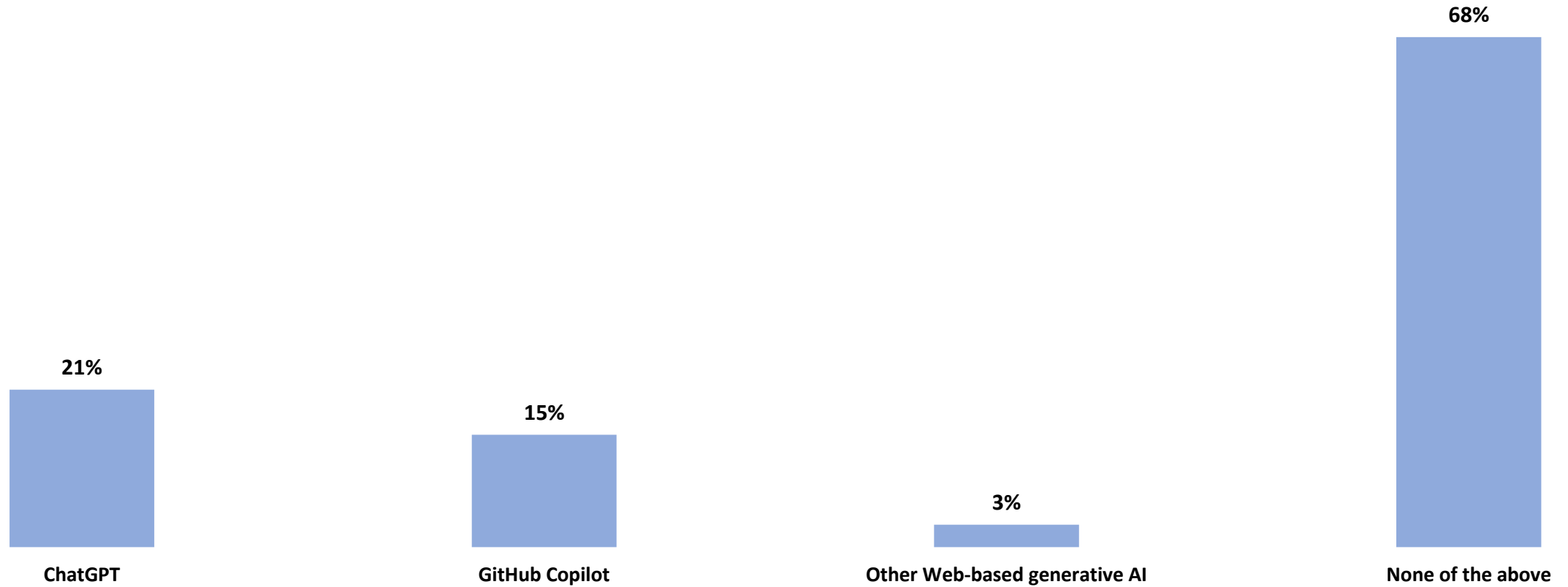


* Added in 2020

** Added in 2021

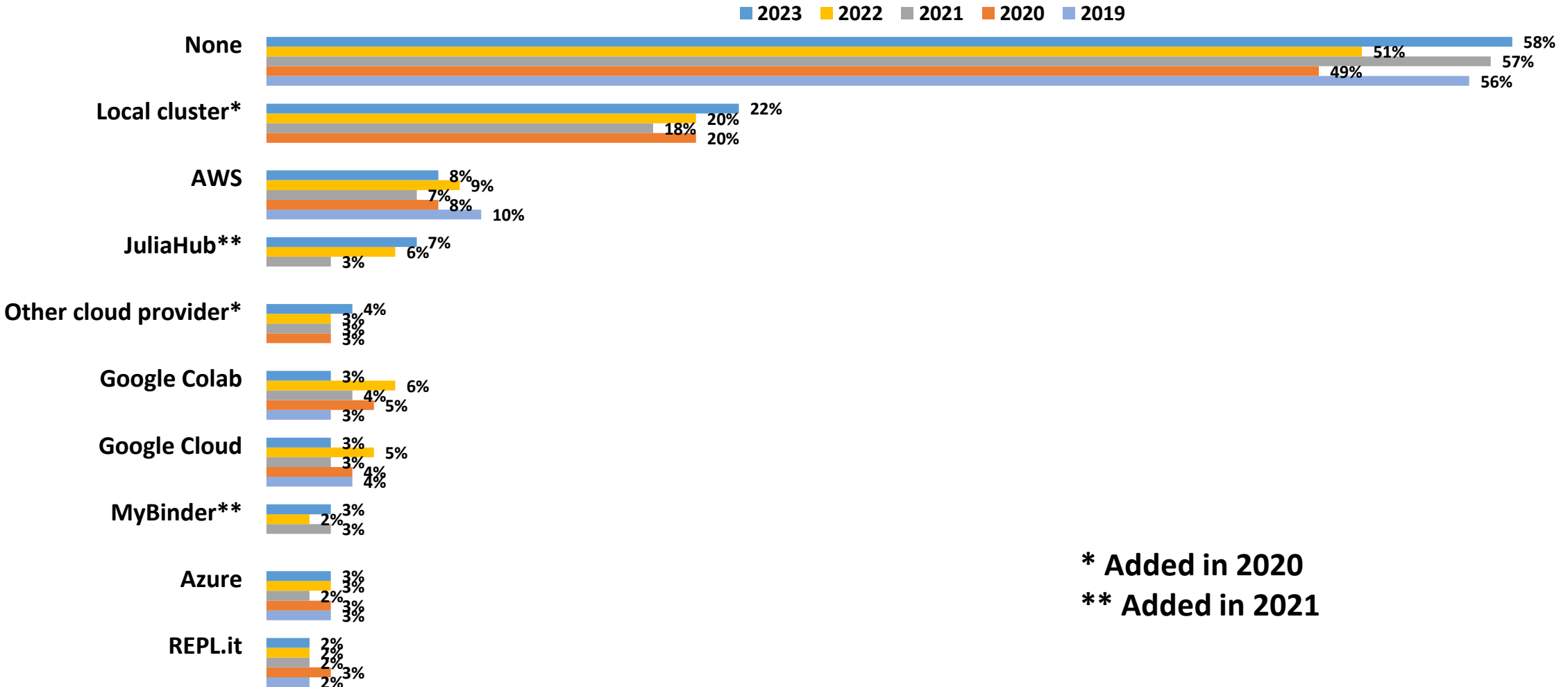
Most Users & Developers Do Not Use AI Assistance – Those Who Do Use ChatGPT or GitHub Copilot

What types of AI assistance do you use frequently with Julia?



Most Use a Local Cluster or No Cloud Solution

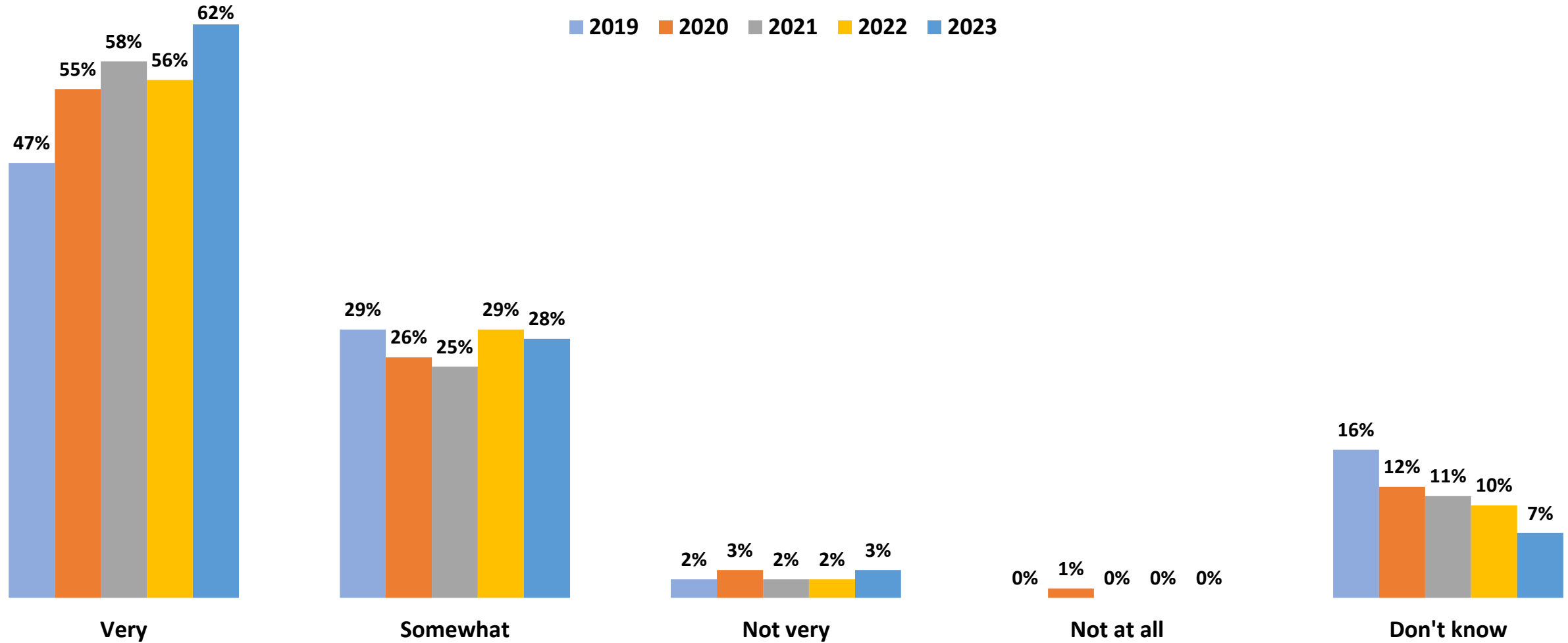
Which cloud solutions, if any, do you use together with Julia?



62% Say the Julia Community Is Very Helpful and Collaborative – Highest Ever

How helpful and collaborative is the Julia community?

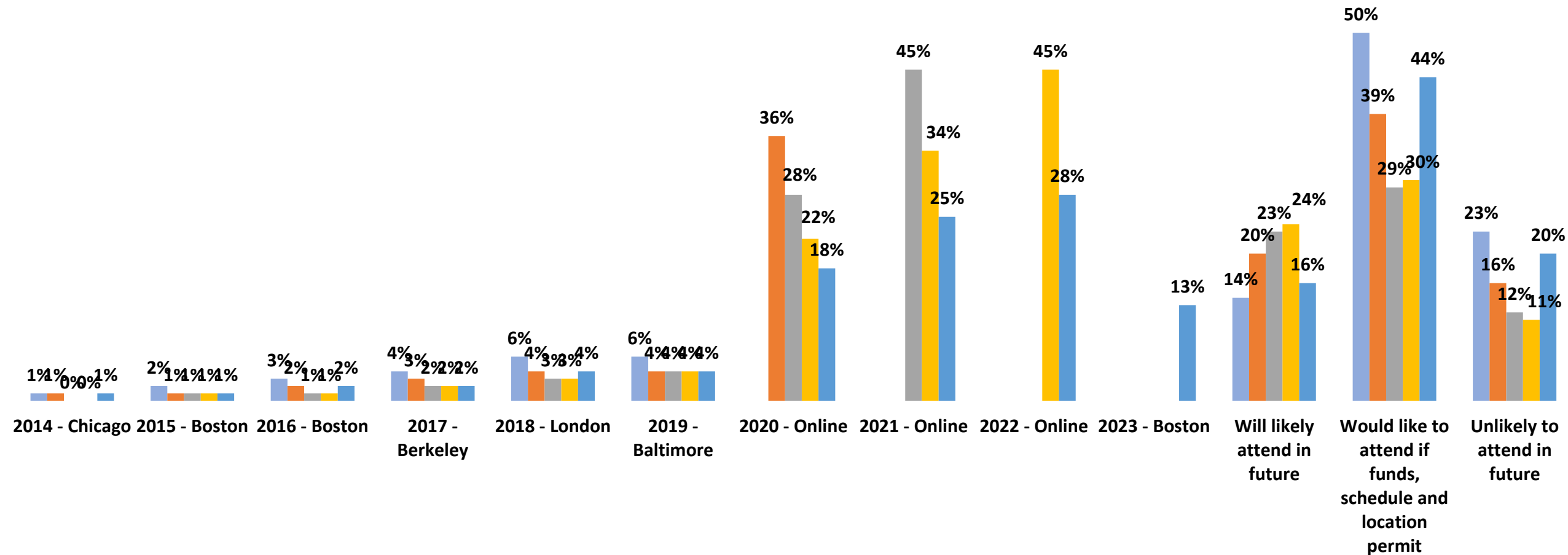
■ 2019 ■ 2020 ■ 2021 ■ 2022 ■ 2023



13% of Respondents Plan to Attend JuliaCon This Year, 16% Will Likely Attend in Future and 44% Would Like to Attend – Highest Since Before the Pandemic

Have you attended or do you plan to attend JuliaCon? Please select all that apply.

2019 2020 2021 2022 2023

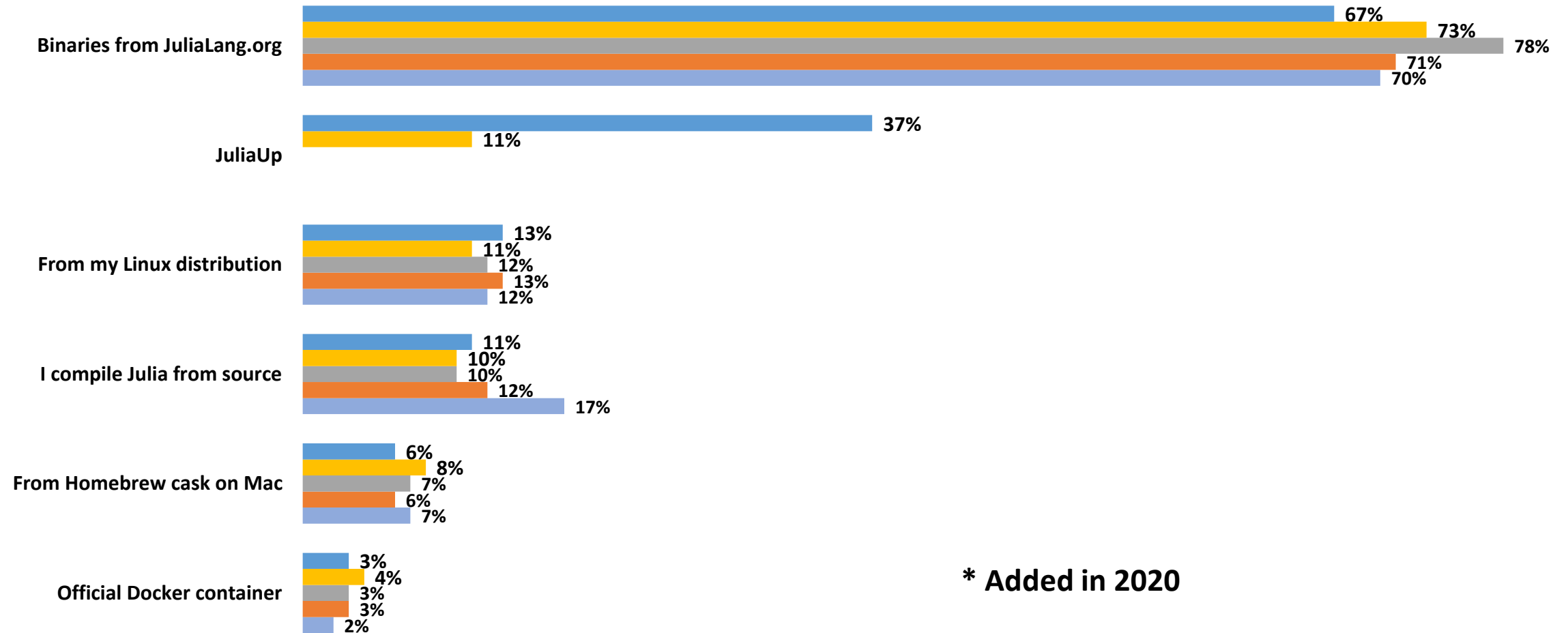


Most Downloaded or Installed Binaries from JuliaLang.org, But the Biggest Increase Is JuliaUp

How did you download and install Julia?

2019-2022: How did you download or install the Julia version you use most frequently?

■ 2023 ■ 2022 ■ 2021 ■ 2020 ■ 2019

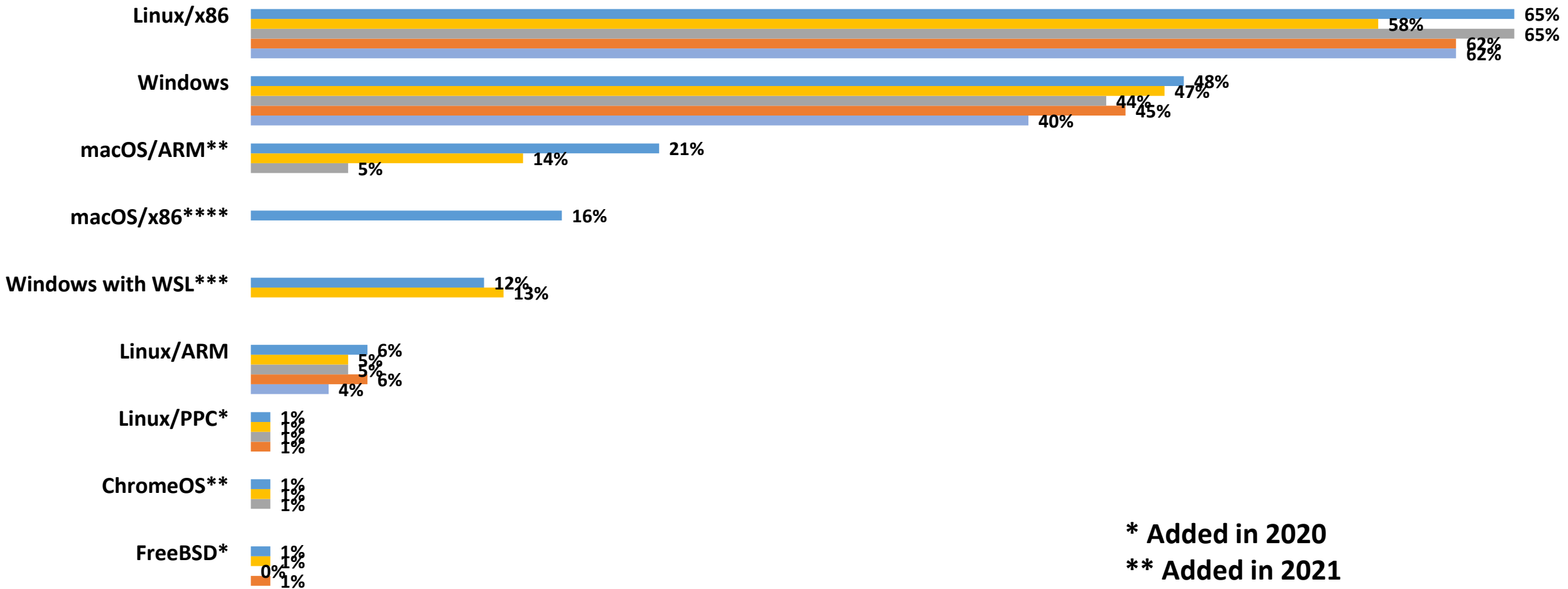


* Added in 2020

Most Still Use Julia with Linux/x86, but Windows and macOS Are Growing

With which operating system(s) do you use Julia?

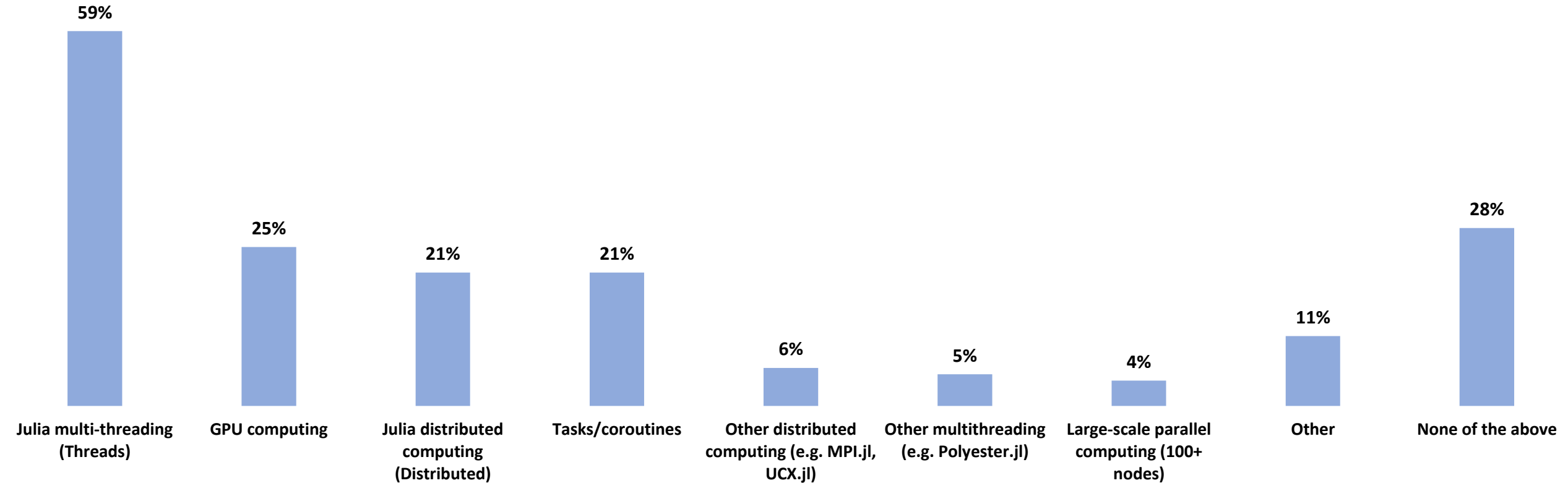
■ 2023 ■ 2022 ■ 2021 ■ 2020 ■ 2019



* Added in 2020
 ** Added in 2021
 *** Added in 2022
 **** Added in 2023

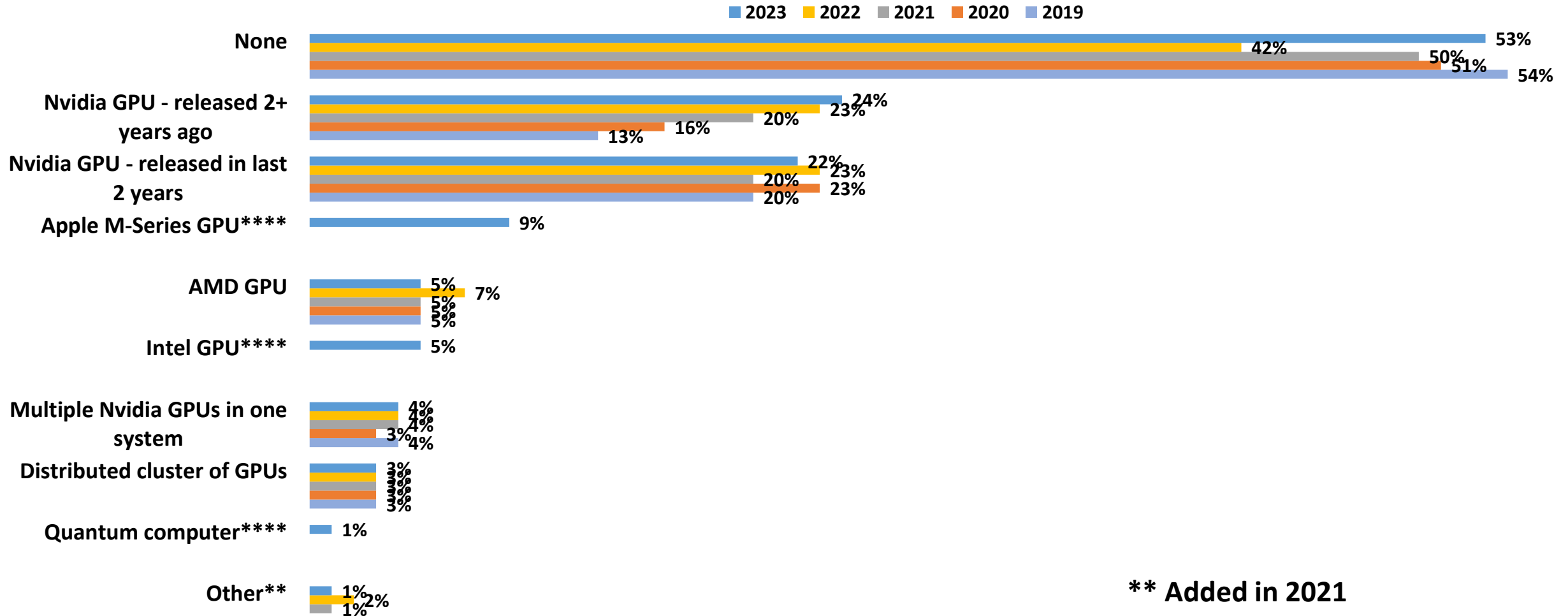
Most Use Julia Multi-Threading (Threads)

Which kind of parallelism, if any, do you use together with Julia?



Nvidia GPUs Are the Most Common Accelerators

Which hardware accelerators, if any, do you use together with Julia?

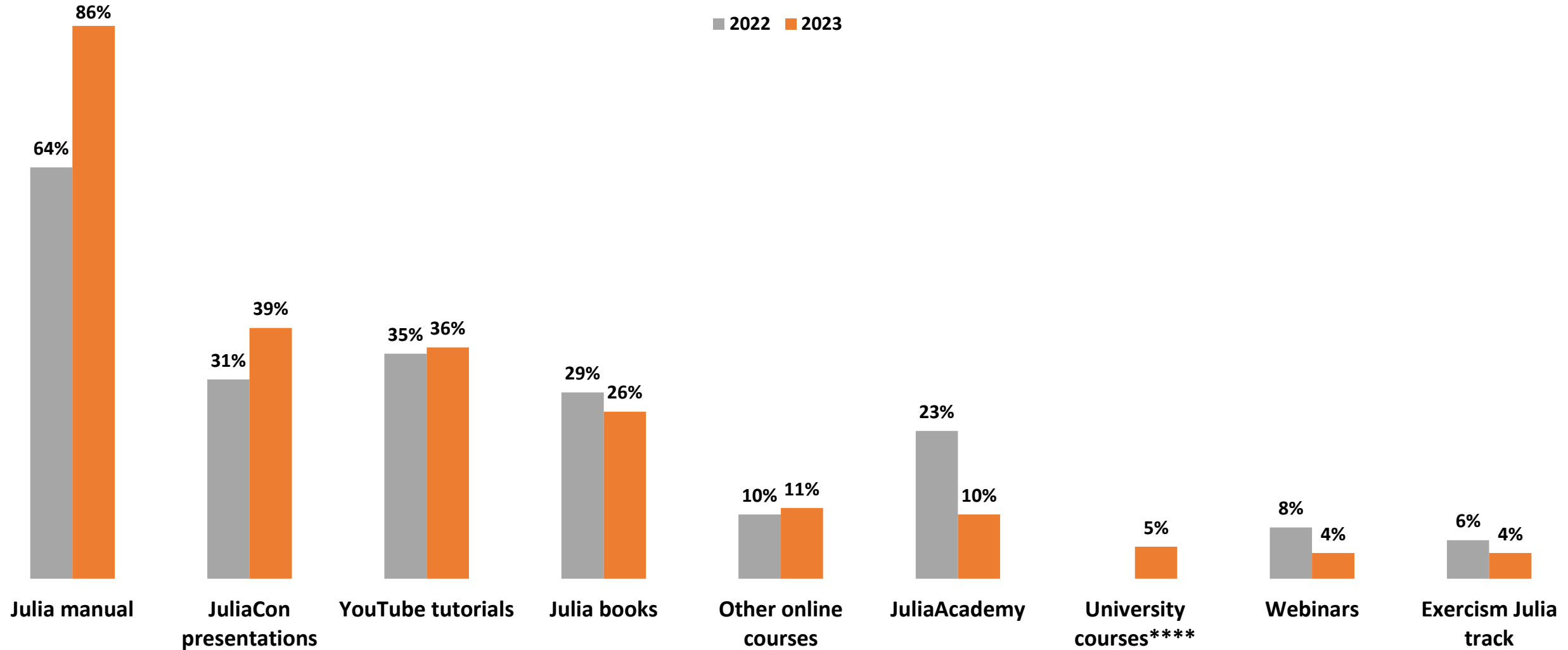


** Added in 2021

**** Added in 2023

Julia Manual Is Most Useful, Followed by JuliaCon Presentations, YouTube and Julia Books

What resources have you found most useful when learning Julia for the first time or when learning how to do something in Julia? Please select all that apply.

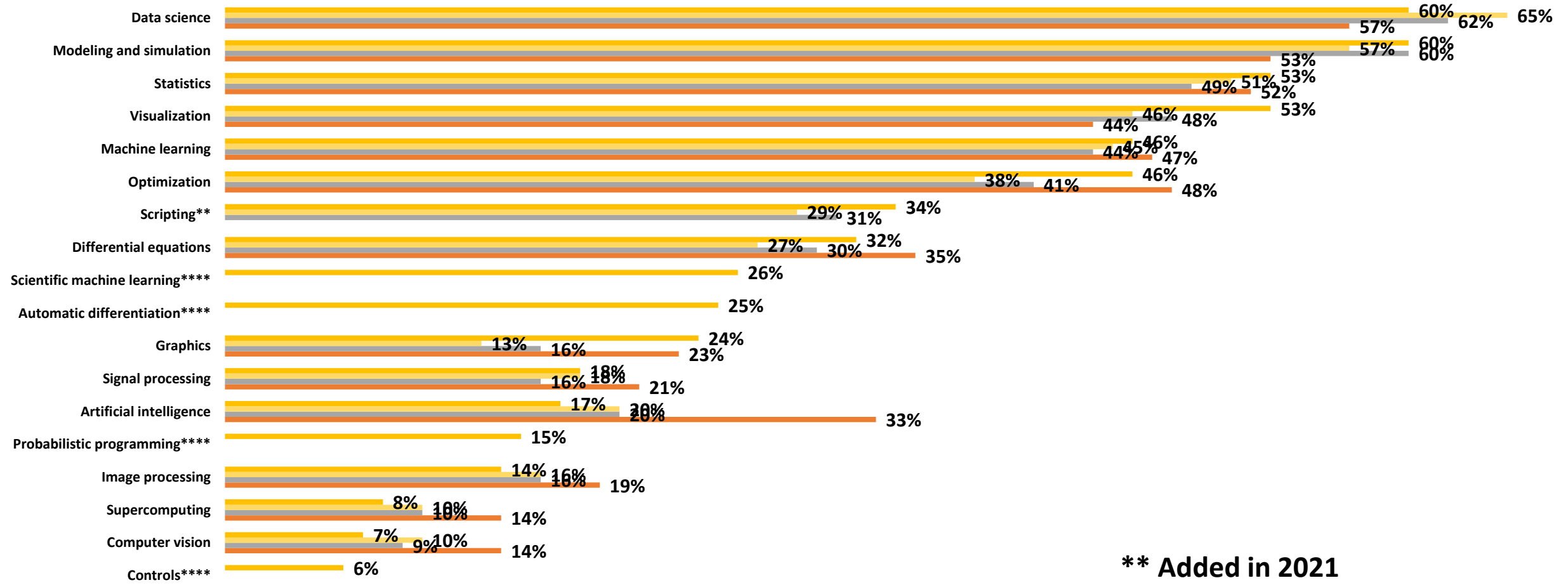


**** Online and in-person university courses combined in 2023

Most Respondents Use Data Science, Modeling and Simulation, Statistics and Visualization

Which of the following do you use?

2023 2022 2021 2020



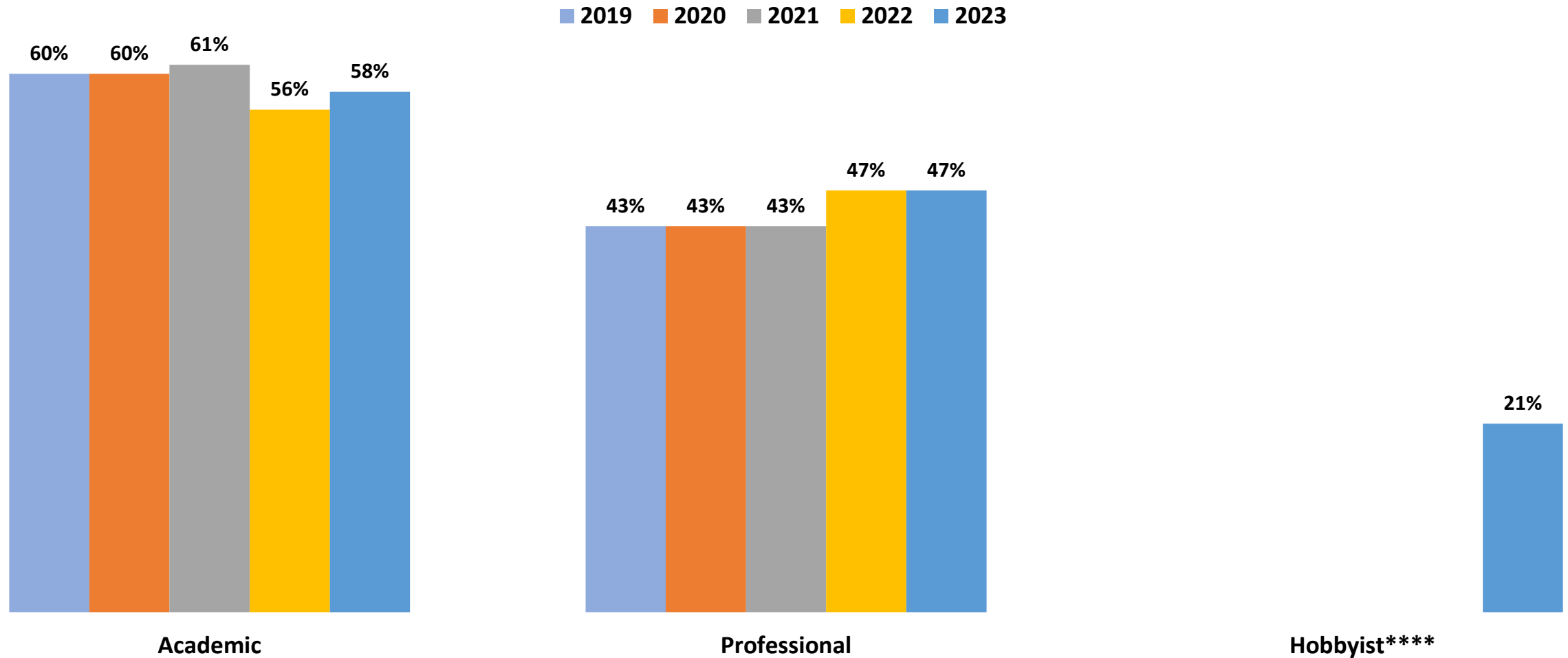
** Added in 2021

*** Added in 2022

**** Added in 2023

Professionals Are Nearly Half of Survey Respondents

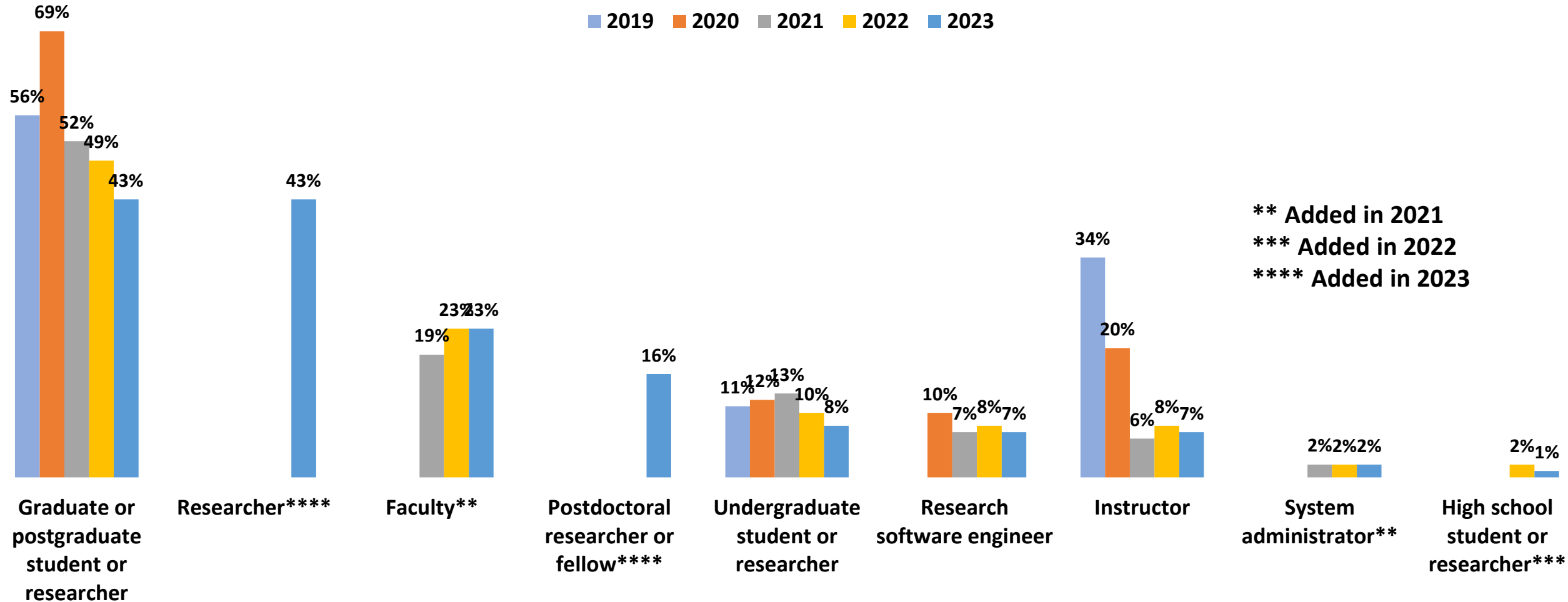
Which of the following best describes you? Please select all that apply.



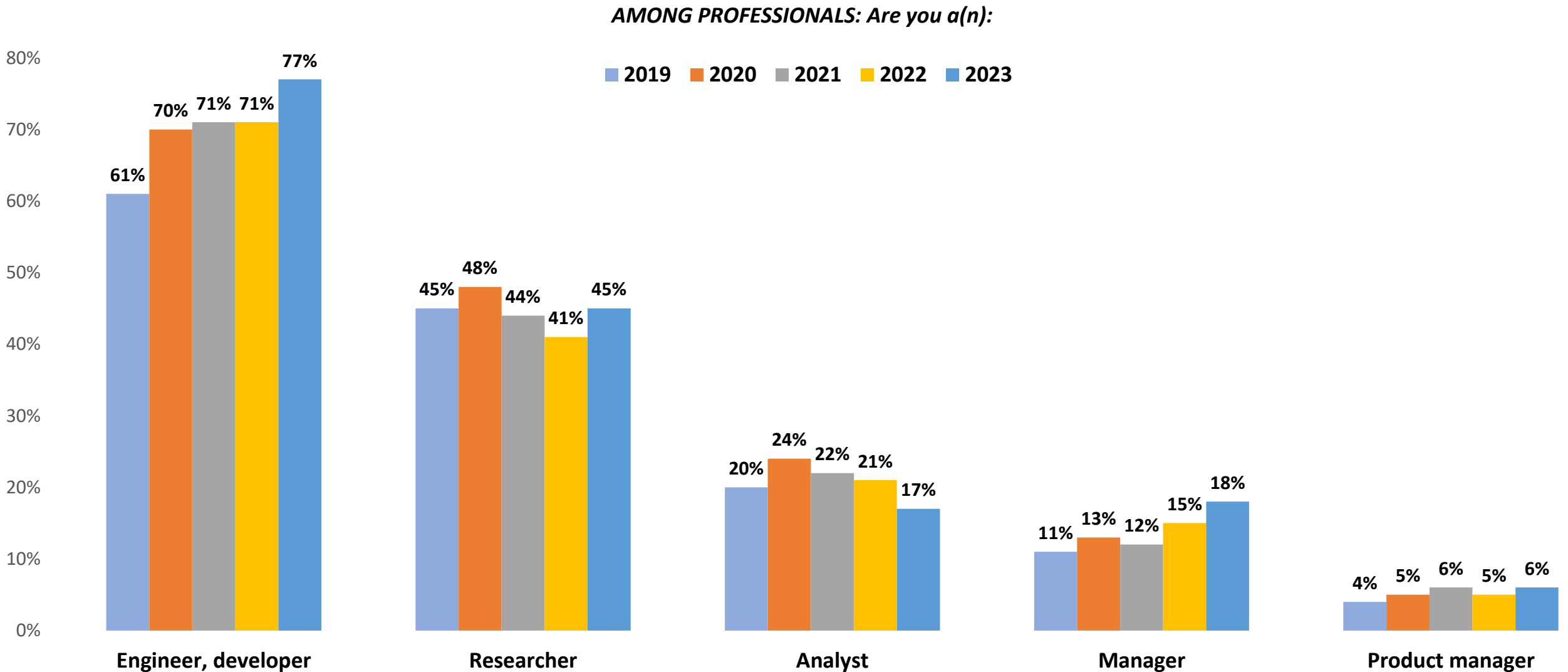
**** Added in 2023

Among Academics, Most Respondents Are Researchers, Graduate or Postgraduate Students or Researchers

AMONG ACADEMICS: Are you a(n):



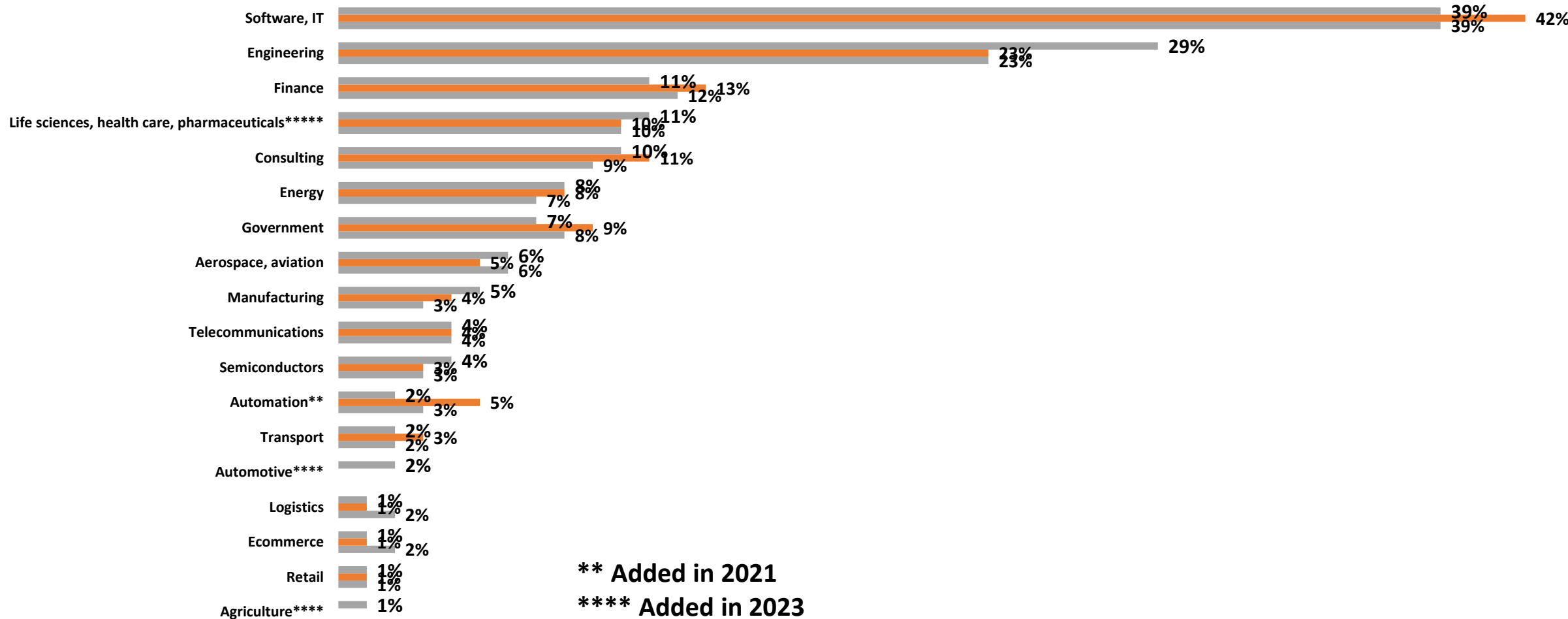
Among Professionals, Most Respondents Are Engineers or Developers



Among Professionals, the Most Common Industries Include Software, IT and Engineering

AMONG PROFESSIONALS: What is the primary industry in which you work?

■ 2023 ■ 2022 ■ 2021



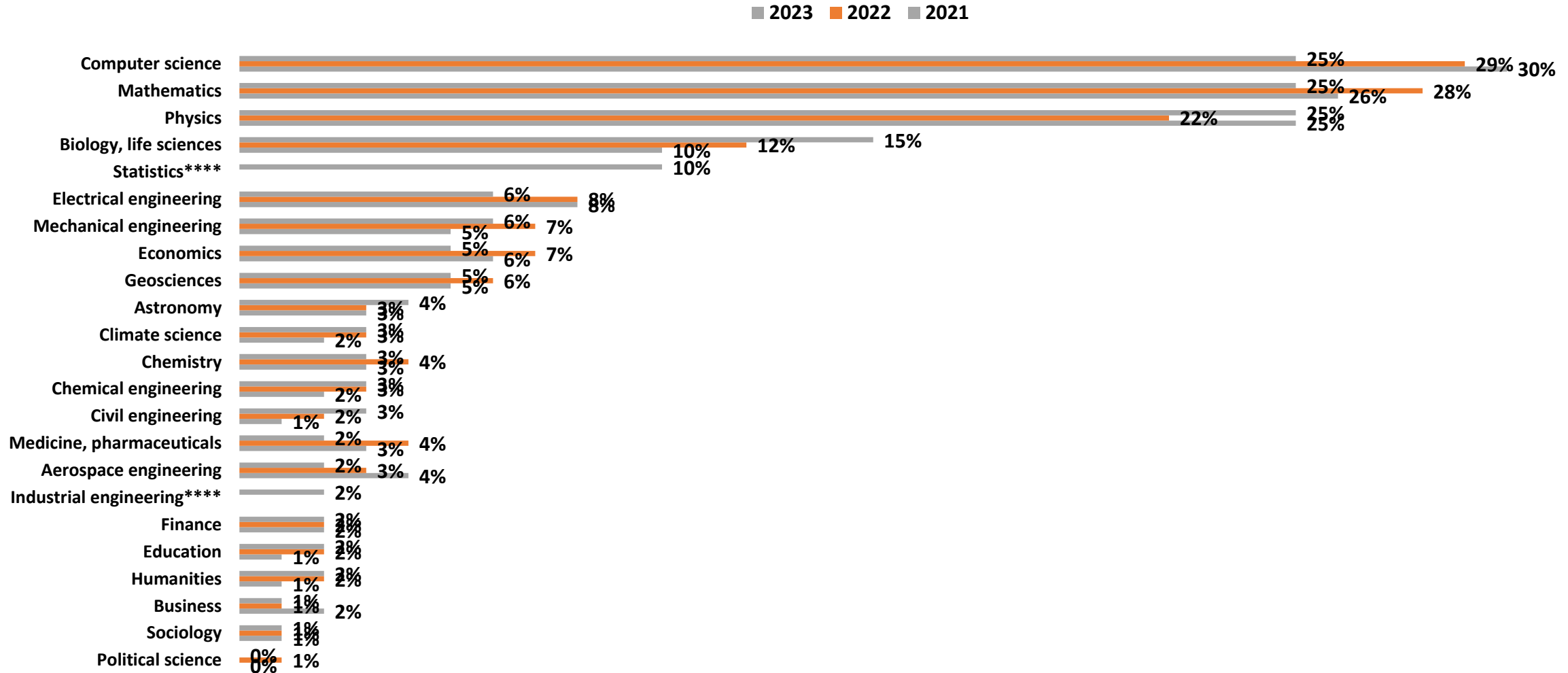
** Added in 2021

**** Added in 2023

***** Pharmaceuticals merged with life sciences/health care in 2023

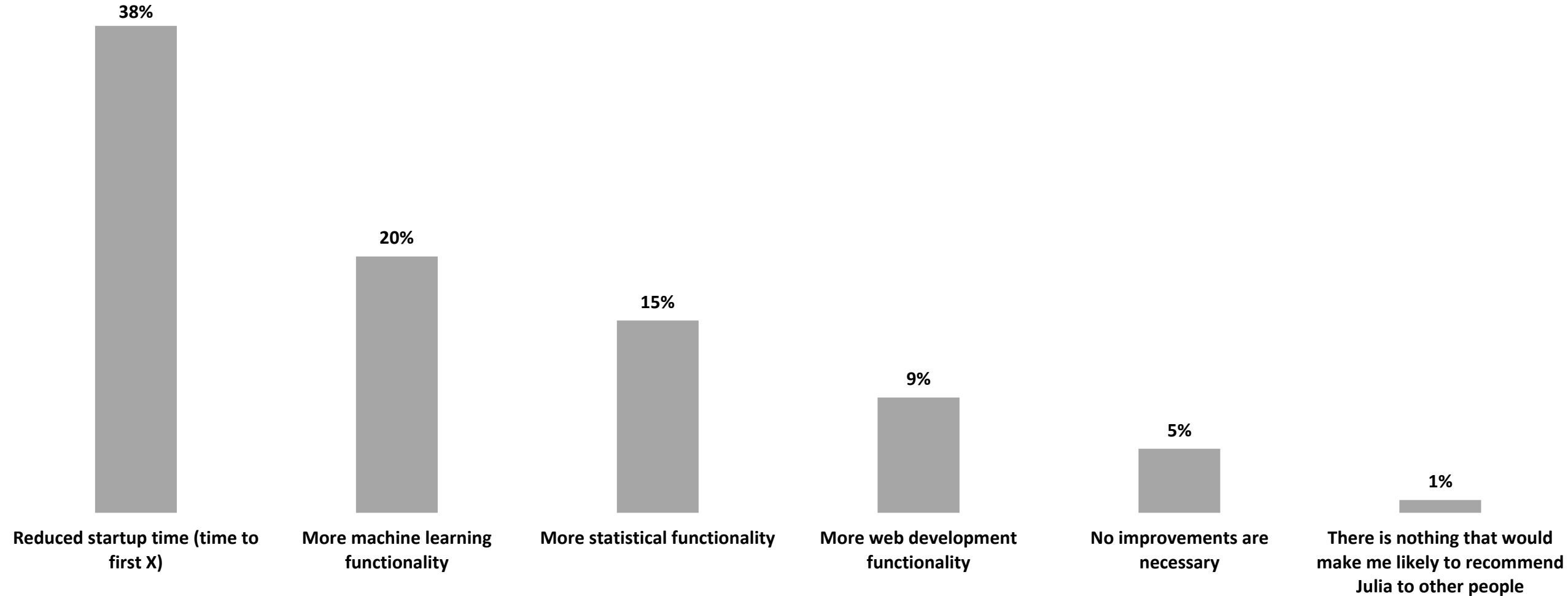
Among Academics, the Most Common Fields Are Computer Science, Mathematics, Physics and Biology

AMONG ACADEMICS: What is your primary field of study or research?



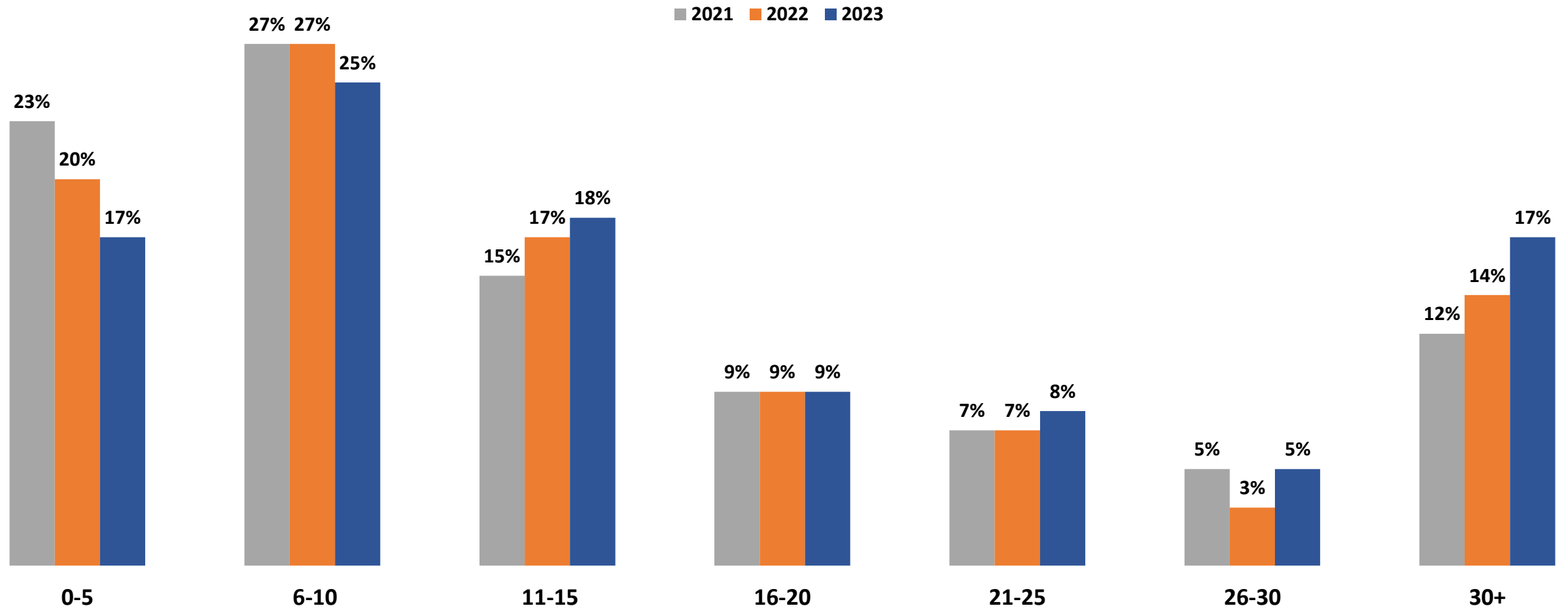
Julia Users Would Be More Likely to Recommend Julia if Startup Time Is Reduced

What type of improvements to Julia would make you more likely to recommend Julia to other people?



Most Julia Users & Developers Have 15 Years Coding Experience or Less, But the Number With 11+ Years of Experience Is Growing

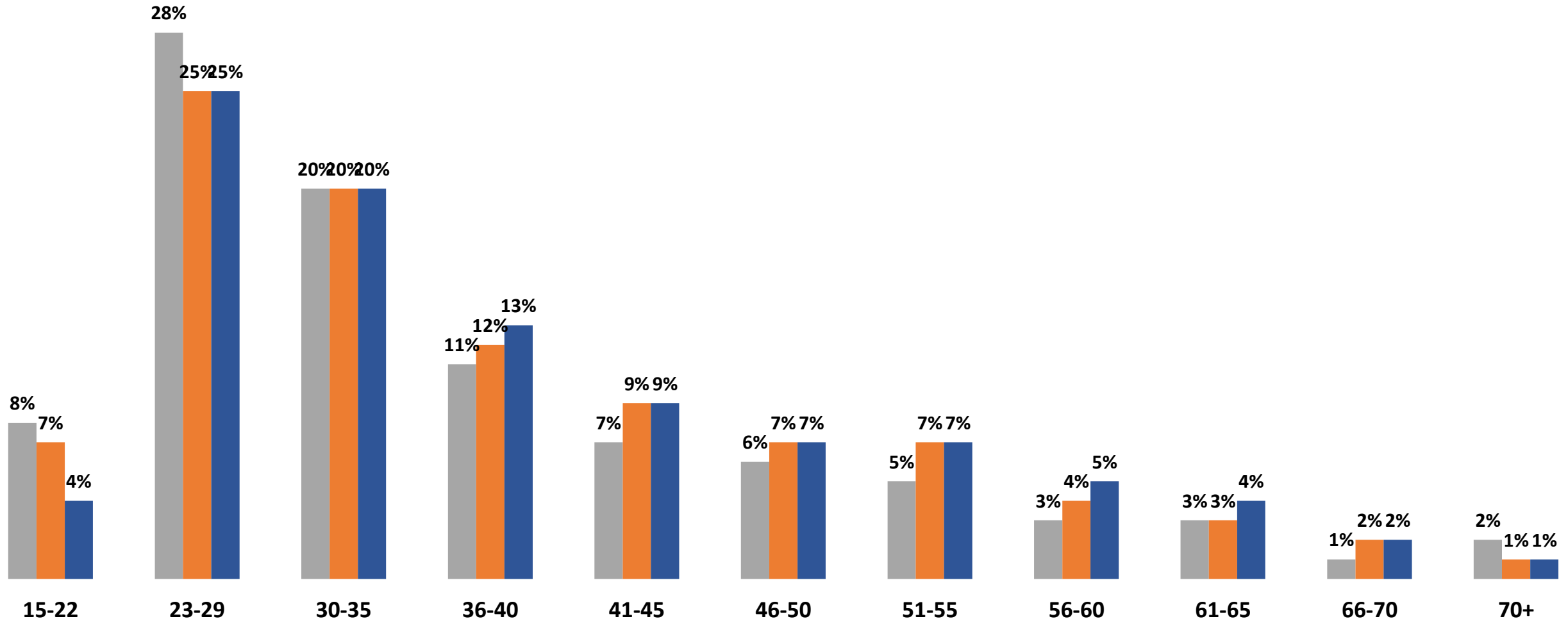
How many years of coding experience do you have?



Most Julia Users and Developers Are Age 23-40

The Number of Julia Users and Developers Age 36+ Is Growing

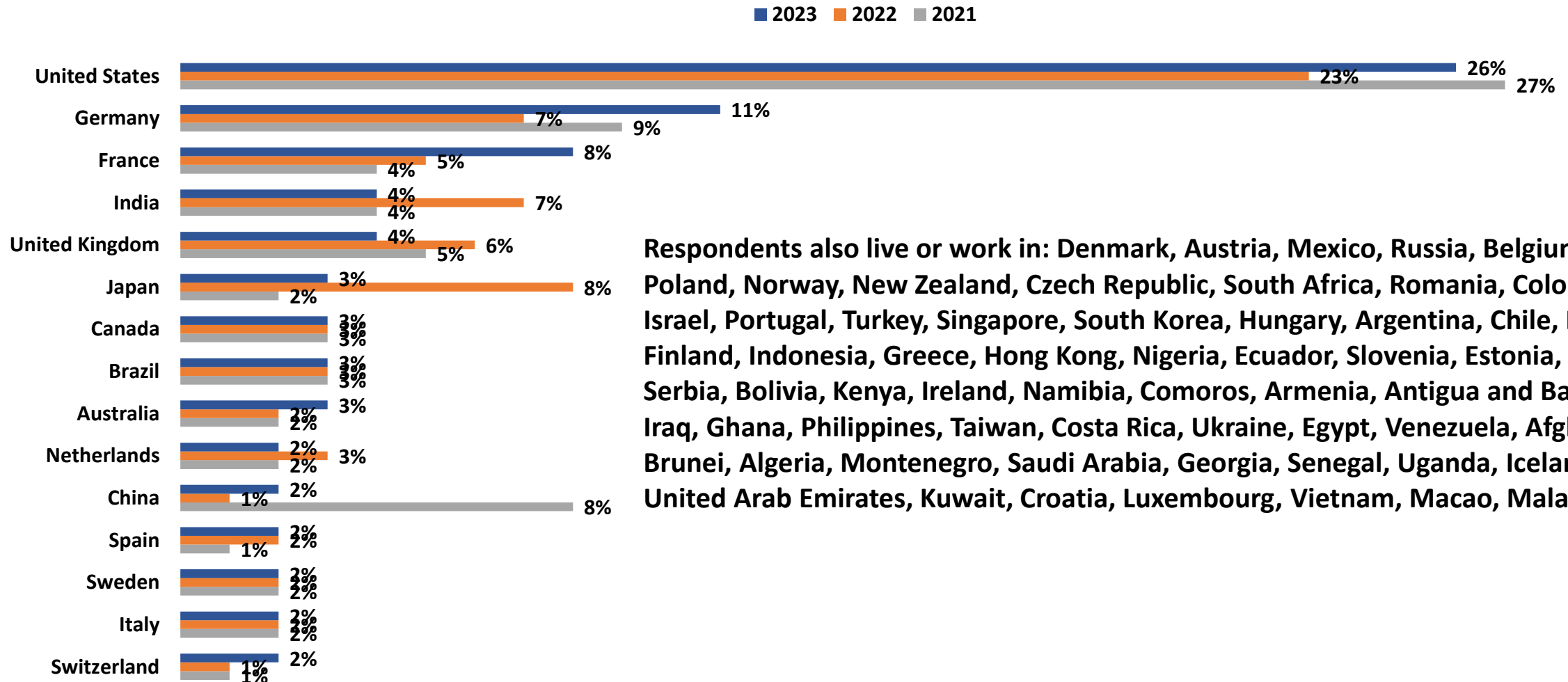
What is your age?



Respondents Live or Work in Over 75 Countries and Regions

Germany and France Show Most Growth

What is the country or region where you currently live or work?

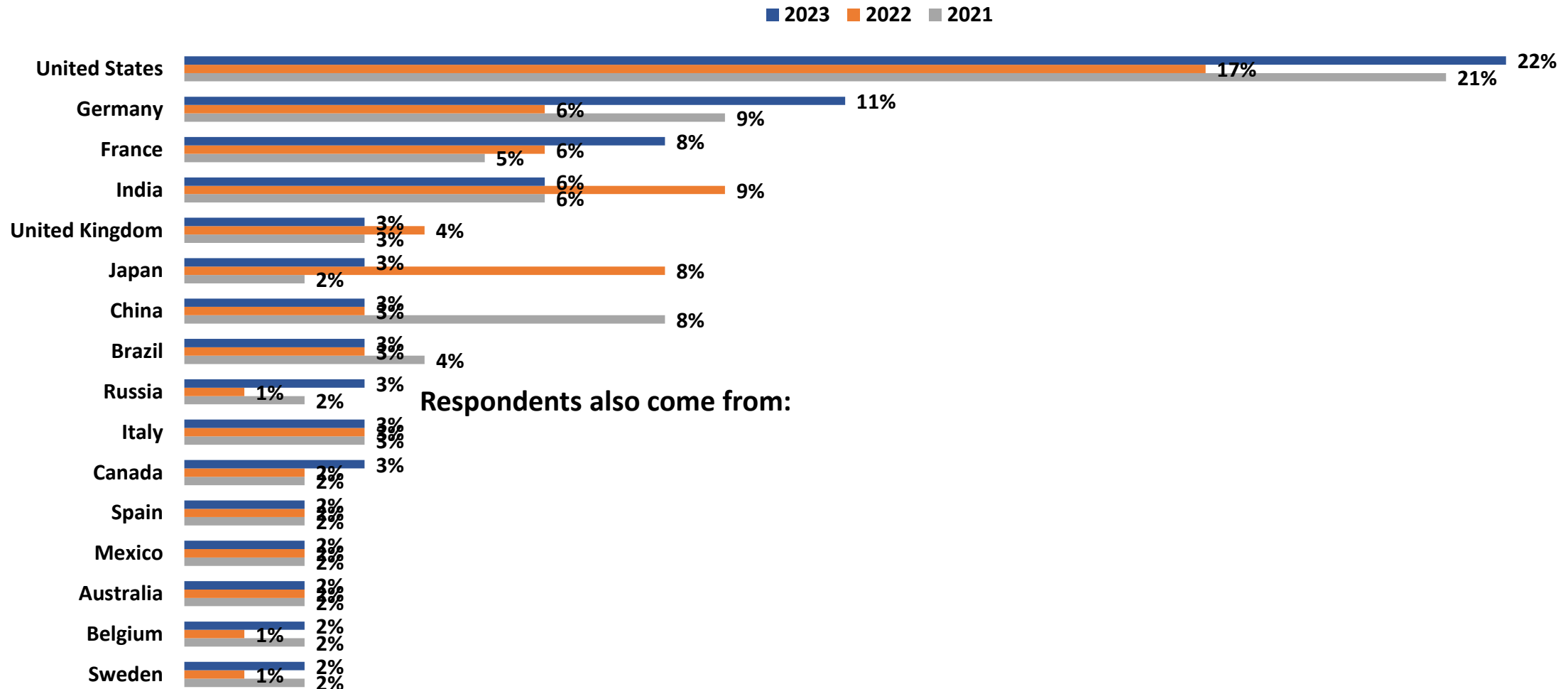


Respondents also live or work in: Denmark, Austria, Mexico, Russia, Belgium, Poland, Norway, New Zealand, Czech Republic, South Africa, Romania, Colombia, Israel, Portugal, Turkey, Singapore, South Korea, Hungary, Argentina, Chile, Iran, Finland, Indonesia, Greece, Hong Kong, Nigeria, Ecuador, Slovenia, Estonia, Thailand, Serbia, Bolivia, Kenya, Ireland, Namibia, Comoros, Armenia, Antigua and Barbuda, Iraq, Ghana, Philippines, Taiwan, Costa Rica, Ukraine, Egypt, Venezuela, Afghanistan, Brunei, Algeria, Montenegro, Saudi Arabia, Georgia, Senegal, Uganda, Iceland, United Arab Emirates, Kuwait, Croatia, Luxembourg, Vietnam, Macao, Malaysia

Respondents Come from 82 Countries and Regions

Germany and France Show Most Growth

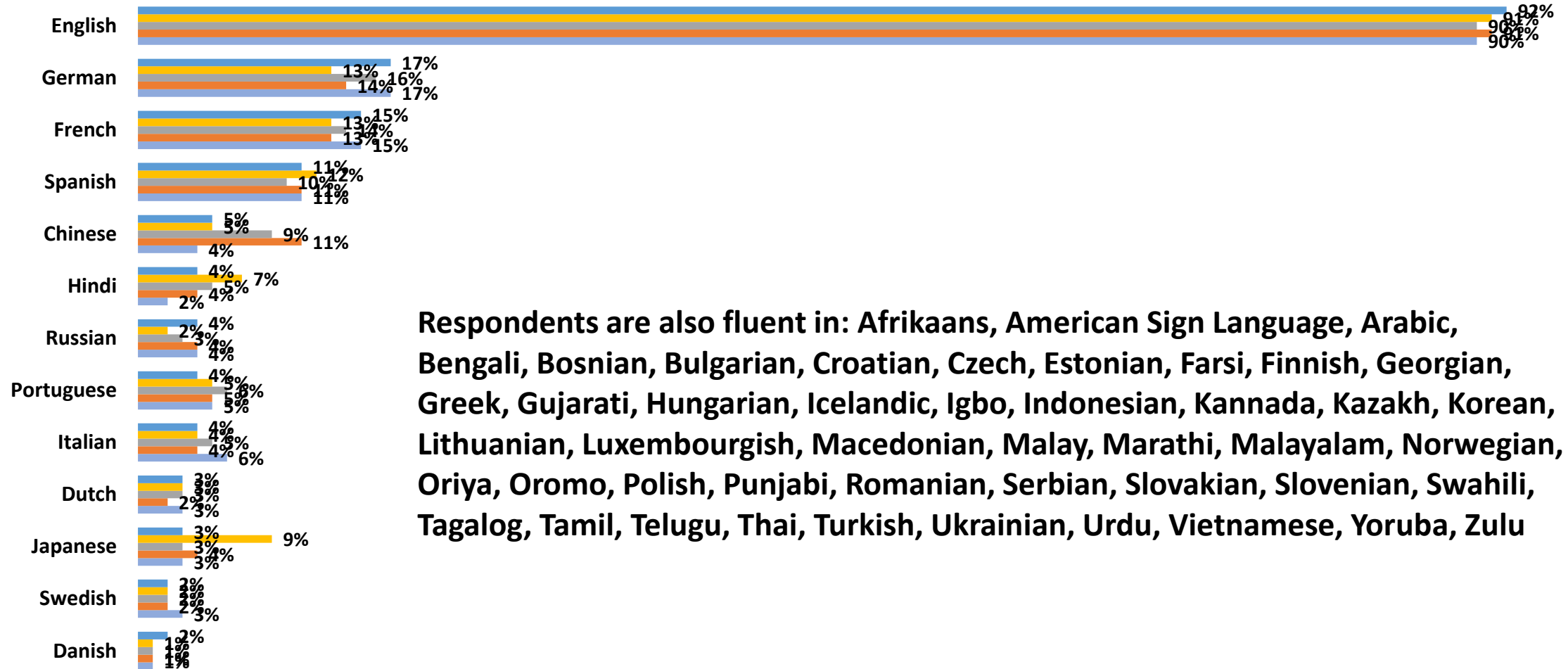
What is the country or region where you are originally from?



Respondents Are Fluent in 60 Languages

In what language(s) are you fluent?

■ 2023 ■ 2022 ■ 2021 ■ 2020 ■ 2019

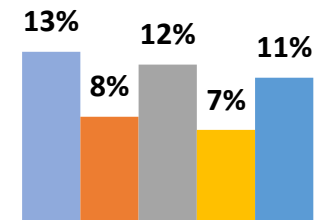
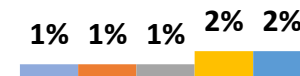
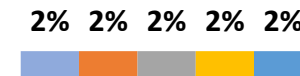
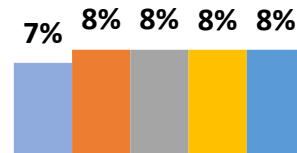
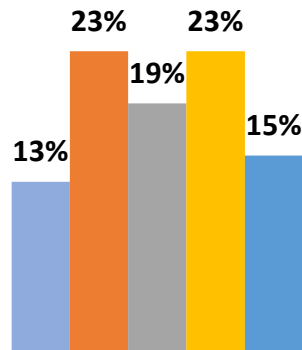
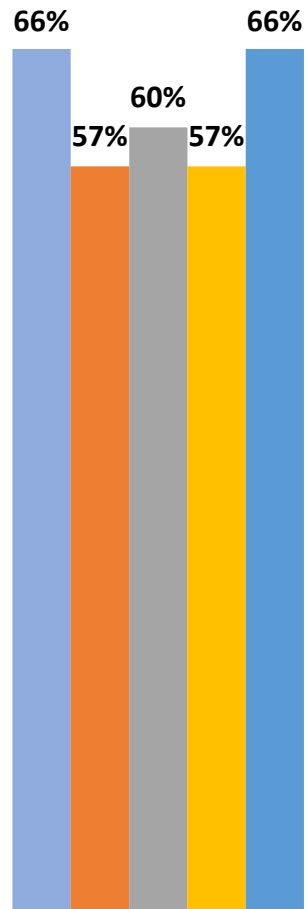


Respondents are also fluent in: Afrikaans, American Sign Language, Arabic, Bengali, Bosnian, Bulgarian, Croatian, Czech, Estonian, Farsi, Finnish, Georgian, Greek, Gujarati, Hungarian, Icelandic, Igbo, Indonesian, Kannada, Kazakh, Korean, Lithuanian, Luxembourgish, Macedonian, Malay, Marathi, Malayalam, Norwegian, Oriya, Oromo, Polish, Punjabi, Romanian, Serbian, Slovakian, Slovenian, Swahili, Tagalog, Tamil, Telugu, Thai, Turkish, Ukrainian, Urdu, Vietnamese, Yoruba, Zulu

Most Respondents Are White or Asian

Which of the following best describes your race or ethnicity?

2019 2020 2021 2022 2023

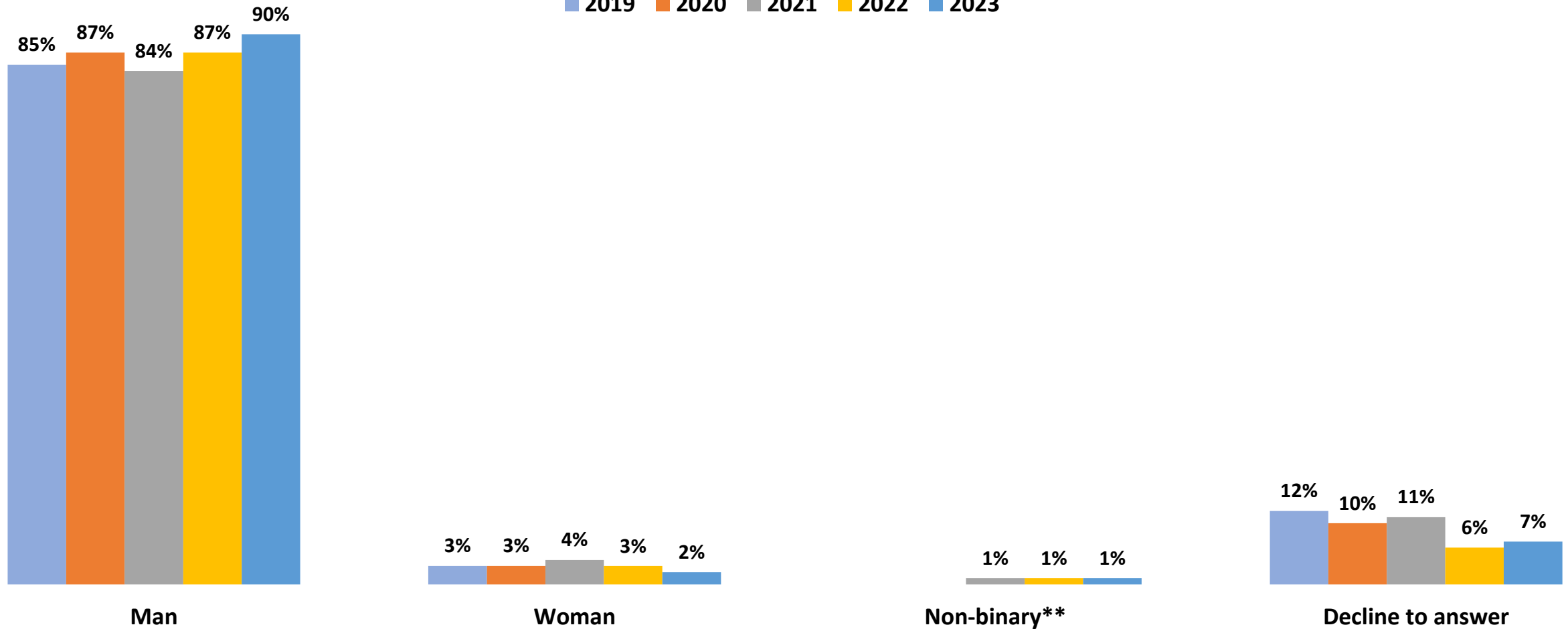


Other responses selected in 2023 include American Indian, Maori and Native Hawaiian or Pacific Islander

90% Identify as Men, 2% Identify as Women, 1% as Non-Binary and 7% Decline to Answer

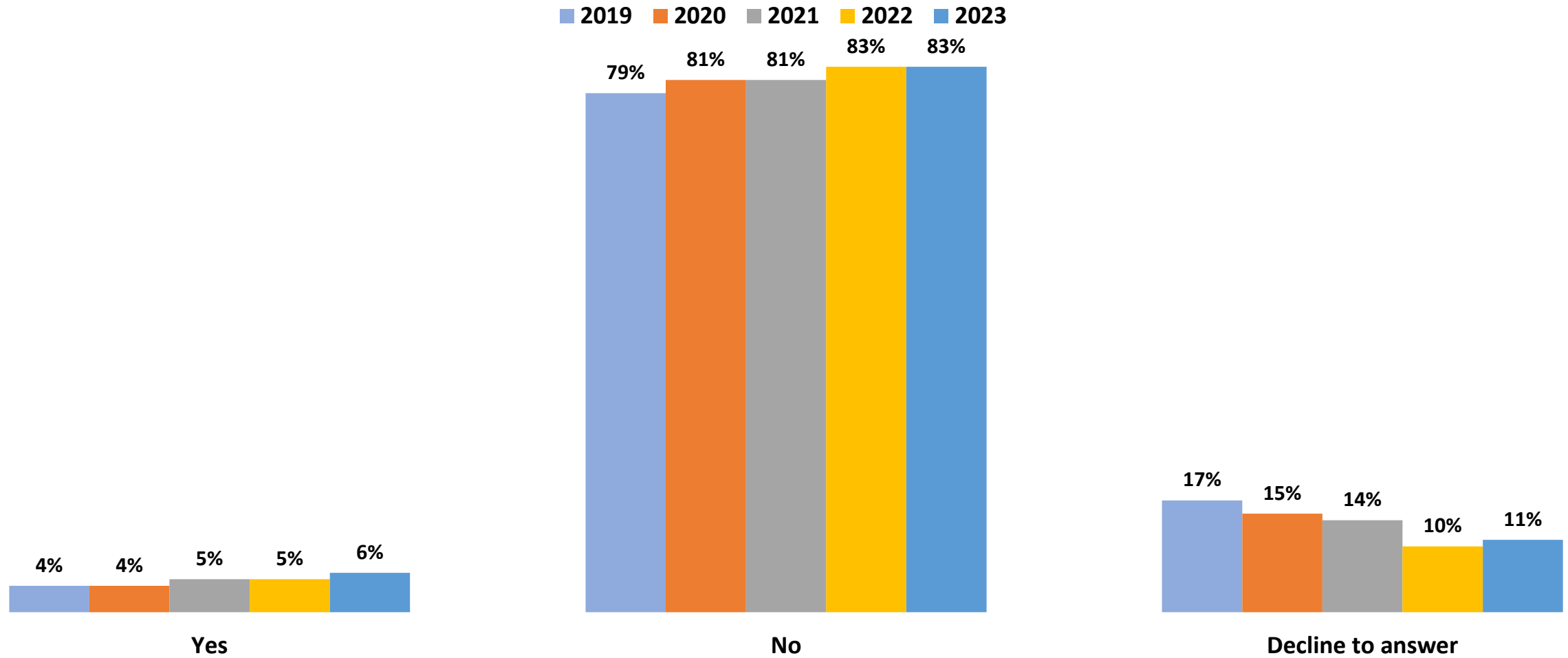
Which of the following best describes how you identify?

2019 2020 2021 2022 2023



6% Identify as LGBTQIA+

Do you identify as LGBTQIA+?

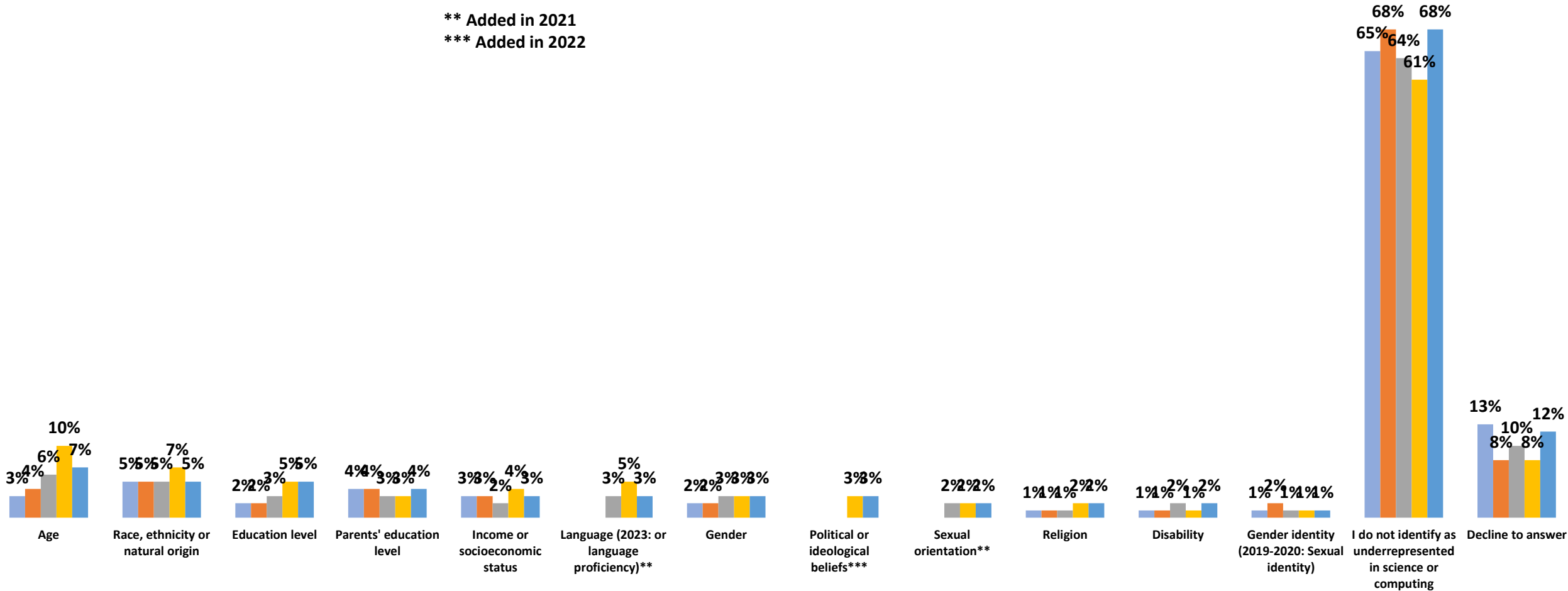


21% Identify as Underrepresented in Science or Computing

Do you identify as underrepresented in science or computing because of your:

■ 2019 ■ 2020 ■ 2021 ■ 2022 ■ 2023

** Added in 2021
 *** Added in 2022



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