**DATA-230 VISUALIZATION PROJECT**

**The Voice of the Developers (AI IN FOCUS):**

**Insights from the 2023 Developer Survey**

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**GITHUB LINK:** [**https://github.com/Shrini9797/Predictive-Analysis-Visualization-Stack-Overflow-Survey-2023-**](https://github.com/Shrini9797/Predictive-Analysis-Visualization-Stack-Overflow-Survey-2023-)

**REPO NAME: [Predictive-Analysis-Visualization-Stack-Overflow-Survey-2023-](https://github.com/Shrini9797/Predictive-Analysis-Visualization-Stack-Overflow-Survey-2023-)**

**INTRODUCTION:**

For more than ten years, Stack Overflow has been like the go-to place for developers. It's where they hang out, share what they know, and help each other out with coding stuff. And every year, they do this big survey to find out what's up in the world of programming. This time, almost 90,000 developers joined in, and it's like looking into the hype happening in AI

The **2023 Stack Overflow Developer** Survey on the developer community - who they are, what tech they use, where they work, and how they roll. This survey happened with the input of over 90,000 developers from 185 countries, making it like the big voice of developers all over the world. Knowing more about developers and how they do their thing helps us understand what they need and how to make things better for them.

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**OBJECTIVE**

In this project, we wanted to know what developers really think about Artificial Intelligence (AI), so we checked out a survey by Stack Overflow. Our main questions were about the tools developers use for AI, how they feel about its accuracy, and if it's changing the way they work, from coding to testing. We were curious if developers are cool with using AI or if they have some worries.

We'll go deeper to see how developers use AI for learning, coding, and testing, and if it's making things more accurate and productive. Our aim is to figure out if AI is really helping developers do their jobs better. We want to share a simple and clear picture of what developers think about AI, telling their stories and insights in an easy way. This report is all about showing what AI means for developers in the real world and how it's shaping the future of tech.

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**DATA COLLECTION:**

In this project, we gathered our data from two distinct sources:

**1.Stack Overflow Survey dataset :** [**https://www.kaggle.com/datasets/stackoverflow/stack-overflow-2023-developers-survey**](https://www.kaggle.com/datasets/stackoverflow/stack-overflow-2023-developers-survey)

**2.Global AI Index :** [**https://www.kaggle.com/datasets/katerynameleshenko/ai-index**](https://www.kaggle.com/datasets/katerynameleshenko/ai-index)

The Stack Overflow Survey dataset provides a rich source of information directly from developers worldwide. By exploring into this dataset, we aim to understand developers' perspectives on various aspects, including their use of AI, the tools they employ, and their sentiments towards AI accuracy. This dataset acts as a valuable window into the real-world experiences and opinions of developers across different regions and industries.

Complementing this, I incorporated data from the Kaggle Global AI Index dataset. IT encompasses key information about 62 countries, including the Global AI Index and seven indicators influencing it. These indicators cover Talent, Infrastructure, Operating Environment, Research, Development, Government Strategy, and Commercial aspects, offering insights into AI implementation, innovation, and investment globally.

Together, these datasets serve as the foundation for our analysis, allowing us to draw meaningful conclusions about the current state of AI in the developer community and its broader implications in the global context.

**DATA CLEANING:**

To clean up the data for visualization, I used Python and some features within Tableau. For a clear view, I utilized Python's Pandas library to clean the data and generate total counts for each related column. Chord diagrams were crafted using pivot tables, explode, and group-by functions. Similarly, for other charts like Sankey,

I employed filtering null values and created JSON files for certain D3 plots. The main visualization was done using Tableau supporting the overall presentation.

**DASHBOARD 1:**

**AI In Focus 2023 Survey Insights: Developer Sentiments and Impact**

Gain insights into the genuine sentiments driving the surge in AI popularity this year. Evaluate whether it's genuinely impacting developers' work or if it's more of a hype.

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**The dashboard features :**

**Map Chart**: Illustrates survey responses from each country, with the size of each marker indicating the number of respondents. Which provides a global perspective on survey responses, highlighting the distribution of sentiments across different countries.

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|  |  |
| --- | --- |
| **Country** | **% of Total Response Id** |
| United States of America | 21.24% |
| Germany | 8.04% |
| India | 6.79% |
| United Kingdom of Great Britain and Northern Ireland | 5.95% |
| Canada | 3.97% |
| France | 3.15% |
| Poland | 2.79% |
| Netherlands | 2.55% |
| Brazil | 2.39% |
| Australia | 2.18% |
| Spain | 1.99% |
| Italy | 1.94% |

**Donut Chart :** which offers a detailed breakdown of respondents based on their professional type, work environment, and age group.

A diagram of a graph

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**Insights from 3 Donut Charts:**

**Total respondents based on their development professional type:**

* I am a developer by profession: 73.93%
* I am learning to code: 6.71%
* I am not primarily a developer, but I write code sometimes as part of my work/studies: 10.81%
* I code primarily as a hobby: 6.57%
* I used to be a developer by profession, but no longer am: 1.99%

**Number of respondents based on their work type (WFH, office, hybrid)**

* Hybrid (some remote, some in-person): 33.85%
* In-person: 13.74%
* NA (Not Applicable): 19.56%
* Remote: 32.85%

**Number of respondents based on their age group** :

* 18-24 years old: 22.18%
* 25-34 years old: 35.77%
* 35-44 years old: 21.22%
* 45-54 years old: 9.09%
* 55-64 years old: 4.00%
* 65 years or older: 1.46%
* Prefer not to say: 0.53%
* Under 18 years old: 5.75%

**Bar Chart:** Examines the use of AI tools in the development process. bar chart reveals a significant trend – a majority of respondents either use AI tools in their development process or have plans to integrate them in the near future, indicating a substantial impact of AI in developers' workflows this year.

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**Yes: 45% No: 27%. No, but plan to soon: 25%**

**Summary dashboard 1:**

The survey findings indicate a rising popularity of AI among developers, showcasing its tangible impact on their work. Yet, a worthy number of developers either don't use AI tools or have no immediate plans to do so.

In summary, the survey offers a useful snapshot of the current landscape of AI adoption among developers. It remains intriguing to observe how these trends will unfold in the years ahead.

**Dashboard 2: AI TOOLS SENITMENTS**

It provides an overview of the AI In Focus 2023 survey results on developer sentiments and impact. The dashboard includes several different visualizations, such as maps, charts, and graphs. These visualizations provide insights into how developers are using AI tools, their trust in the accuracy of AI output, and the benefits they are seeing from using AI tools.

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**Chart 1: Map Analysis of Respondents' AI Tool Benefits**

Evaluate the perceived benefits of AI tools among respondents, such as speeding up learning, increasing productivity, improving accuracy, and enhancing efficiency. Colors on the map reflect the density of responses, and a filter allows for a country-specific analysis. It shows the percentage of developers in each country who are using or are planning to use AI tools in their development process this year. The biggest benefit that developers see from AI tools is increasing productivity.

**KEY INSIGHTS(APPLYING FILTERS FOR EACH COUNTRY ):**

**United States of America:**

* Greater efficiency: 17.06%
* Improve accuracy in coding: 3.86%
* Improve collaboration: 0.91%
* Increase productivity: 51.98%
* Speed up learning: 26.19%

**India:**

* Greater efficiency: 14.06%
* Improve accuracy in coding: 5.21%
* Improve collaboration: 4.69%
* Increase productivity: 51.56%
* Speed up learning: 24.48%

**Germany:**

* Greater efficiency: 21.98%
* Improve accuracy in coding: 2.64%
* Improve collaboration: 1.54%
* Increase productivity: 47.69%
* Speed up learning: 26.15%

**France:**

* Greater efficiency: 16.94%
* Improve accuracy in coding: 2.82%
* Improve collaboration: (Percentage not provided)
* Increase productivity: 60.89%
* Speed up learning: 18.15%

**China:**

* Improve collaboration: 9.52%

**Chart 2: Bubble Chart for AI Sentiments in Software Development**

Explore sentiments towards AI in software development, categorized as favorable, very favorable, unfavorable, and very unfavorable. The chart includes filters for individual countries and developer types (e.g., full-stack, frontend, data scientist).

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Country filter : United States of America Country filter : India

Country filter :**United States of America:**

| **Developer Type** | **Very Unfavorable** | **Unfavorable** | **Favorable** | **Very Favorable** |
| --- | --- | --- | --- | --- |
| Full-stack | 51.02% | 44.93% | 42.62% | 42.07% |
| Back-end | 16.33% | 13.51% | 16.45% | 13.23% |
| Front-end | 7.26% | 6.42% | 6.04% | 13.23% |
| Desktop/Enterprise | 5.19% | 4.77% | 5.07% | 4.71% |

Country filter **: India:**

| **Developer Type** | **Very Unfavorable** | **Unfavorable** | **Favorable** | **Very Favorable** |
| --- | --- | --- | --- | --- |
| Full-stack | 30.00% | 32.43% | 38.87% | 38.69% |
| Back-end | 20.00% | 24.32% | 21.01% | 21.51% |
| Front-end | 20.00% | 10.81% | 11.49% | 11.86% |
| Mobile | 9.46% | 9.46% | 7.14% | - |

The chart shows the sentiment of AI tools among developers in the United States of America, with the size of the bubble representing the number of developers in that category.

Most developers (77%) have a favorable or very favorable sentiment towards AI tools for development. Full-stack developers are more likely to be indifferent than those learning to code (17% vs. 15%).The chart also shows that most developers in the United States are back-end developers, followed by full-stack developers and front-end developers.

Overall, the chart suggests that AI tools for development are well-received by the developer community in the United States. However, there is still some room for improvement, as a significant minority of developers are indifferent or unfavorable towards these tools.

The current chart only shows data for the United States. Added filter to analyze similar data for other countries, to see if there are any regional differences in sentiment towards AI tools for development.

**Chart 3: Radial Chart for Trust and Accuracy in AI**

To Assess the level of trust and accuracy attributed to AI, with categories ranging from somewhat trust to highly trust and somewhat distrust to highly distrust. This radial chart offers a visual representation of respondents' sentiments towards AI reliability.

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The radial chart you have provided shows the accuracy of different AI tools within development workflows, as perceived by developers. The chart is divided into four sections, representing fourdifferent levels of trust in the accuracy of the AI output:

* Highly trust: 2.85%
* Somewhat trust: 42.15%
* Neither trust nor distrust: 30.68%
* Somewhat distrust: 21.71%
* Highly distrust: 5.46%

Overall, developers are somewhat divided on their trust in the accuracy of AI tools. Only a small minority of developers (2.85%) highly trust the accuracy of AI output, while the majority (42.15%) somewhat trust it. A significant number of developers (30.68%) neither trust nor distrust AI tools, while some developers (21.71%) somewhat distrust them, and a small minority (5.46%) highly distrust them.

The dashboard2 provides a valuable snapshot of the current state of AI adoption in the development community. It can be used by developers to learn more about how their peers are using AI tools, and to identify potential benefits of using AI tools in their own development process.

**Dashboard 3: AI TOOLS NEXT YEAR**

The dashboard is designed to show how developers of all experience levels are anticipating changes to their workflows due to AI tools. The graph shows that the four most important tasks for developers are writing code, debugging, and getting help, project planning, and documenting code.

A screenshot of a graph

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**Stacked Bar chart: ( Ai Tools for Next Year Expectations):**

The graph illustrates the percentage of interest in various activities related to software development, including writing code, project planning, learning about a codebase, documenting code, deployment, and monitoring, collaborating with teammates, and testing code.

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1. **Popular Activities:** Writing code is the most popular activity, with 51.20% interest, followed by testing code (41.51%) and debugging/getting help (44.99%).
2. **Specialization Trend:** Interest decreases for more specialized activities; for example, more people are interested in writing code (51.20%) than in learning about a codebase (47.00%), suggesting a preference for getting started in software development rather than specializing.
3. **Collaboration Insight:** The interest in collaborating with teammates is relatively low at 30.10%, indicating that many developers may work independently or have limited collaboration with teammates.

Overall, the graph provides valuable insights into the diverse interests of software developers. It suggests potential areas for educational resources, tools, and communities to support their needs.

| **Activity** | **Similarity Level** | **Score** |
| --- | --- | --- |
| Writing code | Somewhat different | 0.511986853 |
| Learning about a codebase | Somewhat different | 0.470024832 |
| Project planning | Somewhat different | 0.451853344 |
| Debugging and getting help | Somewhat different | 0.449946482 |
| Testing code | Somewhat different | 0.415092179 |
| Documenting code | Somewhat different | 0.400095185 |
| Documenting code | Very different | 0.371856905 |
| Committing and reviewing code | Somewhat different | 0.37007874 |
| Testing code | Very different | 0.342952021 |
| Deployment and monitoring | Somewhat different | 0.337915235 |
| Debugging and getting help | Very different | 0.329953242 |
| Committing and reviewing code | Very different | 0.310616345 |
| Deployment and monitoring | Very different | 0.305841924 |
| Learning about a codebase | Very different | 0.304008514 |
| Collaborating with teammates | Somewhat different | 0.300970874 |
| Collaborating with teammates | Very different | 0.292755788 |
| Project planning | Very different | 0.280016116 |
| Writing code | Very different | 0.209705484 |
| Collaborating with teammates | Neither different nor similar | 0.193427931 |
| Deployment and monitoring | Neither different nor similar | 0.165521191 |
| Committing and reviewing code | Neither different nor similar | 0.156122726 |
| Writing code | Somewhat similar | 0.126280853 |
| Project planning | Neither different nor similar | 0.121877518 |
| Collaborating with teammates | Somewhat similar | 0.11351755 |
| Committing and reviewing code | Somewhat similar | 0.105620418 |
| Deployment and monitoring | Somewhat similar | 0.104810997 |
| Testing code | Neither different nor similar | 0.101912287 |
| Collaborating with teammates | Very similar | 0.099327857 |
| Project planning | Somewhat similar | 0.099315068 |
| Writing code | Neither different nor similar | 0.098601534 |
| Learning about a codebase | Neither different nor similar | 0.096222065 |

This table shows how different measures are perceived to be affected by AI, categorized by whether the impact is "Somewhat different," "Very different," "Somewhat similar," "Neither different nor similar," or "Very similar." The "Measure Values" column represents the corresponding numerical values for each combination.

**Bar Chart: AI Usage in Development Workflow**

A diagram of a code

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INSIGHTS TABLE FOR EACH FITER PROVIDED BELOW:

The bar chart shows how important AI is for different tasks in the development process, depending on the AI tool being used. AI is most helpful for fixing issues and seeking help (49.99%), learning about a codebase (47.00%), and testing code (41.51%). On the other hand, it's less crucial for writing code (37.99%), planning projects (33.79%), handling deployment and monitoring (33.79%), and working with teammates (30.10%).

Summary:

1. **AI in Focus Areas:** AI is super useful for fixing issues, understanding code, and testing. It makes developers more efficient in these tasks.
2. **Mixed Importance:** For writing code, planning projects, deploying, and teamwork, AI is not as crucial. It might not be as effective in these areas or isn't used widely yet.
3. **Tool Matters:** The specific AI tool used plays a big role. The chart shows that the current AI tool is more helpful for fixing issues than other tasks.
4. **In a nutshell, the chart suggests that AI is becoming more important in development, making certain tasks easier. However, there's still room to improve in some area.**Top of FormBottom of Form

**Currently Using:**

| **Measure Names** | **Measure Values** |
| --- | --- |
| Writing code | 31,131 |
| Debugging and getting help | 18,437 |
| Documenting code | 12,963 |
| Learning about a codebase | 11,350 |
| Testing code | 9,000 |
| Project planning | 5,097 |
| Committing and reviewing code | 3,806 |
| Deployment and monitoring | 1,788 |
| Collaborating with teammates | 1,377 |

**Interested in Using:**

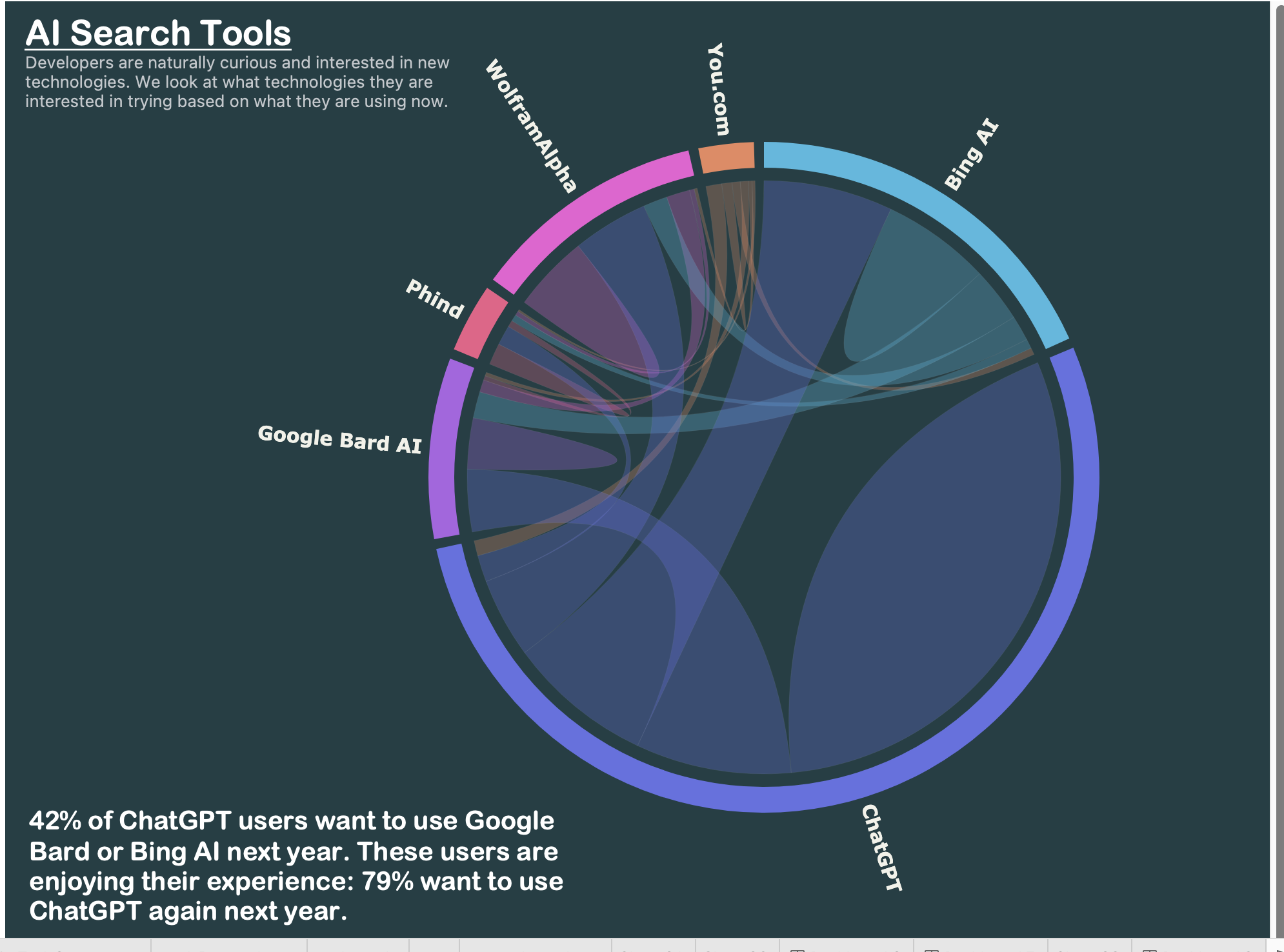
| **Measure Names** | **Measure Values** |
| --- | --- |
| Writing code | 8,945 |
| Debugging and getting help | 15,335 |
| Documenting code | 18,945 |
| Learning about a codebase | 18,467 |
| Testing code | 20,807 |
| Project planning | 14,534 |
| Committing and reviewing code | 18,670 |
| Deployment and monitoring | 17,137 |
| Collaborating with teammates | 11,305 |

**Not Interested in Using:**

| **Measure Names** | **Measure Values** |
| --- | --- |
| Writing code | 1,690 |
| Debugging and getting help | 2,401 |
| Documenting code | 3,042 |
| Learning about a codebase | 4,936 |
| Testing code | 4,316 |
| Project planning | 11,227 |
| Committing and reviewing code | 8,654 |
| Deployment and monitoring | 10,682 |
| Collaborating with teammates | 15,606 |

**Chord diagram: AI Search Tools**

Developers like trying out new technologies. We're checking which ones they're interested in based on what they use now. I created a chord diagram using D3, allowing data filtering, and performed pivot calculations in Python to analyze the AI search tools preferred by developers.



A close-up of a graph

Description automatically generated

The chord diagram shows the percentage of chatbot users who want to use Google Bard or Bing at next year. The percentage of chatbot users who want to use Google Bard or Bing at next year is based on the number of chatbot users who are currently using each platform.

The diagram shows that **42% of ChatGPT** users want to use **Google Bard** or Bing at next year. This is the highest percentage of users from any platform. It says that "10,833 who worked with ChatGPT want to work with Bing AI" means that out of 10,833 people who worked with ChatGPT, a significant number of them expressed interest in working with Bing AI.It says that "9,616 who worked with Bing want to work with ChatGPT" means that out of 9,616 people who worked with Bing, a smaller number of them expressed interest in working with ChatGPT.The difference between the two numbers (10,833 - 9,616 = 1,217) suggests that there is a greater interest in working with Bing AI than there is in working with ChatGPT.

The diagram also shows that 30% of You.com users and 25% of WolframAlpha users want to use Google Bard or Bing at next year. This suggests that these users are looking for a more comprehensive chatbot experience than what is currently offered by You.com and WolframAlpha.

The diagram also shows that 20% of Phind users and 15% of Bing AI users want to use Google Bard or Bing at next year. This suggests that these users are not entirely satisfied with the chatbot experience they are having on Phind and Bing AI.

**Sankey chart: with filter on (AI DEV Tool) :**

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**Fig:1 Fig:2**

The Sankey chart illustrates how users transition between different AI developer tools. GitHub Copilot leads as the most favored tool, with 50.2% of users, followed by Tabnine (25.1%) and Whispr AI (12.4%). AWS CodeWhisperer (12.3%).

Key Insights:

1. **GitHub Copilot Dominance:** GitHub Copilot is the top choice, likely due to its integration with GitHub, the widely used code hosting platform.
2. **Switching Trends:** A notable percentage of users switch between AI developer tools. For instance, 20.1% of GitHub Copilot users try Tabnine, and 15.6% of Tabnine users explore GitHub Copilot, indicating an ongoing exploration of tools to find the best fit.
3. **Tabnine as an Alternative:** Tabnine emerges as a popular alternative to GitHub Copilot. Notably, GitHub acquired Tabnine in 2022, suggesting potential future integration.
4. **Less Popular Tools:** AWS CodeWhisperer and Visual Studio IntelliCode have lower popularity, possibly due to being newer or less integrated with popular code editors and IDEs.

**Fig:2 Results**

Results show that 26% of users want to work with Tabnine, while 100% of users want to work with GitHub Copilot.

This suggests that Tabnine is a popular alternative to GitHub Copilot, but that GitHub Copilot is still the preferred tool among AI developer tool users.

**Zoomable Bubble Chart: Developer Tools Overview**

**Five main categories:**

**1.LANGUAGES**

**2.WEBFRAMEWORKS**

**3.NEWCOLLAB TOOLS**

**4.DATABASES**

**5.OFFICE TOOLS**

This interactive chart allows users to zoom in and explore details within each category, providing a visual and user-friendly representation of various developer tools across these five significant domains.

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**POPULAR LANGUAGES: POPULAR DATABASES:**

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**POPULAR COLLAB TOOLS: POPULAR WEBFRAMWORKS:**

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From the zoomable bubble chart, the major tools in each category are:

1. **Languages: JavaScript**
2. **Web Frameworks: ReactJS**
3. **New Collaboration Tools: VS Code**
4. **Databases: PostgreSQL**
5. **Office Tools: Jira**

These tools stand out as significant choices in their respective categories, as highlighted in the bubble chart.

**Scatter plot for Median salary vs Avg experience:**

The scatter plot shows that having more years of experience is linked to higher salaries. Among the top three highest-paying roles, individuals typically have more than 11 years of experience on average.

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**Details Median salary vs Avg experience:**

|  |  |  |
| --- | --- | --- |
| **Dev Type** | **Avg. Work Exp** | **Median Converted Comp Yearly** |
| Senior Executive (C-Suite, VP, etc.) | 18.48143406 | 124753.5 |
| Engineering manager | 15.69902182 | 124138 |
| Marketing or sales professional | 12.8627451 | 116000 |
| Engineer, site reliability | 12.10622711 | 115657 |
| Developer Experience | 12.84343434 | 107090 |
| Cloud infrastructure engineer | 12.50788644 | 105000 |
| Blockchain | 9.143712575 | 103743 |
| Developer Advocate | 16.94915254 | 100312.5 |
| Security professional | 12.86026201 | 99311 |
| Scientist | 13.2516129 | 92321 |
| Product manager | 16.83412322 | 88934 |
| Research & Development role | 14.01818182 | 85672 |
| Hardware Engineer | 10.69565217 | 85672 |
| Engineer, data | 10.15796178 | 83515 |
| Data scientist or machine learning specialist | 8.734873487 | 80317 |
| DevOps specialist | 11.9610984 | 80158.5 |
| Database administrator | 17.04761905 | 78686.5 |
| Developer, embedded applications or devices | 12.10832587 | 77104 |
| Developer, back-end | 10.70560164 | 76034 |
| Developer, full-stack | 10.82076409 | 71140 |
| Developer, game or graphics | 10.56763285 | 71007 |
| Developer, desktop or enterprise applications | 15.04822097 | 70759 |
| Developer, mobile | 9.462546816 | 68192.5 |
| Educator | 17.09090909 | 65269.5 |
| Developer, QA or test | 9.955882353 | 63927 |
| Project manager | 14.7885906 | 63183 |
| Data or business analyst | 12.18159204 | 61555 |
| Developer, front-end | 8.004481213 | 59970 |
| Designer | 14.8877551 | 59815 |
| System administrator | 12.89310345 | 55764 |
| Academic researcher | 10.63620072 | 53545 |

**I added more information to our analysis by using another dataset called the Global AI Index. This additional data helps us better understand how developer feelings and preferences relate to the larger global AI picture.**

**GLOBAL AI INDEX DASHBOARD:**

**The dashboard shows India's performance on the Global AI Index 2023. The index measures the performance of countries in terms of their AI innovation, investment, and implementation.**

In the Global AI Dashboard, with three bar charts provide insights into innovation, implementation, and investment across various countries.

The data reveals that the USA is a leader, topping the charts in almost all categories. Surprisingly, India does not rank within the top 5 countries in these aspects.

This suggests a notable discrepancy in the AI landscape, emphasizing the dominance of the USA in AI-related innovation, implementation, and investment compared to other countries, including India**.**

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Bar chart Tree map

**Insights from dashboard:**

**BARCHART-1:**

A graph of a bar graph

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**IMPLEMEMTAION:** In the implementation section, we focused on the commercial aspect, specifically ranking countries based on their performance in the Global AI Index. The top five countries are:

**COMMERCIAL:**

**Country Rank**

United States of America 1

China 2

Israel 3

United Kingdom 4

Singapore 5

**GOVERNMENT STARTERGEY:**

In the implementation of government strategy for AI, we have evaluated the ranks and corresponding investments of different countries. The data is presented as follows:

**Country Rank Investment**

Canada 1 31.28

China 2 16.51

Saudi Arabia 3 4.49

Spain 4 17.61

France 5 28.32

This table provides an overview of how these countries are strategically positioning themselves in the realm of AI, with Canada leading the way in government strategy and investment.

**BARCHART-2:**

A graph of a graph with red squares

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**INNOVATION:** In the field of innovation, focusing on development and research, the ranking of countries is as follows:

**DEVELOPMENT AND RESEARCH**

**Country Rank**

China 2

Singapore 4

Switzerland 3

United Kingdom 5

United States of America 1

**BARCHART-3:**

A graph of a graph showing the value of a country

Description automatically generated with medium confidence

**TALENT:**   
In the talent category, which assesses the availability of skilled professionals, the country rankings are as follows

**Country Rank**

India 2

Israel 5

Singapore 4

United Kingdom 3

United States of America 1

**Global AI Leadership:**

The United States maintains its position as the world leader in AI.

China is swiftly advancing and narrowing the gap in AI capabilities.

**Leading AI Hubs:**

Beyond the U.S. and China, other prominent AI hubs include Israel, Singapore, and the United Kingdom

A screenshot of a cellphone

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The tree map shows the distribution of software development tasks across different stages of the development lifecycle. The size of each rectangle represents the percentage of time that developers spend on that task.

**Summary:**

In summary, our visualization into the world of AI, covering how developers feel about it and the tools they use.we looked at different things like how developers feel about it, where it's used the most globally, and the tools developers like to use:

1. **Developers and AI:**
   * Developers really like using AI because it helps them with important things like fixing mistakes, learning about code, and testing.
2. **AI All Over the World:**
   * AI is getting more and more popular around the world. The United States uses it the most, and countries like China, Israel, Singapore, and the United Kingdom also use it a lot. India is doing better with AI too.
3. **Favorite Tools:**
   * GitHub Copilot is the favorite tool for developers. They often switch between different tools. They also like using languages like JavaScript, frameworks like ReactJS, and collaboration tools like VS Code.
4. **Using AI Well:**
   * AI is really good for fixing mistakes and getting help with coding. Developers are still trying out different AI tools to find the ones that work best for them.
5. **India's Plan:**
   * In India, they are focusing on education, building things like internet connections, and getting help from the government to make AI better.

**Conclusion:**

In conclusion, our overall analysis shows that AI is changing a lot. The United States is still leading, but China and India are also doing well. People who create things with technology are using AI tools more, which is a big change. In the future, new ideas, money investments, and getting better at skills will keep shaping how AI grows. This will affect how technology is used all around the world.Top of Form

As we look to the future, a lot will depend on new ideas, investments, and people learning more skills. These things will keep shaping AI, making a big impact on how technology works all around the world.

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