Code Generation Tools Usability

Start of Block: Consent Block

Q1 **A Study of the Usability of Code Generation Tools Consent Form**  
 This survey is part of a research study conducted by [RESAERCHER NAMES REDACTED] at [INSTITUTION REDACTED] and is funded by the [INSTITUTION REDACTED].  
   
 **Summary**  
 This is a 15-minute survey on your experiences of using code generation tools, such as GitHub Copilot. You may enter a raffle to win 1 of 4 $100 Amazon.com gift certificates at the end of the survey. We will record IP addresses. You can opt into the raffle and/or future communications by providing your email.  
   
 **Purpose**  
 The purpose of the research is to better understand the usability of code generation tools, such as GitHub Copilot. Better understanding how software developers use these tools and the challenges they face can help influence innovations in improving code generation tools.  
   
 **Procedures**  
 This is a 15-minute survey on your experiences of using code generation tools, such as GitHub Copilot. If you agree to participate in this study, you will be asked questions on your experiences and challenges of using code generation tools, information about your software engineering experiences, and demographic information. You may refuse to answer any question in the survey.  
   
 **Participant Requirements**  
 Participation in this study is limited to individuals age 18 and older.  
   
 **Risks**  
 The risks and discomfort associated with participation in this study are no greater than those ordinarily encountered in daily life or during other online activities.  
   
 **Benefits**  
 There may be no personal benefit from your participation in the study but the knowledge received may be of value to humanity.  
   
 **Compensation & Costs**  
 You may enter a raffle to win 1 of 4 $100 Amazon.com gift certificates at the end of the survey. We expect there will be around 500-700 participants in this study.  
   
 There will be no cost to you if you participate in this study.  
   
 **Future Use of Information**  
 In the future, once we have removed all identifiable information from your data, we may use the data for our future research studies, or we may distribute the data to other researchers for their research studies.  We would do this without getting additional informed consent from you (or your legally authorized representative). Sharing of data with other researchers will only be done in such a manner that you will not be identified.  
   
 **Confidentiality**  
 By participating in this research, you understand and agree that [INSTITUTION REDACTED] may be required to disclose your consent form, data and other personally identifiable information as required by law, regulation, subpoena or court order.  Otherwise, your confidentiality will be maintained in the following manner:  
   
 Your data and consent form will be kept separate. Your consent form will be stored securely and will not be disclosed to third parties. By participating, you understand and agree that the data and information gathered during this study may be used by [INSTITUTION REDACTED] and published and/or disclosed by [INSTITUTION REDACTED] to others outside of [INSTITUTION REDACTED]. However, your name, address, contact information and other direct personal identifiers will not be mentioned in any such publication or dissemination of the research data and/or results by [INSTITUTION REDACTED]. Note that per regulation all research data must be kept for a minimum of 3 years.  
   
 [INSTITUTION REDACTED] may have access to the research records.  
   
 **Right to Ask Questions & Contact Information**  
 If you have any questions about this study, you should feel free to ask them by contacting the Principal Investigator now at: [RESAERCHER NAME REDACTED], [ADDRESS REDACTED], [PHONE NUMBER REDACTED], [EMAIL REDACTED]. If you have questions later, desire additional information, or wish to withdraw your participation please contact the Principal Investigator by mail, phone or e-mail in accordance with the contact information listed above.  
   
 If you have questions pertaining to your rights as a research participant; or to report concerns to this study, you should contact the Office of Research integrity and Compliance at [INSTITUTION REDACTED].  Email: [EMAIL REDACTED]. Phone: [PHONE NUMBER REDACTED].  
   
 **Voluntary Participation**  
 Your participation in this research is voluntary. You may discontinue participation at any time during the research activity. You may print a copy of this consent form for your records.

Q2 I am age 18 or older.

* Yes (1)
* No (2)

Q3 I have read and understand the information above.

* Yes (1)
* No (2)

Q4 I want to participate in this research and continue with the survey.

* Yes (1)
* No (2)

End of Block: Consent Block

Start of Block: Main Content

Q5 Estimate how often you use code generation tools in your software development work.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Always (more than once daily) (1) | Often (once daily) (2) | Sometimes (weekly) (3) | Rarely (monthly) (4) | I have tried this tool before, but gave up. (6) | I don't know this tool. (5) |
| Amazon CodeWhisperer (1) |  |  |  |  |  |  |
| GitHub Copilot (2) |  |  |  |  |  |  |
| Tabnine (3) |  |  |  |  |  |  |
| OpenAI Codex API (5) |  |  |  |  |  |  |
| Code generation tool specific to my organization that is trained on our proprietary code (6) |  |  |  |  |  |  |
| Other (4) |  |  |  |  |  |  |

Q44 How concerned are you about the following issues that come with using code generation tools?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very concerned (1) | Concerned (2) | Moderately concerned (3) | Slightly concerned (4) | Not concerned at all (5) |
| Code generation tools do not generate proprietary APIs or code. (2) |  |  |  |  |  |
| Code generation tools may produce open-source code. (3) |  |  |  |  |  |
| Code generation tools can produce code that can infringe on intellectual property (IP). (4) |  |  |  |  |  |
| Code generation tools have access to my code. (5) |  |  |  |  |  |

End of Block: Main Content

Start of Block: Main Content (Does Not Use Code Generation Tools)

Q6 For each of the following reasons **why you do not use code generation tools**, rank its importance.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very important (1) | Important (2) | Moderately important (3) | Slightly important (4) | Not important at all (5) |
| I don't think code generation tools provide helpful suggestions. (11) |  |  |  |  |  |
| I find the tool's suggestions too distracting. (10) |  |  |  |  |  |
| I don't understand the code written by code generation tools. (1) |  |  |  |  |  |
| I write and use proprietary code that code generation tools haven't seen before and don't generate. (2) |  |  |  |  |  |
| I don't want to use open-source code. (3) |  |  |  |  |  |
| To prevent potential intellectual property (IP) infringement. (9) |  |  |  |  |  |
| I don't want to use a tool that has access to my code. (4) |  |  |  |  |  |
| I spend too much time debugging or modifying code written by code generation tools. (5) |  |  |  |  |  |
| It's hard to control code generation tools to get code that I want. (6) |  |  |  |  |  |
| Code generation tools write code that doesn't meet functional or non-functional (e.g., security, performance) requirements that I need. (7) |  |  |  |  |  |
| Other (8) |  |  |  |  |  |

End of Block: Main Content (Does Not Use Code Generation Tools)

Start of Block: Main Content (Uses Code Generation Tools)

Q7 Think of one software project in which you used code generation tools. For this portion of the survey, please answer these questions with respect to this project.

Q8 Describe the purpose of your software project.

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Q9 Under what setting did you work on your software project? Check all that apply.

* For work (1)
* For school (2)
* For volunteer work or an open-source software project (3)
* For a hobby or personal side project (4)
* Other (5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q10 For this software project, estimate what percent of your code is written with the help of the following code generation tools.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Never | Rarely | Sometimes | Often | Always | Not Applicable |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

|  |  |
| --- | --- |
| Amazon CodeWhisperer () |  |
| GitHub Copilot () |  |
| Tabnine () |  |
| OpenAI Codex API () |  |
| Code generation tool specific to my organization that is trained on our proprietary code () |  |
| Other () |  |

Q11 For each of the following reasons **why you use code generation tools** in this software project, rank its importance.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very important (1) | Important (2) | Moderately important (3) | Slightly important (4) | Not important at all (5) |
| To finish my programming tasks faster. (6) |  |  |  |  |  |
| To have an autocomplete or reduce the amount of keystrokes I make. (1) |  |  |  |  |  |
| To skip needing to go online to find specific code snippets, programming syntax, or API calls I'm aware of, but can't remember. (2) |  |  |  |  |  |
| To discover potential ways or starting points to write a solution to a problem I'm facing. (3) |  |  |  |  |  |
| To find an edge case for my code I haven't considered. (5) |  |  |  |  |  |
| To collaborate with another person who writes code in a different programming language than me. (7) |  |  |  |  |  |
| Other (4) |  |  |  |  |  |

Q12 Describe the types of situations when you are most successful in using code generation tools in your software project.

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Q13 For your software project, estimate how often you experience the following scenarios when using code generation tools.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Always (4) | Often (5) | Sometimes (6) | Rarely (7) | Never (8) |
| I have difficulty expressing my intent or requirements through natural language to the tool. (12) |  |  |  |  |  |
| I have trouble evaluating the correctness of the generated code. (16) |  |  |  |  |  |
| I find the code generation tool's suggestions too distracting. (17) |  |  |  |  |  |
| I find it hard to debug or fix errors in the code from code generation tools. (9) |  |  |  |  |  |
| I have trouble understanding the code created by a code generation tool. (10) |  |  |  |  |  |
| I don't know what part of my code or comments the code generation tool is using to make suggestions. (13) |  |  |  |  |  |
| I have trouble controlling the tool to generate code that I find useful. (11) |  |  |  |  |  |
| I rely on code generation tools too much to write code for me. (14) |  |  |  |  |  |

Q14 Describe the strategies you use to get code generation tools to generate the best answers for you.

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Q15 For your software project, estimate how often you experience the following scenarios **when you get code from a code generation tool**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Always (1) | Often (2) | Sometimes (3) | Rarely (4) | Never (5) |
| I use the code created by a code generation tool as-is. (6) |  |  |  |  |  |
| I successfully incorporate the code created by a code generation tool by changing the generated code. (5) |  |  |  |  |  |
| I successfully incorporate the code created by a code generation tool by changing the code or comments around it and regenerating a new suggestion. (8) |  |  |  |  |  |
| When a code generation tool outputs something I don’t want, I'm able to modify it to something I want. (2) |  |  |  |  |  |
| I give up on incorporating the code created by a code generation tool and write the code myself. (4) |  |  |  |  |  |

Q16 For your software project, estimate how often you use the following methods to **evaluate the generated code**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Always (1) | Often (2) | Sometimes (3) | Rarely (4) | Never (5) |
| Consulting API documentation (1) |  |  |  |  |  |
| Compilers, type checkers, in-IDE syntax checkers, or linters (2) |  |  |  |  |  |
| Executing the generated code (3) |  |  |  |  |  |
| Quickly checking the generated code for specific keywords or logic structures (4) |  |  |  |  |  |
| Examining details of the generated code's logic in depth (5) |  |  |  |  |  |
| Other (6) |  |  |  |  |  |

Display This Question:

If For your software project, estimate how often you experience the following scenarios when using c... = I have trouble understanding the code created by a code generation tool. [ Always ]

Or For your software project, estimate how often you experience the following scenarios when using c... = I have trouble understanding the code created by a code generation tool. [ Often ]

Or For your software project, estimate how often you experience the following scenarios when using c... = I have trouble understanding the code created by a code generation tool. [ Sometimes ]

Or For your software project, estimate how often you experience the following scenarios when using c... = I have trouble understanding the code created by a code generation tool. [ Rarely ]

Q17 For your software project, estimate how often the following reasons are **why you have trouble understanding code**created by code generation tools.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Always (1) | Often (2) | Sometimes (3) | Rarely (4) | Never (5) |
| The generated code uses APIs or methods I don’t know. (1) |  |  |  |  |  |
| The generated code contains too many control structures (e.g., loops, if-else statements). (4) |  |  |  |  |  |
| The generated code is too long to read quickly. (2) |  |  |  |  |  |
| Other (3) |  |  |  |  |  |

Display This Question:

If For your software project, estimate how often you experience the following scenarios when you get... = I give up on incorporating the code created by a code generation tool and write the code myself. [ Always ]

Or For your software project, estimate how often you experience the following scenarios when you get... = I give up on incorporating the code created by a code generation tool and write the code myself. [ Often ]

Or For your software project, estimate how often you experience the following scenarios when you get... = I give up on incorporating the code created by a code generation tool and write the code myself. [ Sometimes ]

Or For your software project, estimate how often you experience the following scenarios when you get... = I give up on incorporating the code created by a code generation tool and write the code myself. [ Rarely ]

Q18 For your software project, estimate how often the following reasons are **why you find yourself giving up on code** created by code generation tools.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Always (1) | Often (2) | Sometimes (3) | Rarely (4) | Never (5) |
| I don’t understand the generated code well enough to use it. (1) |  |  |  |  |  |
| The generated code is too complicated. (8) |  |  |  |  |  |
| The generated code doesn’t perform the action I want it to do. (2) |  |  |  |  |  |
| The generated code doesn't meet functional or non-functional (e.g., security, performance) requirements that I need. (9) |  |  |  |  |  |
| The generated code contains too many defects. (3) |  |  |  |  |  |
| The generated code's style doesn't match my project's. (4) |  |  |  |  |  |
| The generated code uses an API I know, but don’t want to use. (5) |  |  |  |  |  |
| The generated code uses an API I don’t know. (6) |  |  |  |  |  |
| Other (7) |  |  |  |  |  |

Q19 For your software project, how important is it for code generation tools **to only use the APIs that you want them to use**?

* Not at all important (1)
* Slightly important (2)
* Moderately important (3)
* Very important (4)
* Extremely important (5)

Q20 How important would it be for you to **specify which APIs you do not want code generation tools to include** in their suggestions?

* Not at all important (1)
* Slightly important (2)
* Moderately important (3)
* Very important (4)
* Extremely important (5)

Q21 How important would it be for you to **emphasize a subset of your code for the code generation tool to focus on** while making suggestions?

* Not at all important (1)
* Slightly important (2)
* Moderately important (3)
* Very important (4)
* Extremely important (5)

Q22 How important would it be for you to **provide direct feedback to the code generation tool** on what you did and did not like about its suggestions?

* Not at all important (1)
* Slightly important (2)
* Moderately important (3)
* Very important (4)
* Extremely important (5)

Q23 What types of feedback would you like to give to code generation tools to make its suggestions better? Why?

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Q24 Please enter any additional comments about the usability of code generation tools.

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End of Block: Main Content (Uses Code Generation Tools)

Start of Block: Basic Information

Q25 For the remainder of the survey, we will ask questions about your programming experience and demographics. **You can consider all software projects you have worked on while answering questions in this section.**

|  |
| --- |
|  |

Q26 How many years of experience of programming do you have? Give your best estimate.

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Q27 In the past year, I have programmed as... Check all that apply.

* a professional software developer. (1)
* a part of my job, but not as a professional software developer. (2)
* a hobby. (3)
* a student. (4)
* an open-source software contributor. (6)
* Other (5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q28 Which **programming, scripting, and markup languages** have you done extensive development work in over the past year? Check all that apply.

* Bash/Shell (1)
* C# (2)
* C++ (3)
* HTML/CSS (4)
* Java (5)
* JavaScript (6)
* PHP (7)
* Python (8)
* SQL (9)
* TypeScript (10)
* Other (11) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q29 Which **developer tools, development environments, or other tools** have you done extensive development work in over the past year? Check all that apply.

* GitHub Copilot (1)
* Tabnine (2)
* Amazon CodeWhisperer (3)
* IntelliJ (4)
* Notepad++ (5)
* Vim (6)
* Visual Studio (7)
* Visual Studio Code (8)
* Git/GitHub (9)
* Docker (10)
* Kubernetes (12)
* Homebrew (11)
* npm (13)
* Yarn (14)
* Other (15) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q30 What is your gender?

* Woman (1)
* Man (2)
* Non-binary / gender diverse (3)
* Prefer to self-describe (4) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Prefer not to say (5)

Q31 Please select the following that apply. Check all that apply.

* I would like to sign up for the raffle to win one of four $100 Amazon.com gift certificates. (4)
* I am willing to be contacted about a follow-up study on this same topic. I understand that if/when you contact me about the study, I am under no obligation to participate in it. (2)
* I would like to be updated on the results of this study. (3)

Display This Question:

If If Please select the following that apply. Check all that apply. q://QID41/SelectedChoicesCount Is Greater Than 0

Q32 Please enter your email.   
 *This will be used to put you in the raffle or contact you about the research based on your response to the previous question. This will be kept separately from your responses to the survey and will never be published or shared with others.*

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End of Block: Basic Information