# Exploring Developer Sentiments: Analyzing Stack Overflow 2023 Survey with a Focus on AI Perspectives

**Vemulapalli Sathya**

## I. N+1 NOSQL QUERIES

**Query 1: Try to find if old developers are more reluctant towards AI**

This query aims to find if older developers are more reluctant towards AI by analyzing the SOAI (sentiment on AI), Age, and YearsCodePro fields. It categorizes the SOAI responses into "AI" (positive), "NoAI" (negative), and "neutral" sentiments. Then, for each age group, it calculates the percentage of responses in each sentiment category and the average years of coding experience.

**Query 2: Do developers from developed nations feel different when compared with developers from developing nations**

This query compares the sentiments towards AI between developers from developed and developing nations by utilizing the SOAI, Country, and Currency fields. It first classifies nations as "Developed" or "Developing" based on a predefined list of developed countries. The SOAI responses are categorized into "wanto" (positive sentiment towards AI), "dontwantto" (negative sentiment towards AI), and "neutral" sentiments.

The analysis groups the data by nation type (developed or developing) and the most commonly used currency in that group. For each nation type, it calculates the percentage of responses falling into each sentiment category.

**Query 3: Try to find a relation between the use of AI and developers position and income**

This query explores the relationship between a developer's sentiment towards AI, their position (DevType), and their income (CompTotal). It utilizes fields such as SOAI, CompTotal, DevType, YearsCodePro, and Employment.

The analysis first categorizes the SOAI responses into "wanto" (positive sentiment towards AI), "dontwantto" (negative sentiment towards AI), and "neutral" sentiments. It then bins the compensation (CompTotal) into different brackets (< 10000, 10000 - 100000, 100000 - 500000, 500000 - 1000000, > 1000000).

The data is grouped by DevType and CompBracket, and for each group, the analysis calculates the percentage of responses in each sentiment category, the average years of coding experience, and the employment status distribution.

**Query 4: Is there any relation between the technology the developers use and their opinion?**

This query investigates if there is a relationship between the technologies used by developers and their sentiment towards AI. It utilizes the SOAI field and various technology-related fields, such as Webframe, MiscTech, ToolsTech, NEWCollabTools, OpSys, OfficeStackAsync, OfficeStackSync, AISearch, and AIDev.

The analysis allows the user to select a specific technology type from a dropdown menu. The SOAI responses are categorized into "positive", "negative", and "neutral" sentiments based on regular expressions.

For the selected technology type, the data is grouped by the individual technologies and sentiment categories. The analysis calculates the count and percentage of responses for each sentiment and technology combination.

## II. NOSQL DATABASE AND DATASET

The NoSQL database used in this project is MongoDB[3], a popular document-oriented database. The specific database analyzed is named "databaseSystems," and the collection used is called "project2." This collection contains the data related to developers, their sentiments towards AI, their demographics, and the technologies they use.

The dataset within the "project2" collection is structured as a collection of documents, each representing a developer's response. The documents contain various fields, such as SOAI (sentiment on AI), Age, Country, Currency, CompTotal (compensation total), DevType (developer type), YearsCodePro (years of coding experience), Employment (employment status), and various technology-related fields like Webframe, MiscTech, ToolsTech, NEWCollabTools, OpSys, OfficeStackAsync, OfficeStackSync, AISearch, and AIDev These are all the fields that were utilised in the project. There are certain other fields which weren't utilised to implement any of the queries.

The dataset utilised is Stack Overflow Annual Developer Survey 2023[4]. Over 90,000 developers responded to the annual survey about how they learn and level up, which tools they're using, and which ones they want. According to Stack Overflow Analysts, IT leaders, reporters, and other developers turn to this report to stay up to date with the evolving developer experience, technologies that are rising or falling in favour, and to understand where tech might be going next. This

year, Stack Overflow focused into AI/ML to capture how developers are thinking about it and using it in their workflows.

## III. PROJECT OUTCOME

The primary objective of this project is to gain insights into the relationship between developers' sentiments towards AI and various factors, such as age, location, income, position, and technologies used. The implemented queries and analyses aim to answer specific questions related to these relationships.

The results of the analyses are presented through visualizations, including stacked bar charts, grouped bar charts, and bubble charts. These visualizations aid in understanding the distribution of sentiments across different segments, such as age groups, developed vs. developing nations, developer types, and compensation brackets. Additionally, the visualizations provide insights into the relationships between sentiments and other factors, such as average years of coding experience and technology usage.

The project aims to provide a comprehensive understanding of the factors influencing developers' attitudes towards AI, which can be valuable for organizations, technology companies, and researchers working in the field of AI adoption and development.

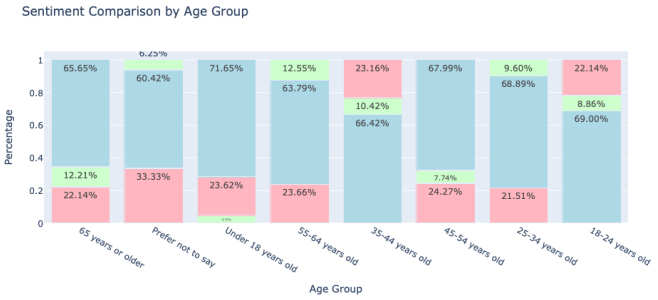


Fig 1: Query 1 visualisation

A stacked bar chart is used to illustrate the findings of query 1, which are displayed in Fig 1. The x-axis shows the age groups, the y-axis shows the proportion of responses, and different colours correspond to the varied attitudes. It is simple to compare the sentiment distribution across age groups with this visualisation. The graphic makes it abundantly evident that individuals of different ages have similar ideas about leveraging AI, with the majority of them wanting stack overflow to adopt the technology. People who do not want stack overflow to use AI varies in percentage from 22.14% to 33.33%. Very few individuals have a neutral perspective.

A grouped bar chart is used to display the results of query 2, as seen in Fig 2. The x-axis displays the sentiment, the y-axis displays the percentage of responses, and the different colours correspond to developed and developing countries. It is apparent that people in developed and developing countries have quite similar views. The number of people with comparable views varies very little, and the majority of people in both categories of countries have positive opinions about artificial intelligence.

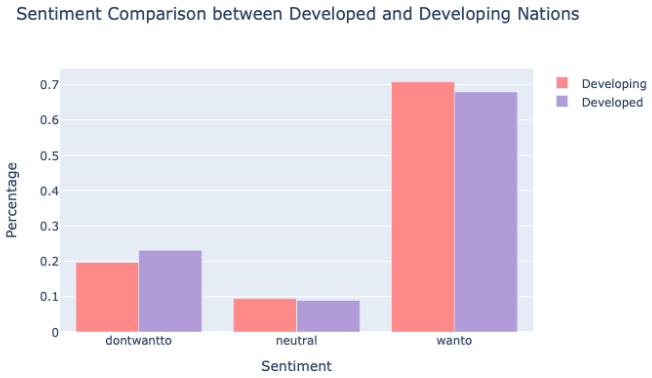


Fig 2: Query 2 visualisation

As seen in Fig. 3, a bubble chart is used to display the results of query 3. The bubble size corresponds to the average number of years of coding experience, the x-axis shows the proportion of "wanto" feeling, and the y-axis shows the percentage of "dontwantto" sentiment. The developer type is indicated by the colour of the bubbles. The majority of persons are concentrated in the greater "wantto" percentage, indicating that there is a common outlook among all types of developers.

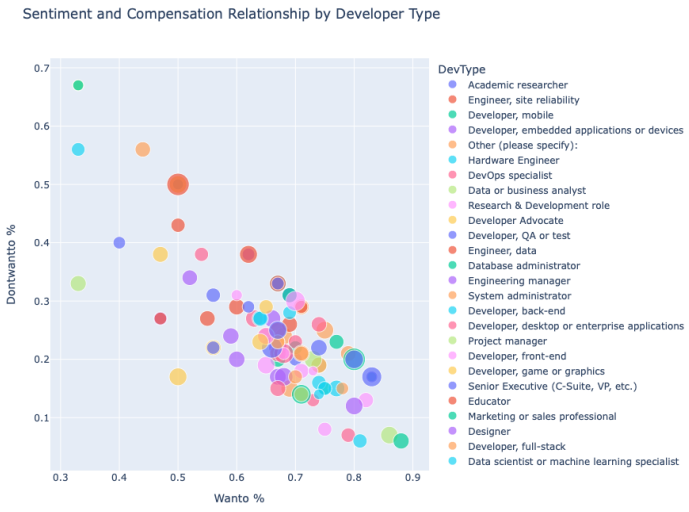


Fig 3: Query 3 visualisation

Finally, a horizontal bar chart is used to display the results of query 4, with the names of the technologies on the y-axis, the number of responses on the x-axis, and various colours denoting the various sentiment categories. The outcome changes based on the user's selection. The data for the opinion based on the Web framework that the developers used is shown in the image below, shown in Fig 4.

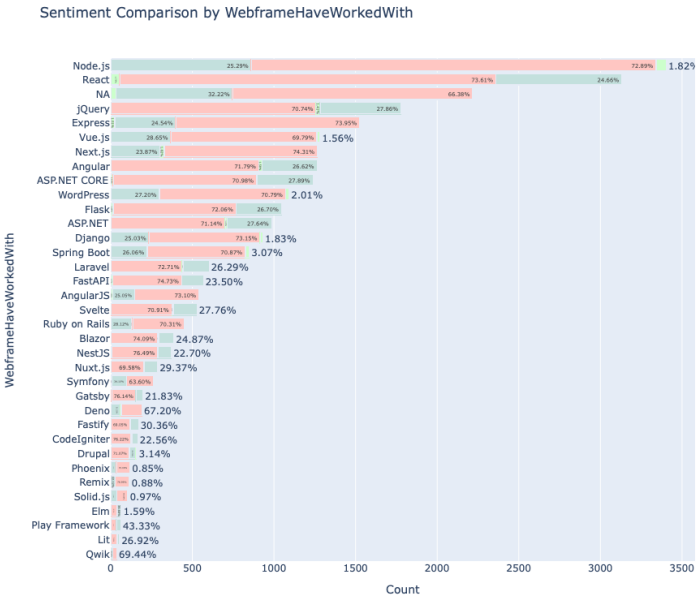


Fig 4: Query 4 visualisation

The image below shows the User Interface of the application. There's a sidebar linking to each of the visualisation showcased above and it's upto the user to view the visualisation of their choice.

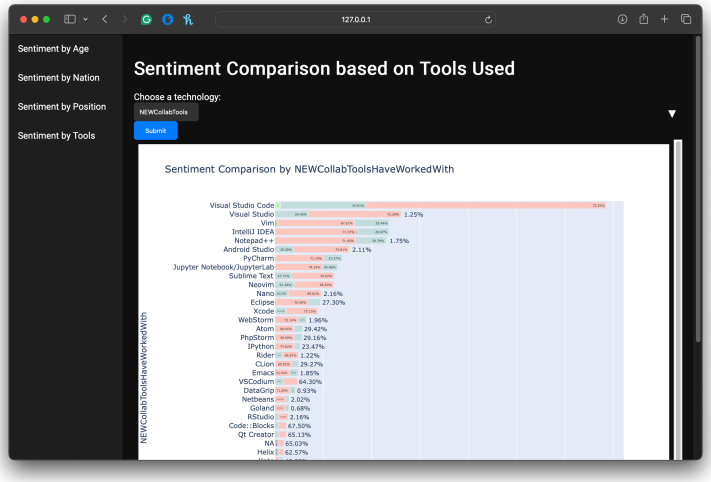


Fig 5: User Interface of Application

## REFERENCES


1. R. Elmasri and S. B. Navathe, Algorithms, Fundamentals of Database Systems, Seventh Edition, Pearson, 2017.
2. Michael Ernst, How to Write a Technical Paper, https://homes.cs.washington.edu/~mernst/advice/write-technical-paper.html .
3. MongoDB https://www.mongodb.com/try/download/community
4. Stack Overflow Annual Developer Survey 2023 https://cdn.stackoverflow.co/files/jo7n4k8s/production/49915bfd46d0902c3564fd9a06b509d08a20488c.zip/stack-overflow-developer-survey-2023.zip