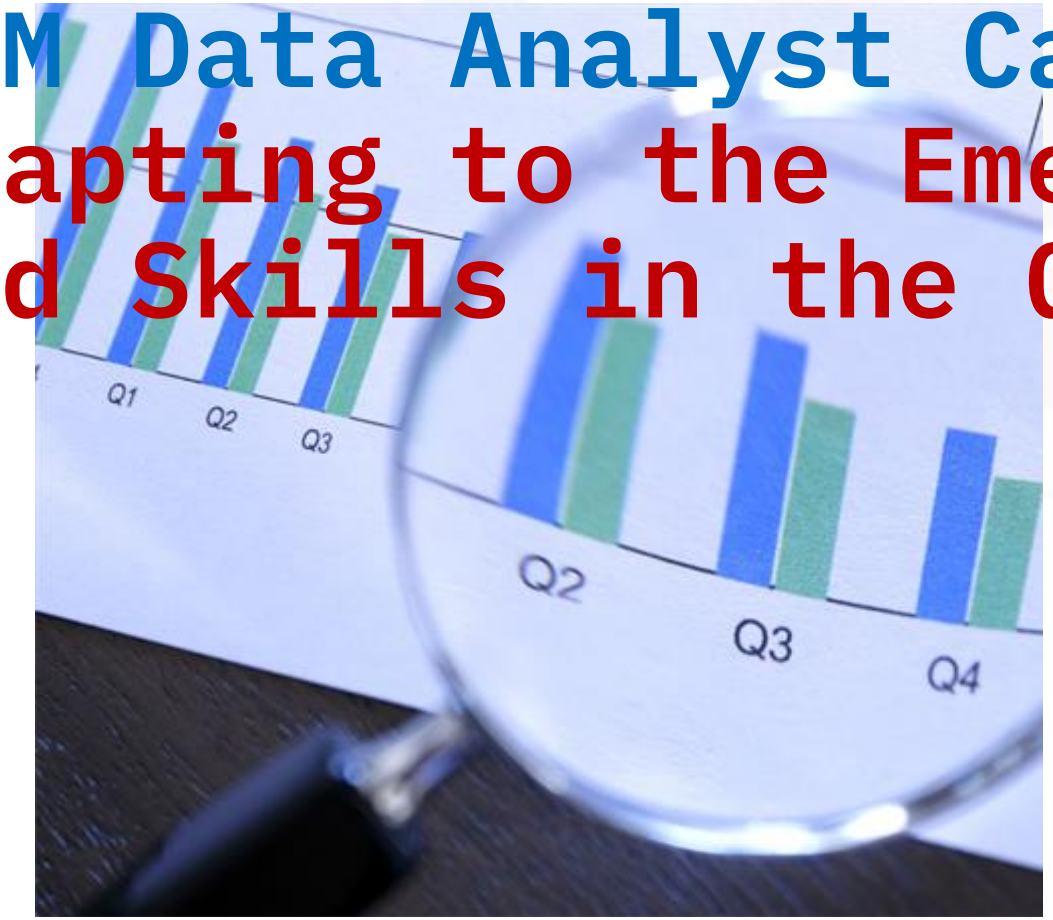
IBM Data Analyst Capstone Project: Adapting to the Emerging Technologies and Skills in the Global IT Sector



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IBM Developer

SKILLS NETWORK

OUTLINE

- Executive Summary
- Introduction
- Methodology
- Results
  - Visualization – Charts
  - Dashboard
- Discussion
  - Findings & Implications
- Conclusion
- Appendix

EXECUTIVE SUMMARY

Summary of methodologies

- The data was collected from several datasets (such as Stack Overflow Survey, Github job postings), web scraped and explored.
- The data was then wrangled to remove duplicates & impute missing values from the survey dataset, and the cleaned data was normalized.
- The wrangled data was subjected to EDA (Exploratory Data Analysis) to determine the distribution of the normalized data, and to detect and remove outliers from the survey dataset.
- During Data Visualization, various charts were plotted to visualize the distribution, interesting relationships between features, composition and comparison of the data.
- Cognos was employed to create interactive dashboards to help analyze & present the data dynamically.

Summary of all results

- The findings from the dashboard showed that JavaScript, HTML/CSS, SQL & Python top the list of most used popular programming languages in demand by respondents for the current year and next year.
- MySQL & Microsoft SQL Server top the list of the most frequently used databases in demand by respondents for the current year, but PostgreSQL and MongoDB are expected to have more demand in the future.
- jQuery was identified as the most broadly used web frame in demand in the current year, but React.js. was expected to be the most desired web frame to learn next year by respondents.
- Most of the respondents were males, had bachelor degree, located in the USA & were 28 yrs during the survey.

INTRODUCTION

- Technical skills required in the global IT sector & business consulting firms are constantly changing. Thus, Global IT and business consulting services firm should regularly analyze data to be competitive & keep pace with the ever-changing technologies.
- As part of a capstone project, I took on the role of a Data Analyst with this company to assist with collection, web scraping, exploration, wrangling, analysis and visualization of several datasets obtained from various sources to help identify trends for the year's report on emerging technologies and skills.
- The cleaned dataset will be analyzed to identify insights & trends that answer following questions:
  - What are the top programming languages that are in demand?
  - What are the top database skills that are in demand?
  - What are the most popular IDEs, platforms, web frames?
  - What do the Demographic data (gender, age, country, education level) look like ?
- Cognos will be employed to create interactive dashboards to help analyze & present the data dynamically.
- Storytelling skills will be used to provide a narrative & present the findings of the analysis.

METHODOLOGY

- **Data Collection: API**
  - Job data were collected from Jobs API (job postings) for the technology skills that are in demand.
  - The collected data were stored into an Excel Spreadsheet named 'job-postings.xlsx’

- **Data Collection: Webscraping**
  - Language name & Average Annual salary were scraped from a Programming_Languages.html website
  - The scraped data were written into a popular-languages.csv file.

- **Survey Dataset Exploration**
  - A survey data (a modified subset of Stack Overflow dataset) available at a dataset_url were loaded into a dataframe.
  - The dataset was explored for the technology skills that are in demand, and the data types of each column were identified.

METHODOLOGY…

- **Data Wrangling**
  - Duplicate values were identified & removed from the survey dataset.
  - Missing values were identified & imputed in the survey dataset.
  - The cleaned data were normalized in the survey dataset.

- **Exploratory Data Analysis**
  - Statistical techniques were applied to analyze the data and identify patterns & trends.
  - The distribution of the normalized data in the survey dataset was determined.
  - Outliers were detected and removed from the survey dataset.
  - Interesting correlation between different features was determined in the survey dataset.

- **Data Visualization**
  - Various charts were plotted to visualize the distribution, interesting relationships between features, composition and comparison of the data.
  - **Horizontal bar chart** was plotted to visualize comparison of Developers & non-developers, **Appendix**).

METHODOLOGY…

- **Building an Interactive Dashboard with IBM Cognos**

2 CSV files, **m5_survey_data_demographics.csv** & **m5_survey_data_technologies_normalised.csv** were downloaded & then uploaded to the **IBM Cognos Dashboard**.

- A **Dashboard** renamed as **Current Technology Usage** was created where
  - Metrics such as Top 10 LanguageWorkedWith, Top 10 DatabaseWorkedWith, PlatformWorkedWith & Top 10 WebFrameWorkedWith were captured, and visualized as bar chart, column chart, word cloud chart and hierarchical bubble chart, respectively.

- A **Dashboard** renamed as **Future Technology Trend** was created where
  - Metrics such as Top 10 LanguageDesireNextYear, Top 10 DatabaseDesireNextYear, PlatformDesireNextYear & Top 10 WebFrameDesireNextYear were captured, and visualized as bar chart, column chart, tree map chart and hierarchical bubble chart, respectively.

- A **Dashboard** renamed as **Demographics** was created where
  - Metrics such as ‘Respondent classified by Gender’, ‘Respondent Count for Countries’, ‘Respondent Count by Age’, and ‘Respondent Count by Gender classified by Formal Education Level’ were captured, and visualized as pie chart, map chart, line chart and stacked bar chart, respectively.

RESULTS

Programming Language Trends

- Findings & Implications

Database Trends

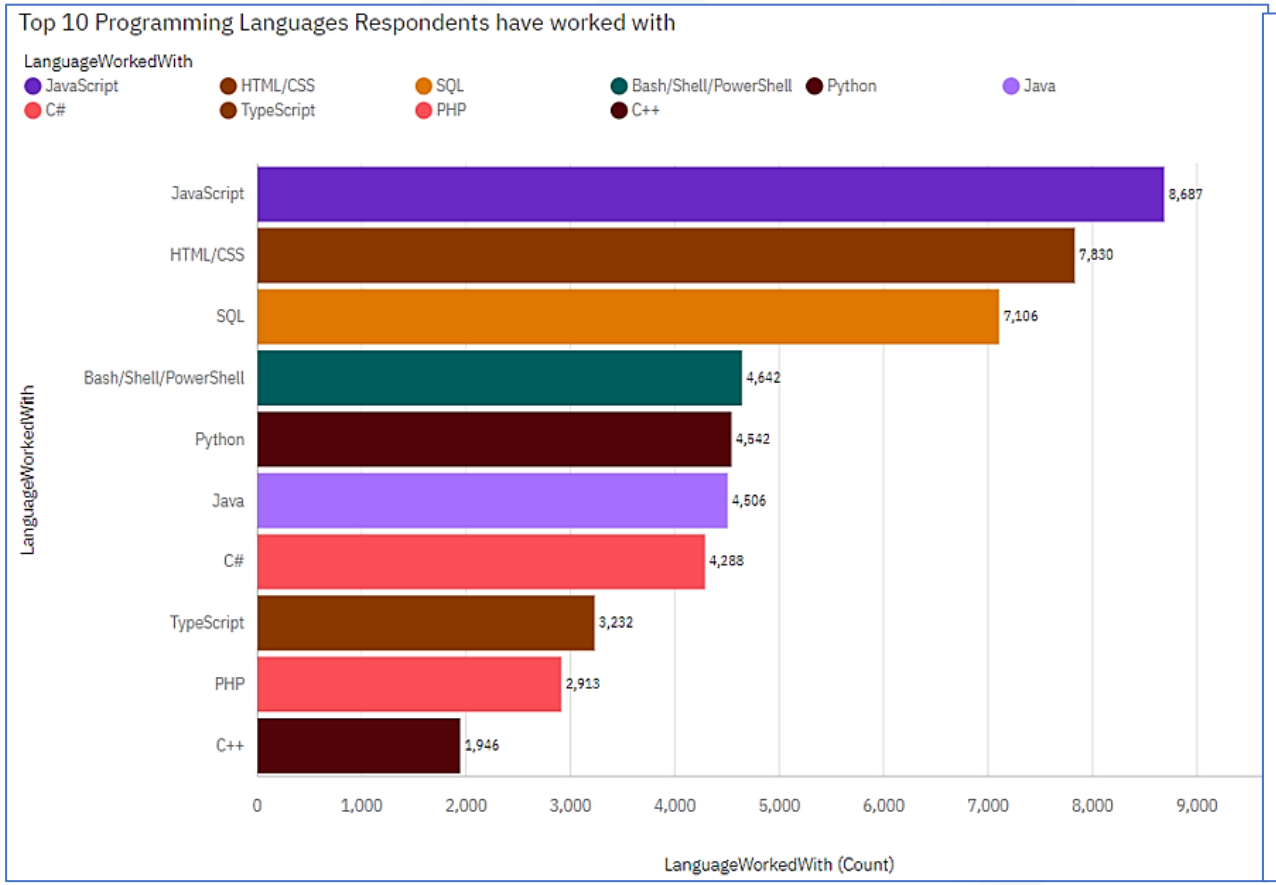
- Findings & Implications

Dashboard

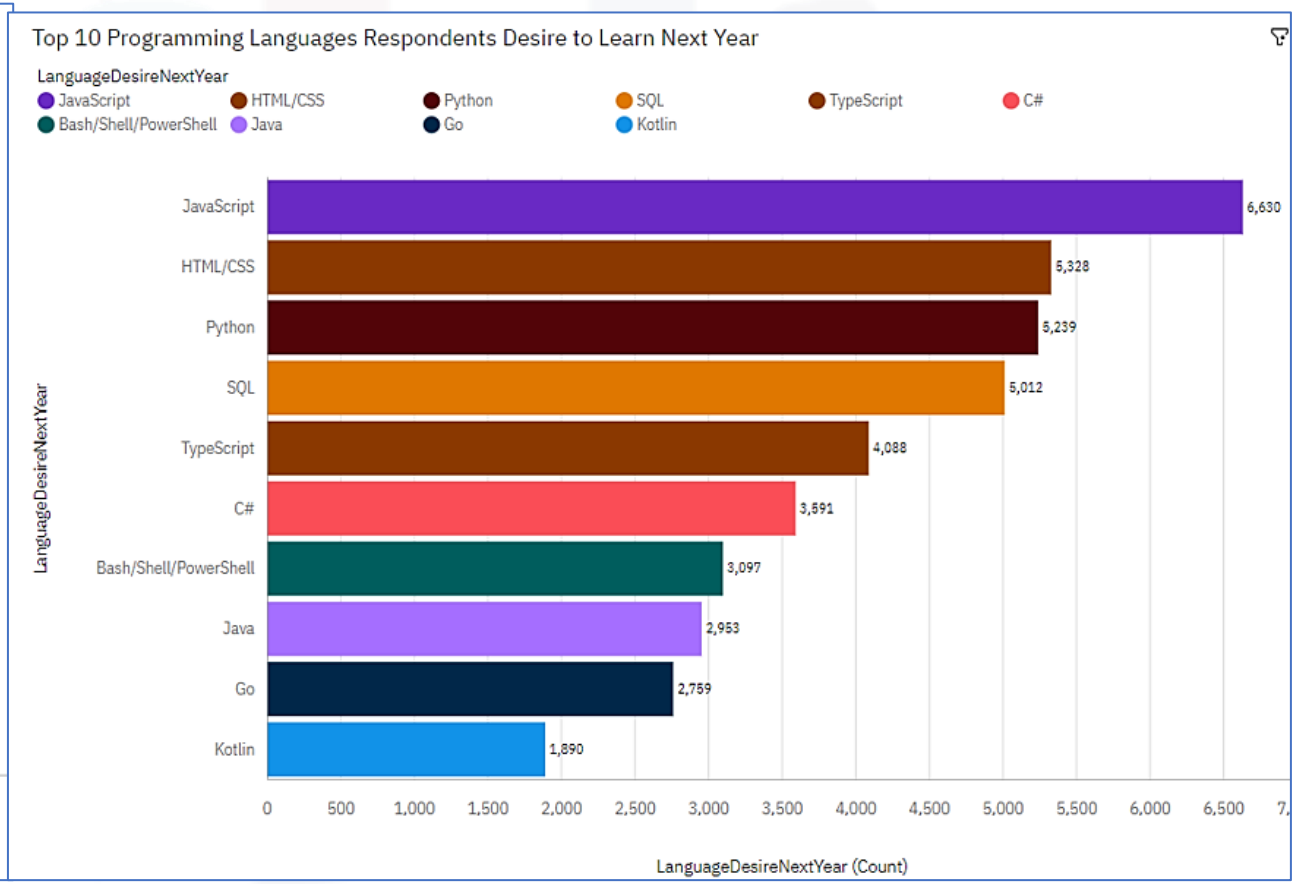
- Dashboard Tab 1
- Dashboard Tab 2
- Dashboard Tab 3

PROGRAMMING LANGUAGE TRENDS

Current Year



Next Year



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PROGRAMMING LANGUAGE TRENDS-FINDINGS & IMPLICATIONS

Findings

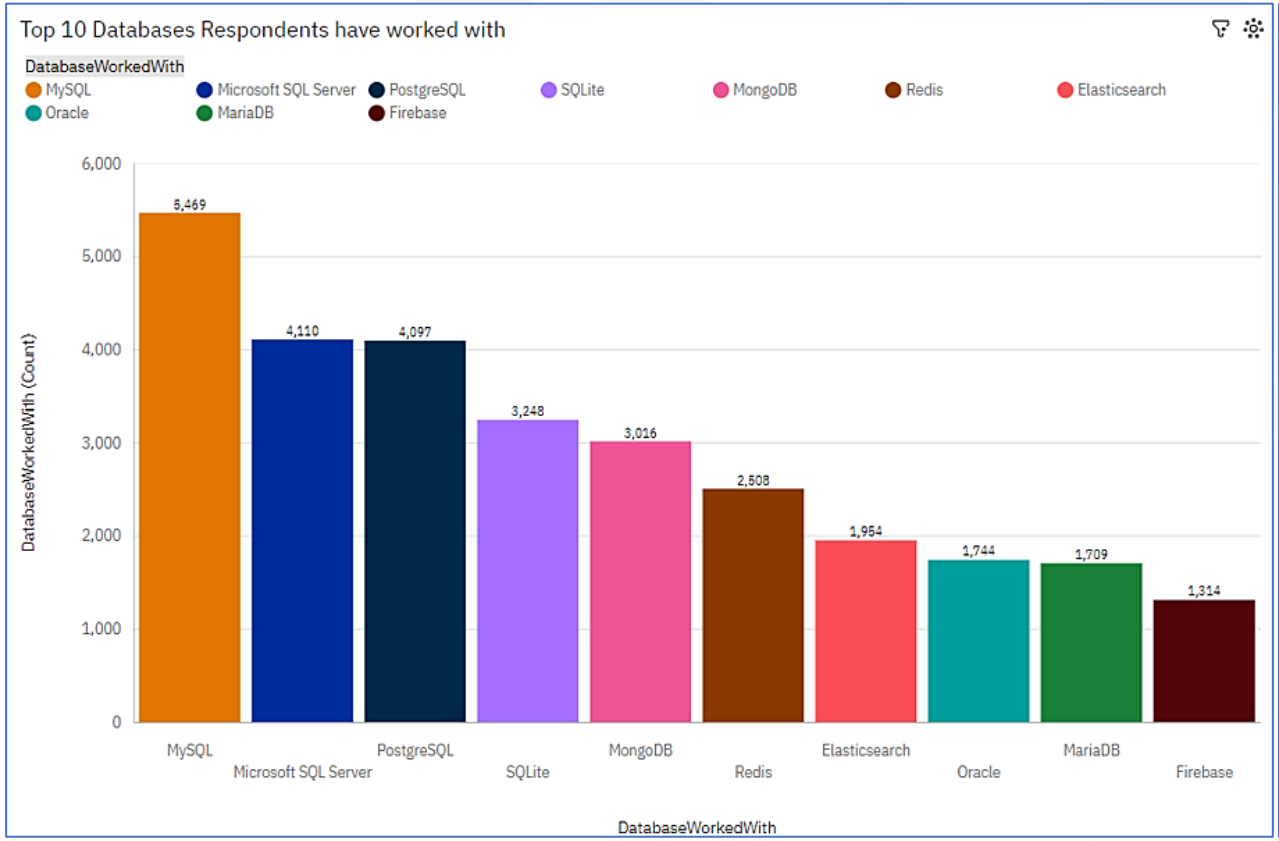
- The plotted bar charts for the Top 10 Programming language show that JavaScript & HTML/CSS remain to be the 1st and 2nd choices that respondents have currently worked with and desire to learn in the future.
- Python has risen in the ranks of programming language from 5th in the current year to 3rd next year.
- Go & Kotlin have joined the Top 10 category of programming languages that respondents desire to learn next year, edging out PHP & C++.

Implications

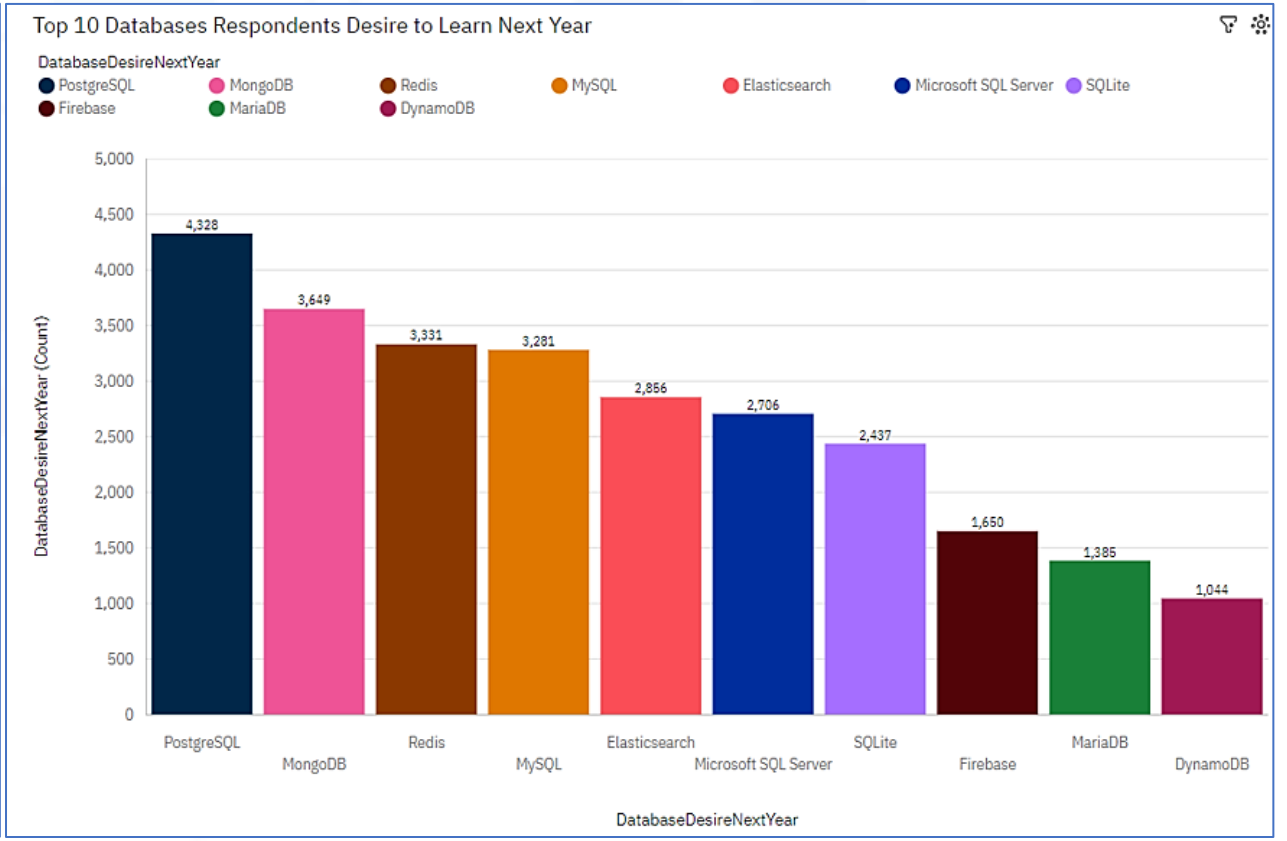
- JavaScript's & HTML/CSS's remaining top of all programming languages in both current and future situations implies that they are widely used & required by respondents & professional developers.
- Python's dramatic rise in demand in the top list of all programming languages in the next year than the current year implies that it has become the fastest growing major programming language & will become the 3rd most desired language in demand by respondents for next year.
- The rise of Go & Kotlin languages into the top 10 category implies that there is an upward trend for using these languages for industry & professional development.

DATABASE TRENDS

Current Year



Next Year



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DATABASE TRENDS - FINDINGS & IMPLICATIONS

Findings

- The column charts plotted for the Top 10 Databases show that MySQL has become the most frequently used database by respondents currently, but PostgreSQL will become the 1st choice that respondents desire to learn in the future, edging ahead of Microsoft SQL Server.
- MongoDB has risen in the ranks of databases from 5th in the current year to 2nd in the next year.
- DynamoDB has joined the Top 10 category of databases that respondents desire to learn next year, kicking out Oracle.

Implications

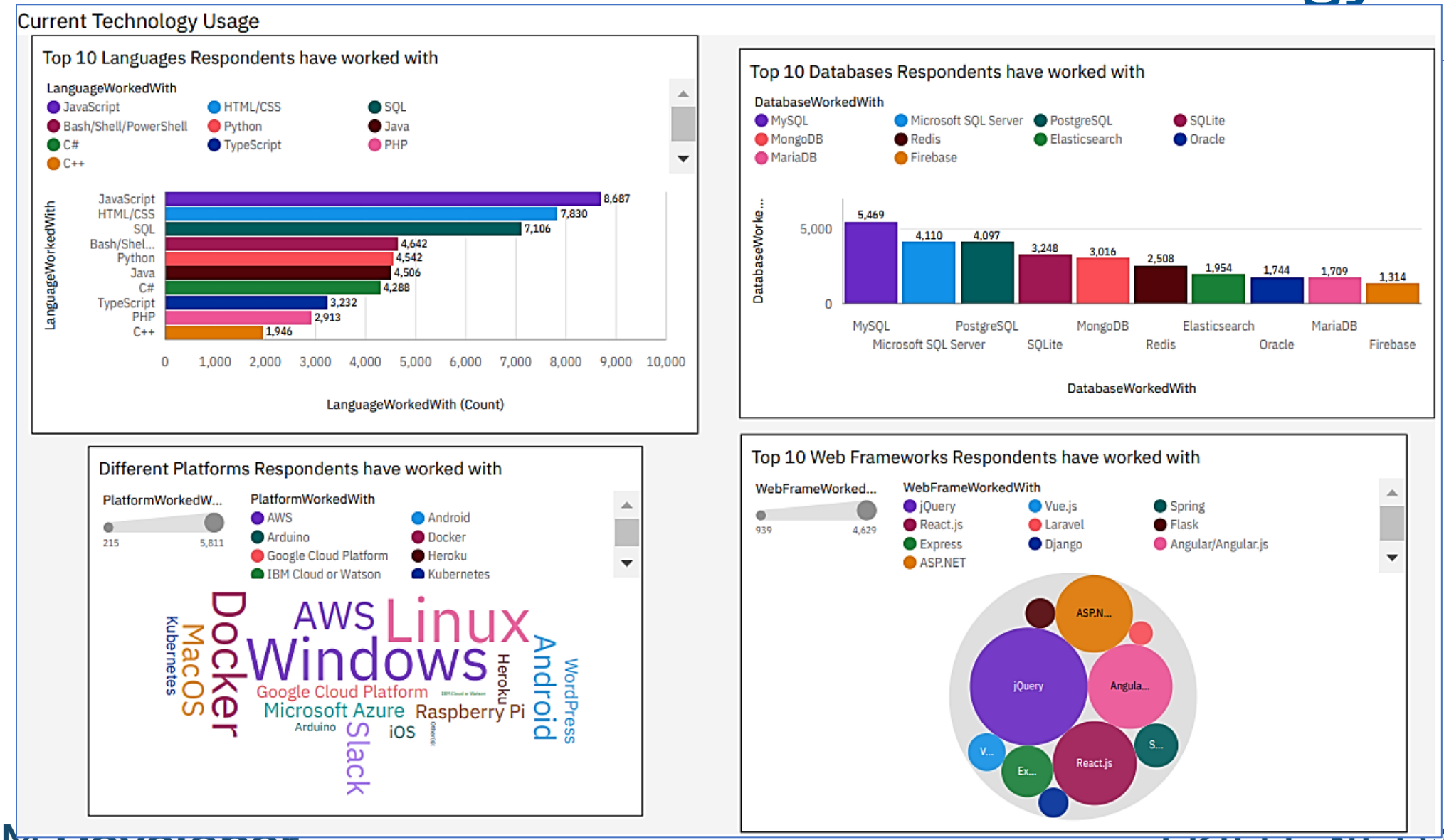
- MySQL's reign over all other databases in the current year and PostgreSQL's dramatic rise to the top of all databases in the future implies that both are widely used and required by respondents & professional developers.
- MongoDB's impressive rise in demand in the next year than the current year implies that it will become the 2nd most desired database in demand by respondents.
- The rise of DynamoDB into the top 10 category implies that there is an upward trend for using this database for industry & professional development.

DASHBOARD

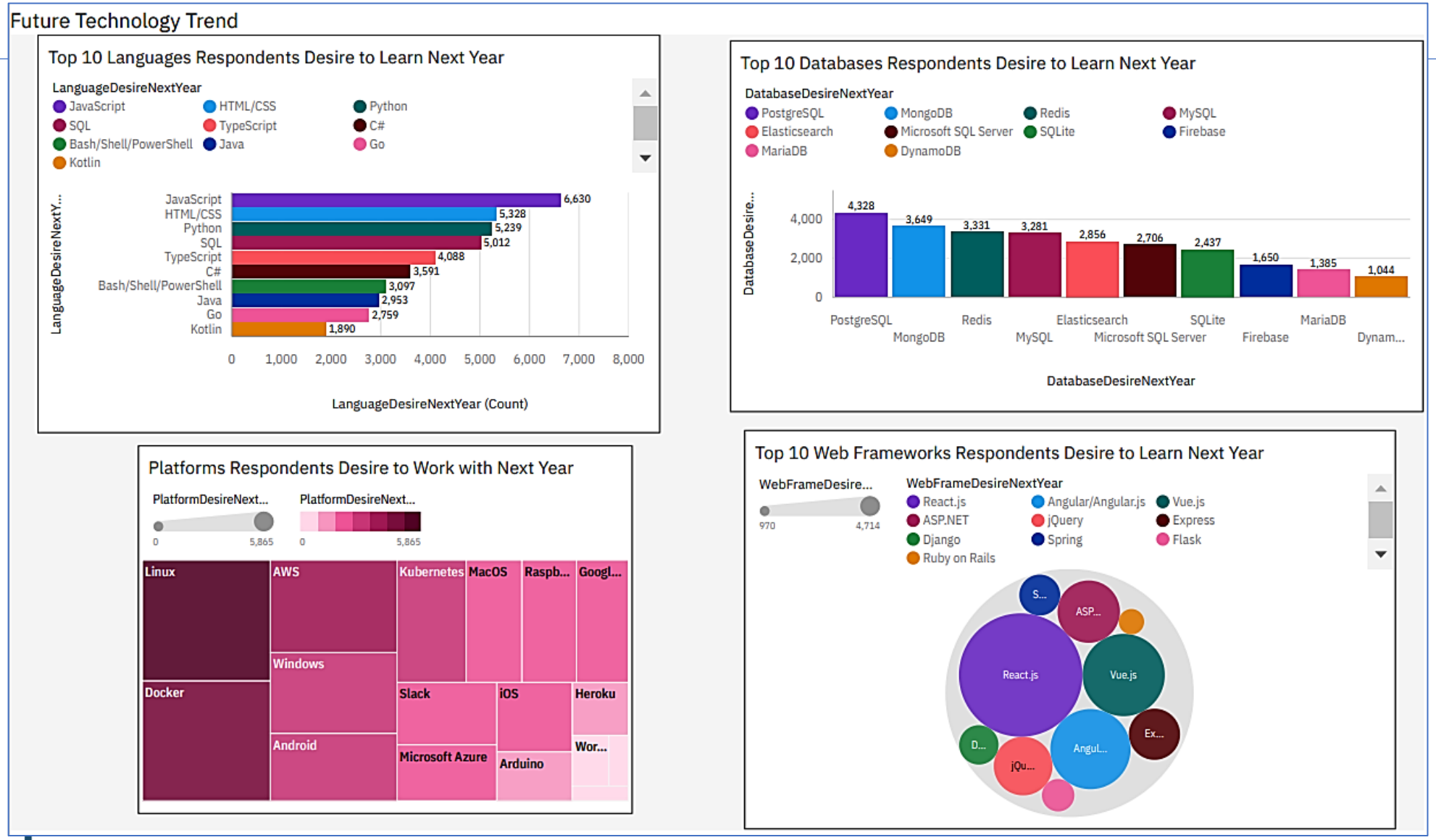
The GitHub link of the Cognos,

https://github.com/abiyselassie22/IBM-Data-Analyst-Capstone/blob/master/7.%20Building%20Dashboard%20IBM%20Cognos%20Analytics.pdf

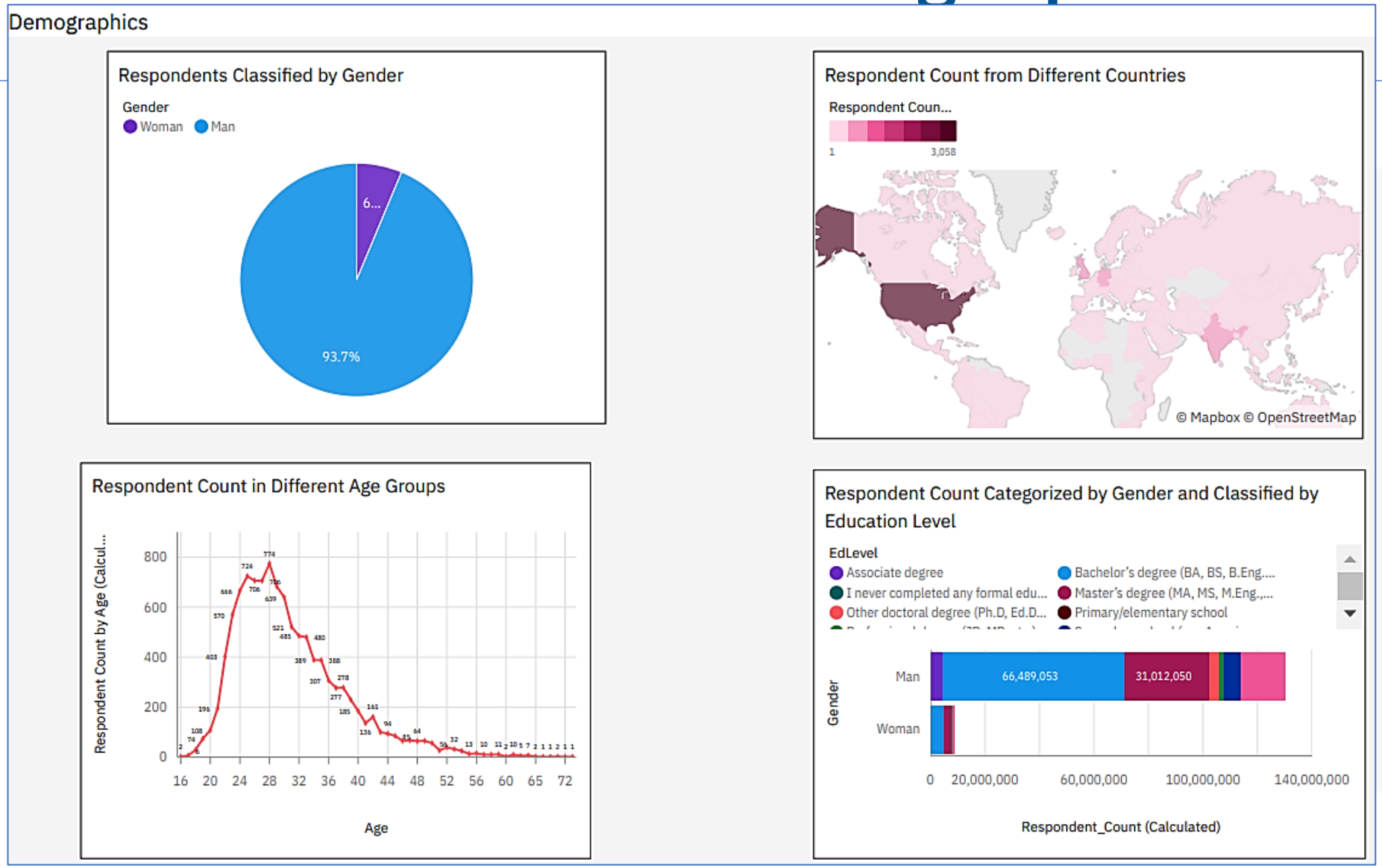
DASHBOARD TAB 1 – Current Technology Usage



DASHBOARD TAB 2 – Future Technology Usage



DASHBOARD TAB 3 - Demographics



DISCUSSION

OVERALL FINDINGS & IMPLICATIONS

- The overall findings and implications would help the Firm make more informed data-driven decisions before it is advertising job postings and hiring job seekers.

OVERALL FINDINGS & IMPLICATIONS

Findings

- JavaScript, HTML/CSS & SQL top the list of most used popular programming languages in demand by respondents for the current year. And Python will be the most desired language to learn by respondents for the next year.

- MySQL, Microsoft SQL server & PostgreSQL top the list of the most frequently used databases in demand by respondents currently. But PostgreSQL & MongoDB will be the most desired databases to learn by respondents in the future, edging ahead of MySQL & Microsoft SQL Server.

Implications

- It is imperative for respondents to develop skills in Python in addition to JavaScript, HTML/CSS & SQL as Python now becomes the fastest-growing programming language because it is easy to learn & has a larger developer community.

- It is essential for respondents to develop skills in MongoDB in addition to MySQL, Microsoft SQL Server & PostgreSQL in the future as it is a highly demanded database by respondents & professional developers.

OVERALL FINDINGS & IMPLICATIONS…

Findings

- jQuery was identified as the most broadly used web frame in the current year. But React.js. will be the most desired web frame to learn next year by respondents.
- Linux, Windows & Docker were the most common platforms by respondents in the current year. Linux & Docker were the most used platforms that respondents desire to learn next year.
- Most of the respondents were males (93.7%), located in the USA & were at age of 28 during the survey (**Demographic Dashboard**).
- Most Respondents were developers by their profession (**Appendix**) & had Bachelor degrees (**Demographic Dashboard**).

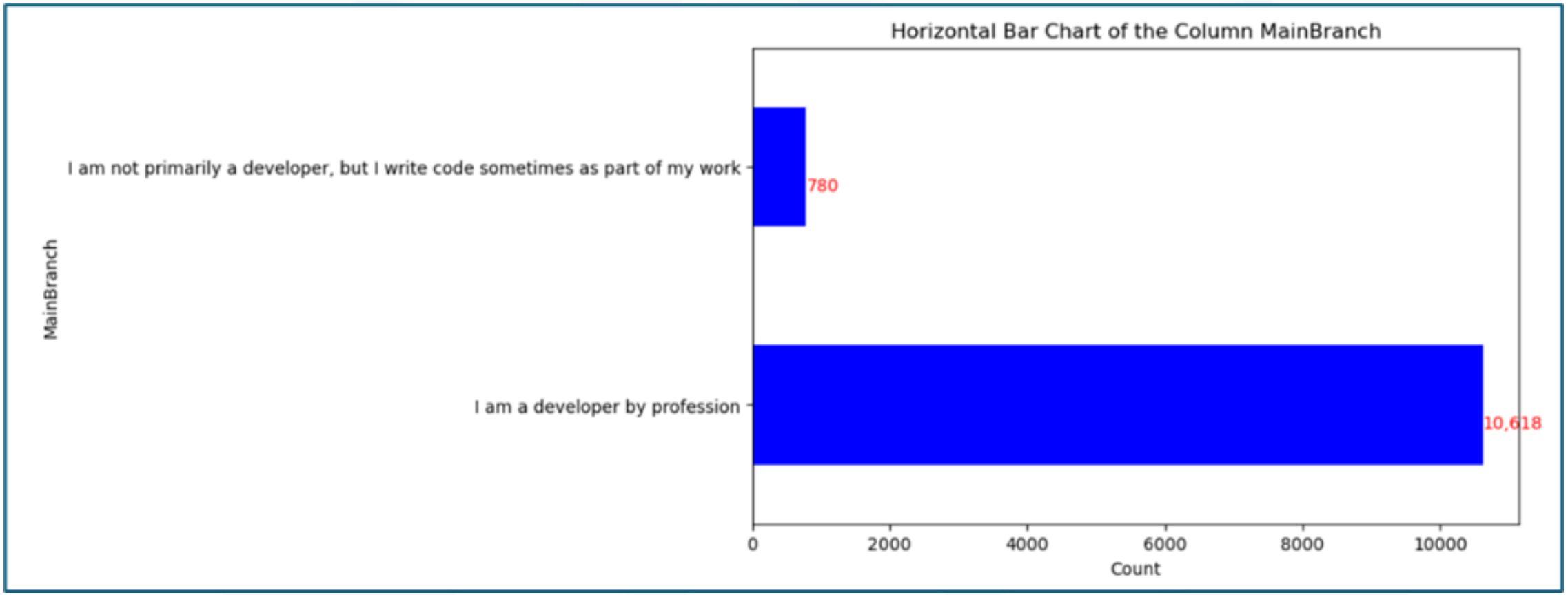
Implications

- It is relevant for respondents to develop skills in React.js. web frame in addition to jQuery in the next year as it is more powerful tool in web development and a lucrative skill.
- It is appropriate for respondents to develop skills in the Docker platform in addition to Linux & windows as it is more powerful tool in development of software & applications.
- Small percentage of females (6.3%) & increasing trend in count of younger respondents (< 30yrs) in the tech skills implies that females & older respondents should be encouraged more to gain access to the emerging technologies.
- Respondents in less developed countries should be exposed to the high-tech skills.

CONCLUSION

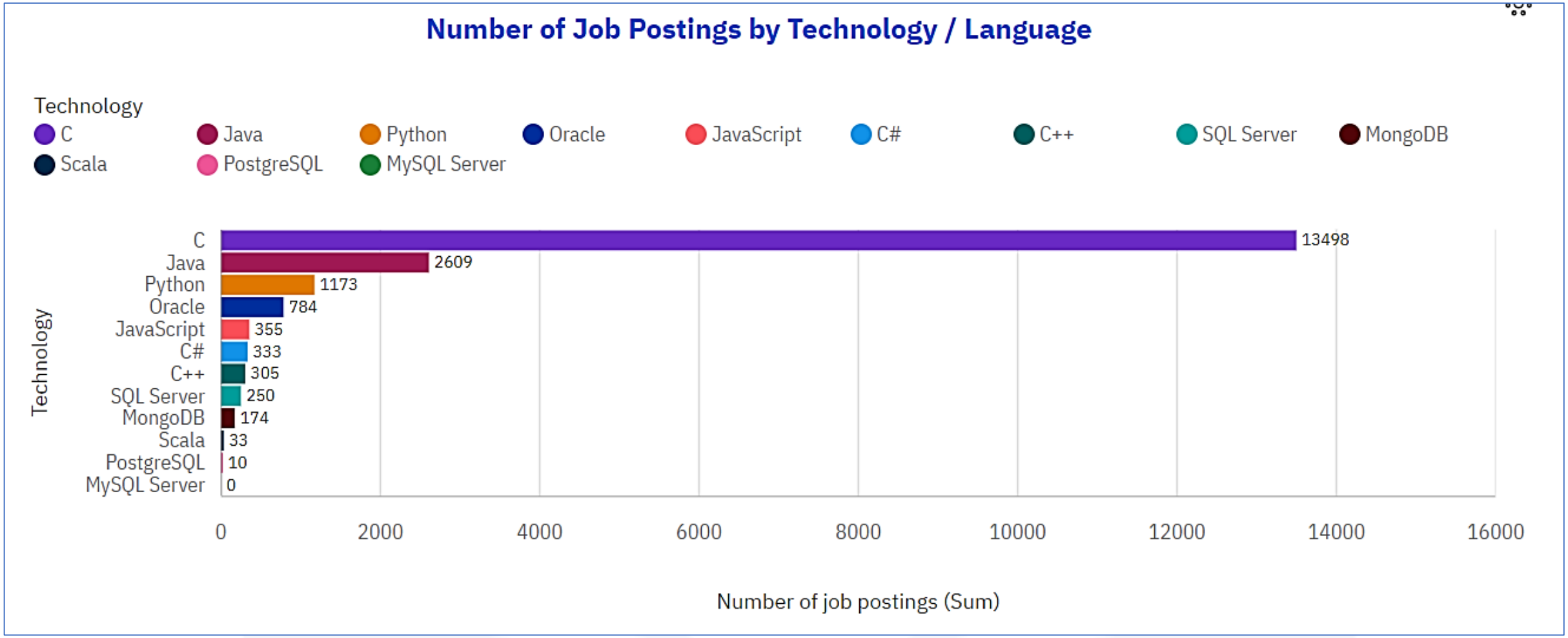
- Python, along with JavaScript, HTML/CSS & SQL must always be included in the Firm's list of the next year's job posting as it has now become the fastest-growing programming language in demand.
- MongoDB is also to added in the list of top databases as it is a highly demanded skill by respondents & professional developers next year.
- React.js. web frame must be added in the next year Job Posting plan as it is more powerful & lucrative skill in web development; And respondents may learn the web frame together with the highly demanded language JavaScript in order to be competitive.
- Docker platform should be added to the list as it is more powerful tool in development of software & applications.
- The wider gender gap in tech must be closed by encouraging more females to enter the tech field. Older respondents should be given more opportunities during internship & recruitment programs.
- Respondents in less developed countries should be exposed to the high-tech skills so that they would be developers by profession.
- So, the Data analyst found it vital to adapt to trends in the Emerging Technologies & Skills in the Global IT Sector as the trends change from year to year worldwide.

APPENDIX



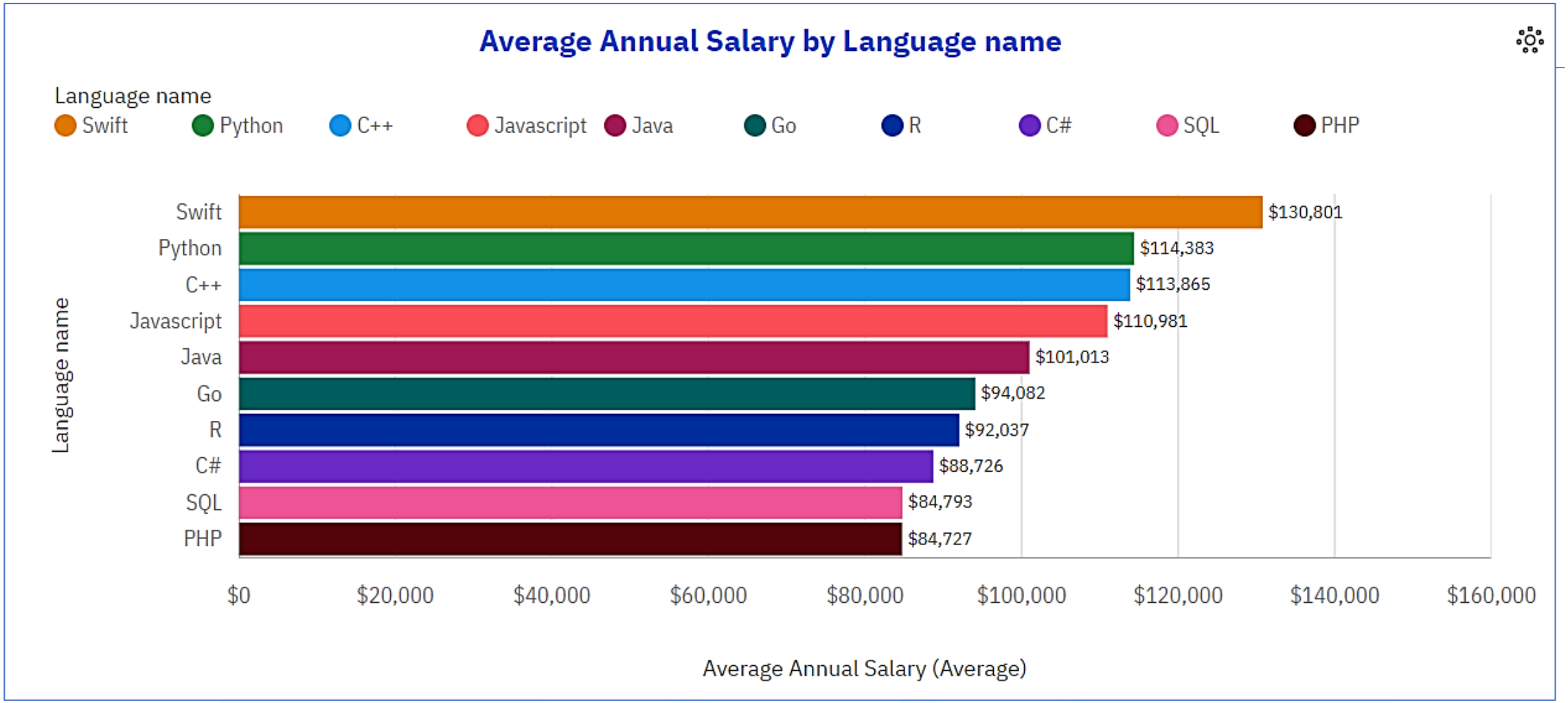
Horizontal Bar Chart showing Comparison of the Survey Responders who are developers or not by Profession.

JOB POSTINGS

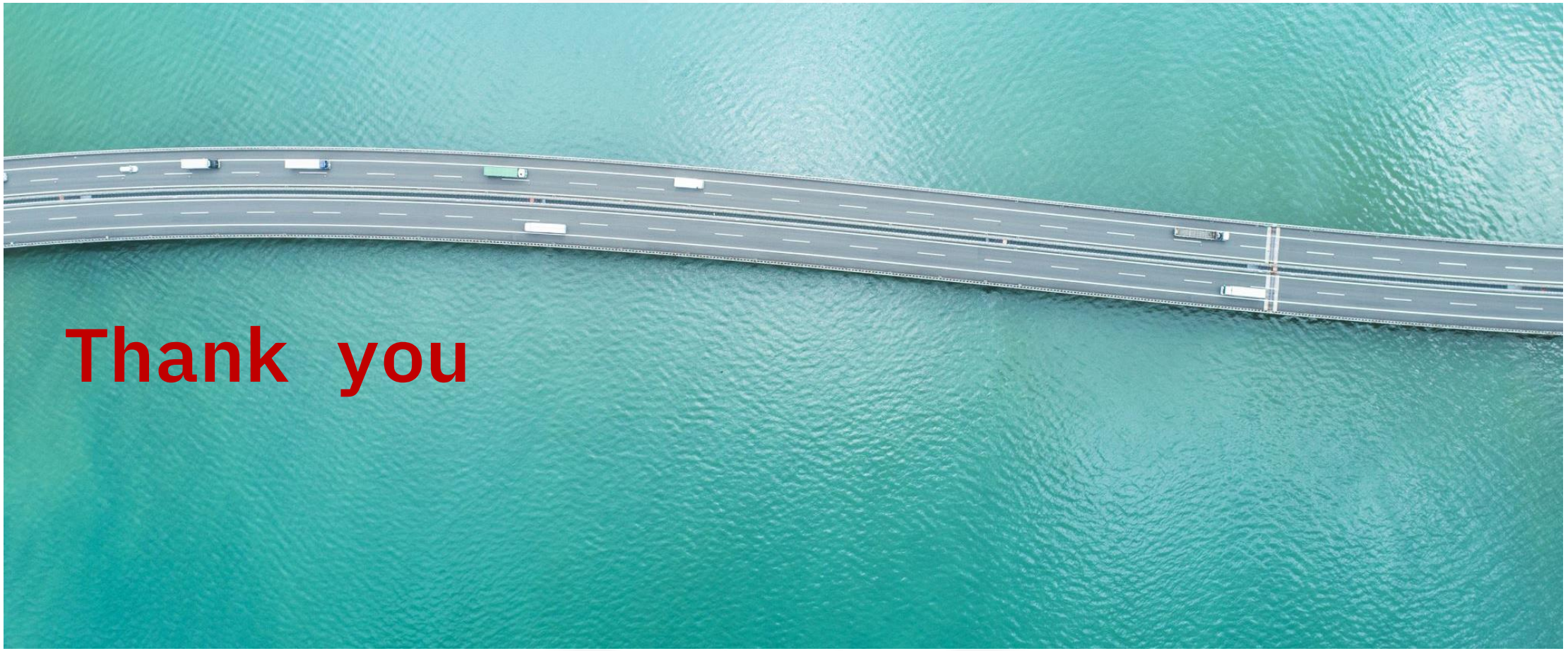


Bar Chart showing the Job Posting by Technology / Language (Result for Github Job Posting API).

POPULAR LANGUAGES



Bar Chart showing Popular languages & their Average Annual salary (Result for Survey Dataset Web scraping).


Thank you