Navigating the Digital Frontier:

Exploration of the Ever-Changing Landscape of IT Skills

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EXECUTIVE SUMMARY

- Study Objective
  - Conduct a data analysis to investigate the current and future skill requirements for information technology (IT) professionals in order to keep pace with the changing technology landscape and remain competitive in the field.
- Methodology and Tools
  - Data Collection using Python API requests, web scraping and survey data gathering
  - Data Wrangling using Python
  - Exploratory Data Analysis using Microsoft Excel, Python and SQL
  - Interactive Visual Analytics using IBM Cognos
- Findings
  - The various profiles of IT professionals in the study were characterized based on demographics.
  - Top technologies encompassing the leading programming languages, databases, platforms and web frameworks identified by IT professionals were determined.
  - A comparative analysis was performed between currently used and desired leading technologies by IT professionals.

INTRODUCTION

- The realm of information technology is an ever-evolving landscape – characterized by rapid advancements, disruptive innovations, and transformative breakthroughs.
- In such dynamic environment, the role of information technology (IT) professionals has become increasingly pivotal, demanding constant adaptation and skill updates.
- This capstone project generally aims to conduct a data analysis of the current and future skill requirements for IT professionals to gain insights on the changing industry needs based on their perception.
    - In particular, an exploratory data analysis including a visual analytics dashboard will be formulated which could provide a visual snapshot of the data in a clear and concise manner – allowing to derive insights, uncover patterns and understand relationships.


Section 1
Methodology

METHODOLOGY

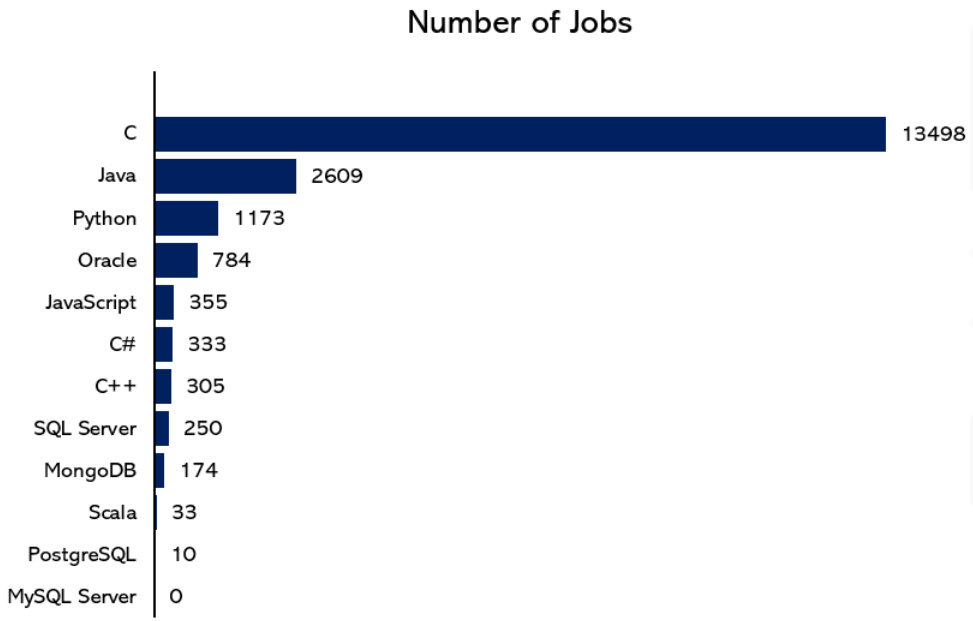
- Data Collection using Python
  - API Request – Kaggle Job Postings [Link]
  - HTML Web Scraping – HTML Table of Annual Salary by Popular Programming Languages [Link]
  - Survey Data – Stack Overflow Developer Survey [Link]
- Data Pre-processing using Python
  - Duplicate data detection | removal, missing data detection | imputation and normalization [Link]
- Exploratory Data Analysis using Microsoft Excel, Python and SQL
  - Data distribution checking, outlier detection, outlier treatment and correlation analysis [Link]
  - Visualization of data distributions, relationships, compositions and comparisons [Link]
- Interactive Visual Analytics using IBM Cognos
  - Dashboard creation, pattern analysis and insights generation through interactive exploration [Link]

Section 2

Results

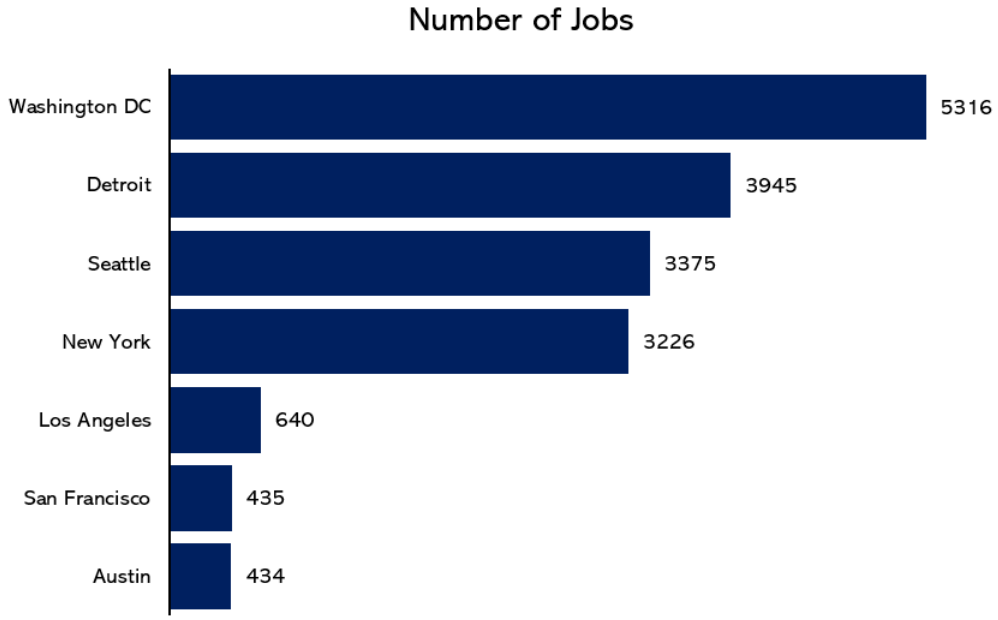
RESULTS – JOB POSTINGS

Language



- C language recorded the highest number of job postings.
- Java and Python were also equally in high demand.

US State



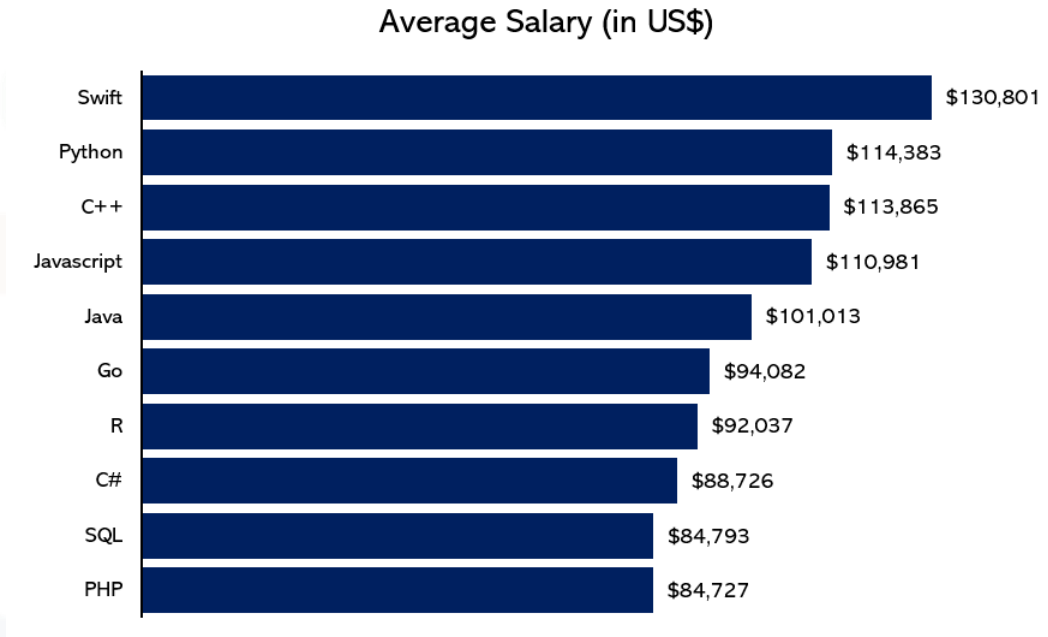
- High demand for developer jobs was noted in Washington DC, Detroit, Seattle and New York.

RESULTS – JOB POSTINGS

- Findings
  - Majority of the job postings were for the following programming languages:
    - C
    - Java
    - Python
  - Major US cities have a higher demand for developer jobs including:
    - Washington DC
    - Detroit
    - Seattle
    - New York
- Implications
  - Both legacy and modern programming languages continue to be in high demand in major US cities.

RESULTS – POPULAR LANGUAGES

Compensation



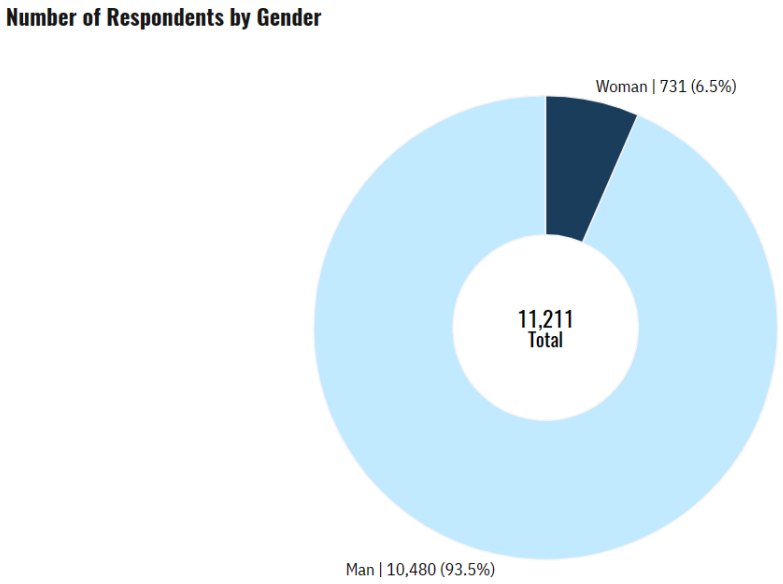
- Swift, Python, C++, Javascript and Java recorded the highest average salaries among all other popular programming languages.

RESULTS – POPULAR LANGUAGES

- Findings
  - The highest average salaries were noted for professionals with skills in the following programming languages:
    - Swift
    - Python
    - C++
    - Javascript
    - Java
- Implications
  - Both legacy and modern programming languages continue to remain significant, as reflected by the higher compensation for IT professionals with these skills.

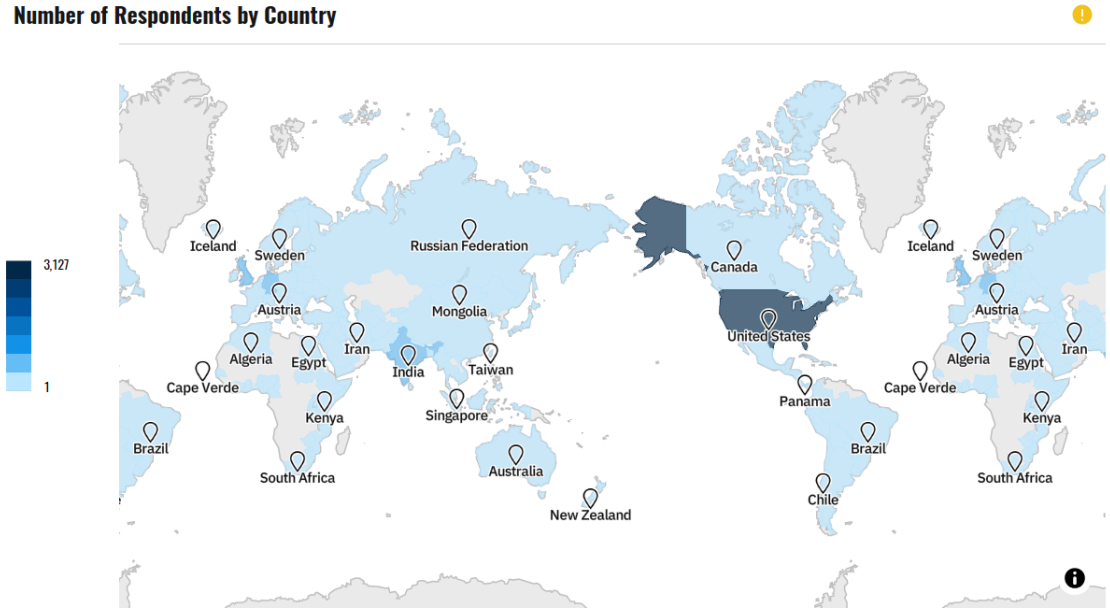
RESULTS – SURVEY RESPONDENT PROFILES

Gender



- Respondents were predominantly male comprising 94% overall.

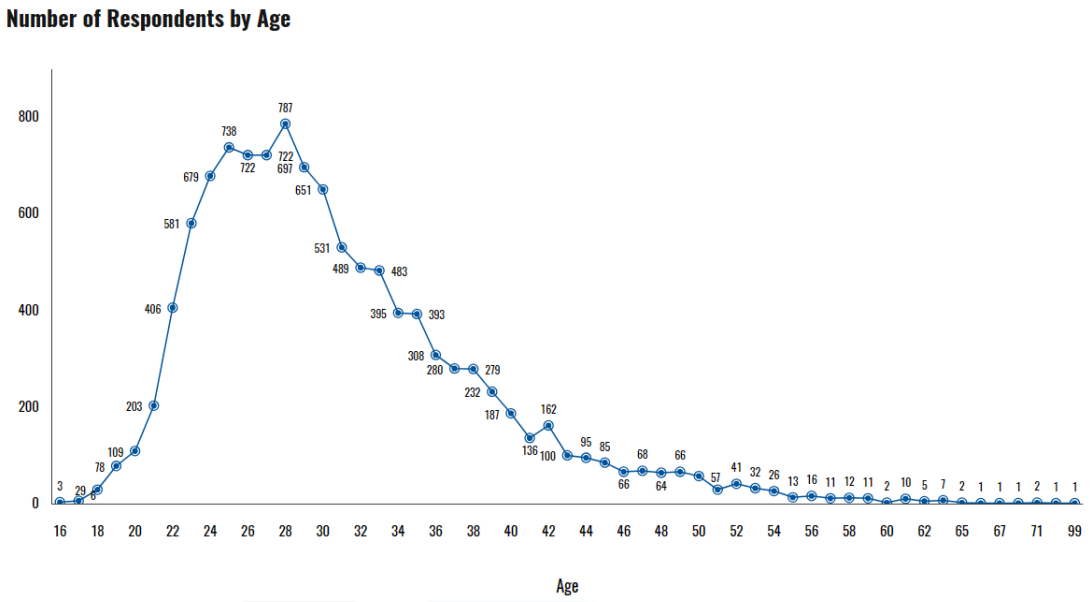
Country



- Respondents were predominantly from developed countries including the US, UK, India and Germany.

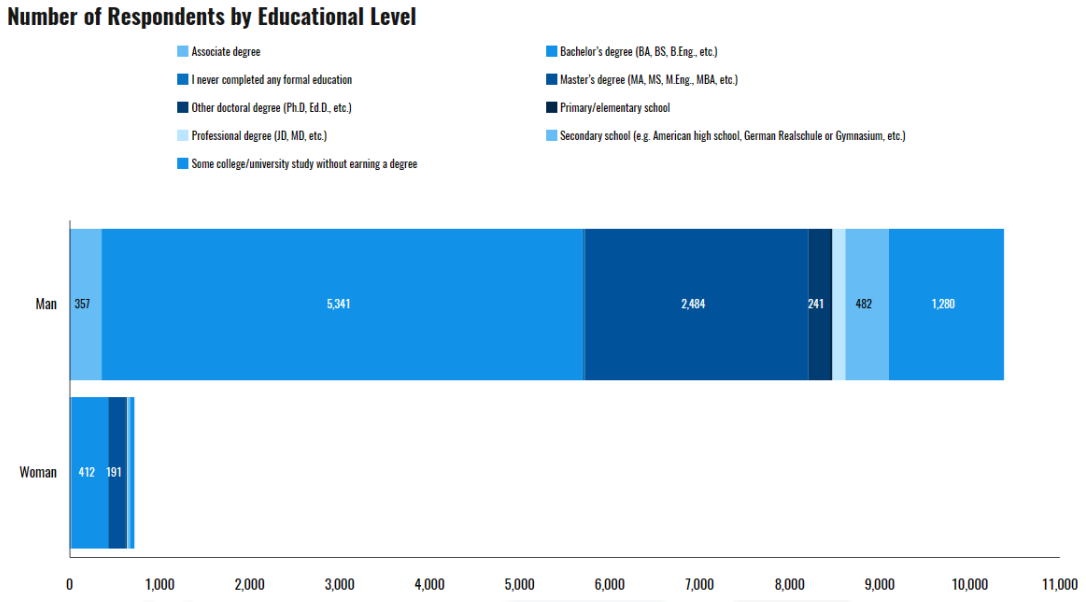
RESULTS – SURVEY RESPONDENT PROFILES

Age



- Respondents were predominantly young to middle-aged professionals ranging between 20 to 40 years old.

Educational Level



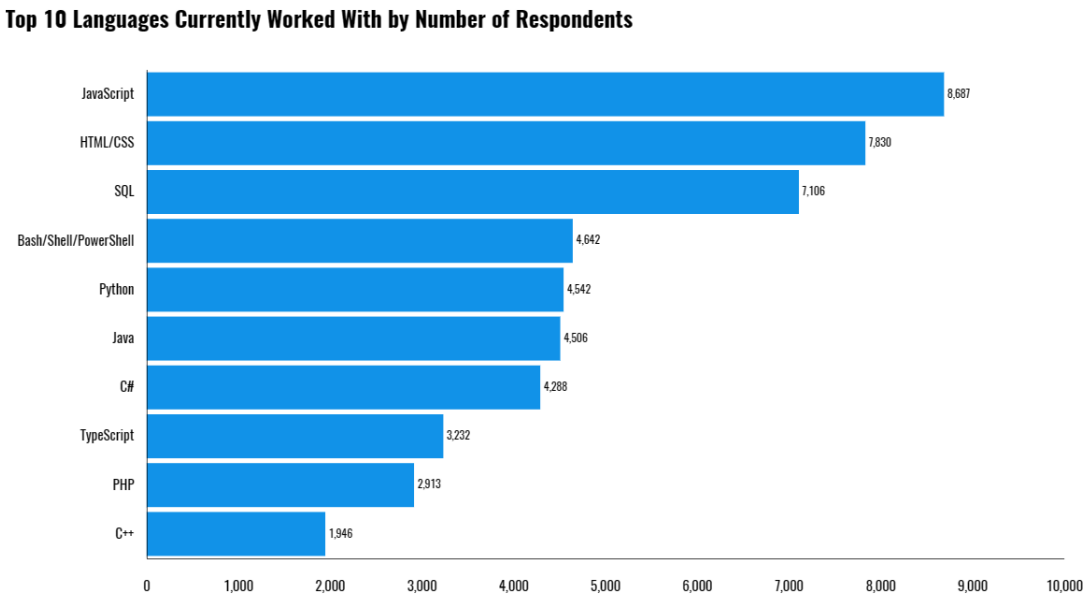
- Respondents were predominantly educated with a Bachelor's degree or a Master's degree.

RESULTS – SURVEY RESPONDENT PROFILES

- **Findings**
  - Majority of the respondents in the study have the following characteristics:
    - Male
    - From the US, UK, India and Germany
    - Between 20 to 40 years old
    - With Bachelor's or Master's degrees
- **Implications**
  - The IT profession – being male-dominated with practitioners composed of predominantly young and well-educated professionals from developed countries reflects a dynamic workforce with the need to continuously adapt to new requirements, regulations, and emerging technologies to provide relevant support and solutions.

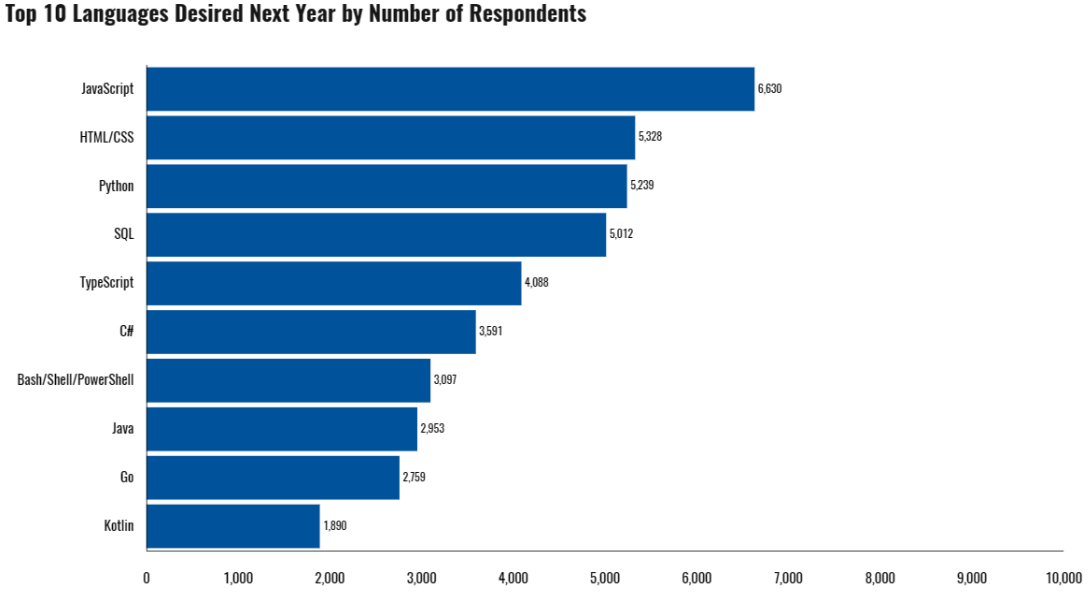
RESULTS – PROGRAMMING LANGUAGE TRENDS

Current Year



- The leading languages currently being used included Javascript, HTML/CSS and SQL.

Next Year



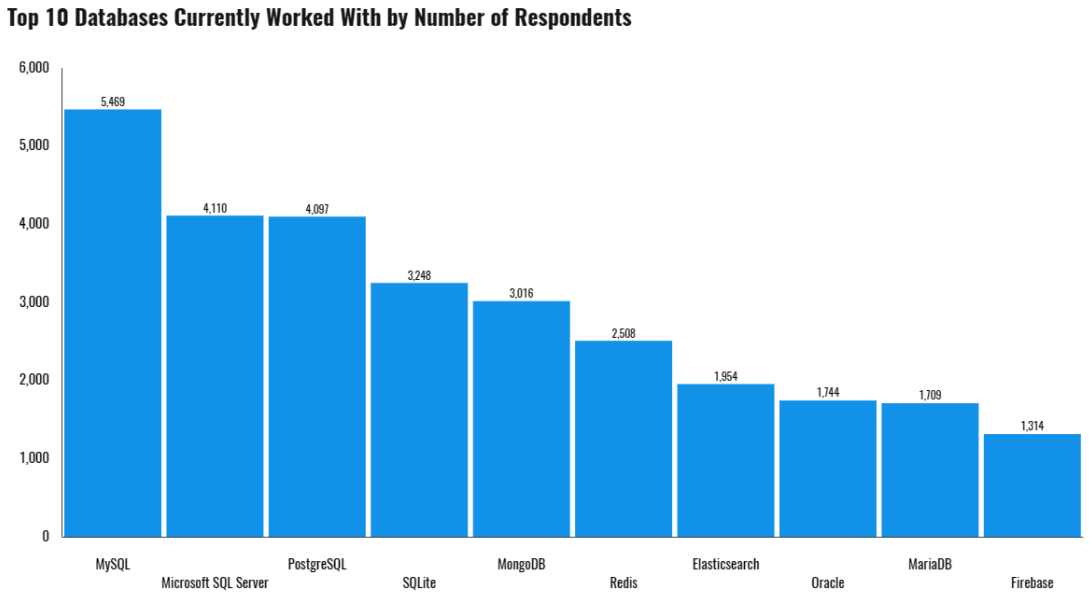
- Javascript, HTML/CSS and SQL remain important languages in the next year.
- Python reflects higher demand for the subsequent year.

RESULTS – PROGRAMMING LANGUAGE TRENDS

- Findings
  - The most currently used programming languages are composed of:
    - Javascript
    - HTML/CSS
    - SQL
  - The most desired programming languages for the following year included:
    - Javascript
    - HTML/CSS
    - Python
    - SQL
- Implications
  - Javascript, HTML/CSS and SQL continue to remain relevant and critical skills for developers.
  - There is a trending demand for skills involving general purpose languages like python among developers.

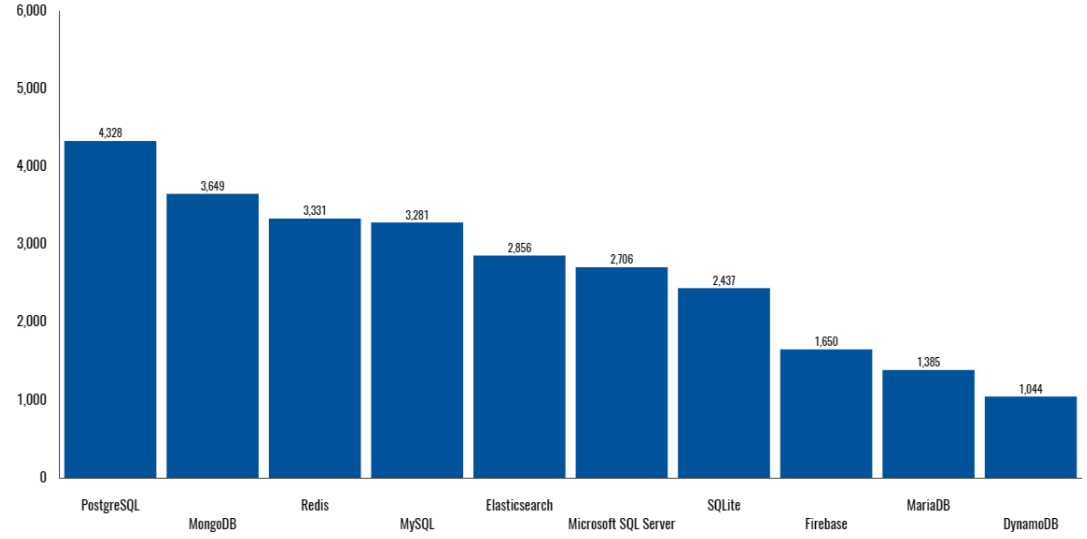
RESULTS – DATABASE TRENDS

Current Year



- The leading databases currently being used included MySQL, Microsoft SQL Server and PostgreSQL.

Next Year



- PostgreSQL and MySQL remain important databases in the next year.
- MongoDB and Redis reflect higher demand for the subsequent year.

RESULTS – DATABASE TRENDS

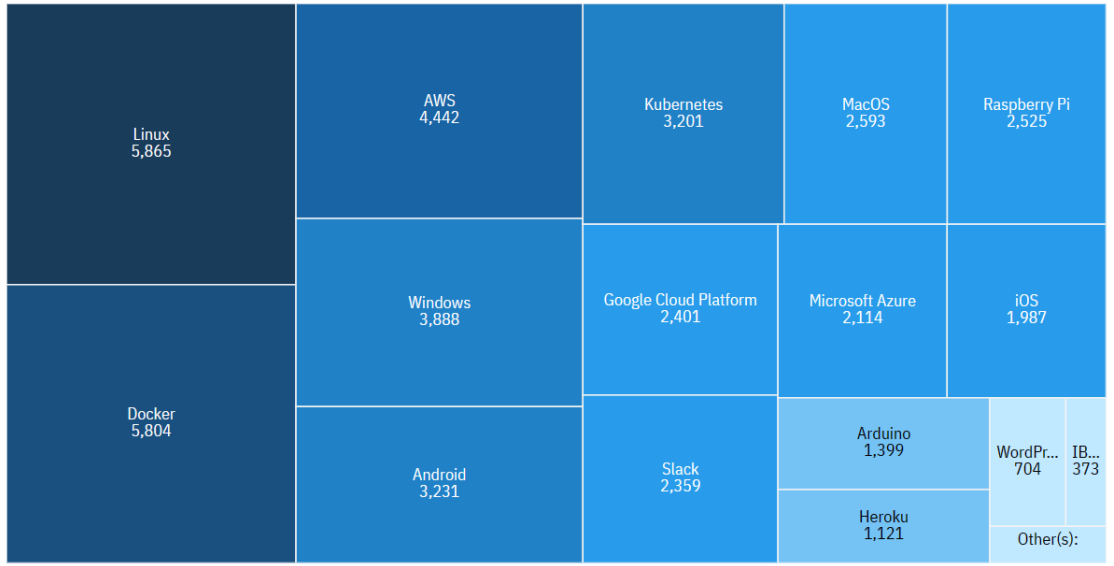
- Findings
  - The most currently used databases are composed of:
    - MySQL
    - Microsoft SQL Server
    - PostgreSQL
  - The most desired databases for the following year included:
    - PostgreSQL
    - MongoDB
    - Redis
    - MySQL
- Implications
  - Relational databases MySQL and PostgreSQL continue to remain relevant and critical skills for developers.
  - There is a trending demand for skills involving non-relational databases including MongoDB and Redis among developers.

RESULTS – PLATFORM TRENDS

Current Year

- The leading platforms currently being used included Linux, Windows, Docker and AWS.

Next Year



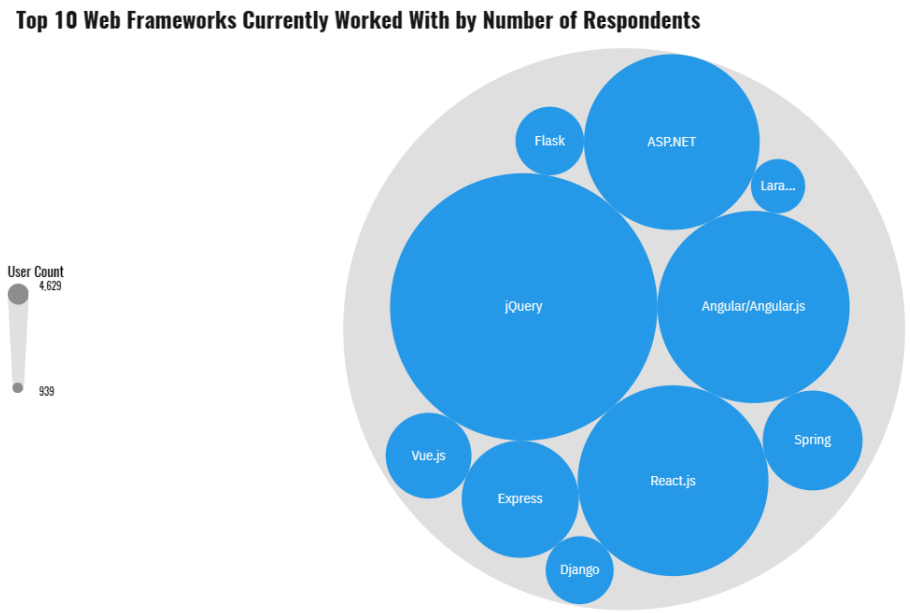
- Linus, Docker, AWS and Windows remain important platforms in the next year.
- Docker reflects higher demand for the subsequent year.

RESULTS – PLATFORM TRENDS

- Findings
  - The most currently used platforms are composed of:
    - Linux
    - Windows
    - Docker
    - AWS
  - The most desired platforms for the following year included:
    - Linux
    - Docker
    - AWS
    - Windows
- Implications
  - Legacy closed-source platforms like Microsoft continue to remain relevant and critical skills for developers.
  - There is a trending demand for skills involving open-source platforms including Linux, Docker and AWS among developers.

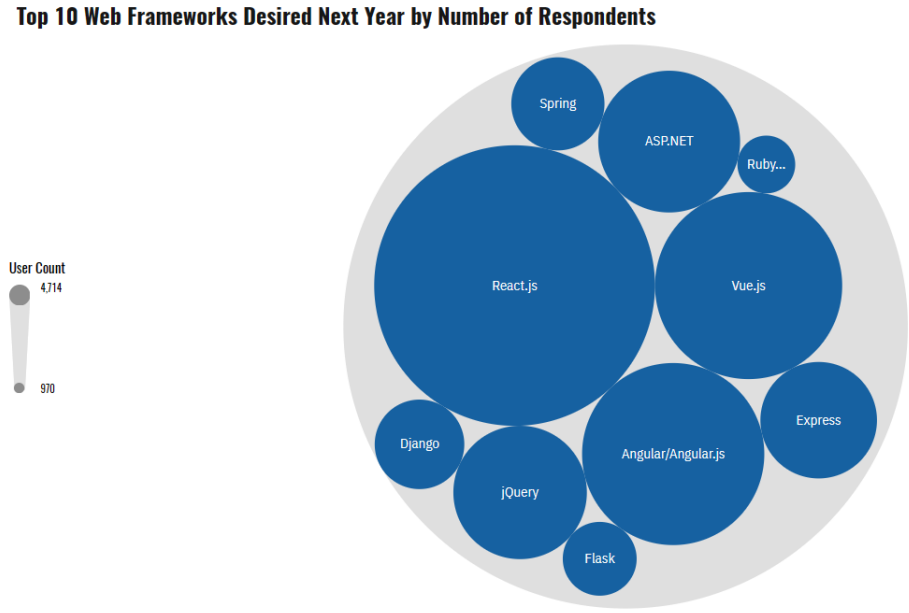
RESULTS – FRAMEWORK TRENDS

Current Year



- The leading framework currently being used included jQuery, Angular/Angular.js, React.js and ASP.NET.

Next Year



- React.js, Angular/Angular.js, and ASP.NET remain important frameworks in the next year.
- jQuery reflects lower demand for the subsequent year.

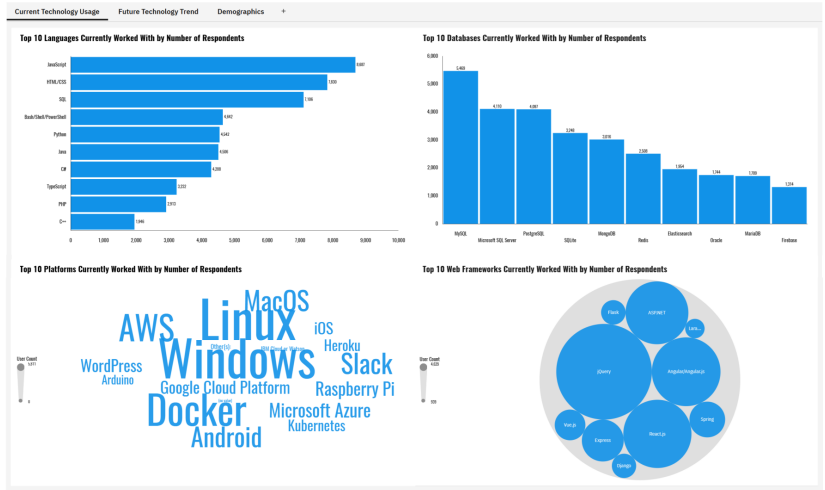
RESULTS – FRAMEWORK TRENDS

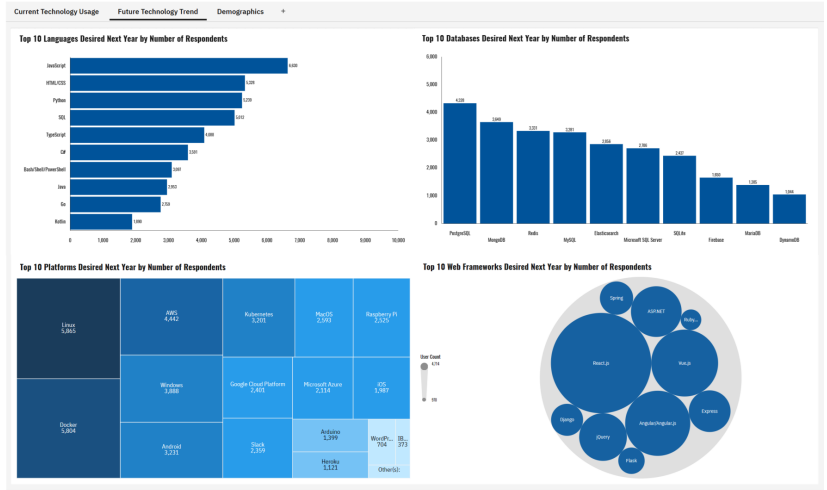
- Findings
  - The most currently used frameworks are composed of:
    - jQuery
    - Angular/Angular.js
    - React.js
    - ASP.NET
  - The most desired frameworks for the following year included:
    - React.js
    - Vue.js
    - Angular/Angular.js
    - ASP.NET
- Implications
  - Legacy frameworks like jQuery and ASP.NET continue to remain relevant and critical skills for developers.
  - There is a trending demand for skills involving more modular and flexible frameworks including React.js, Vue.js and Angular/Angular.js among developers.

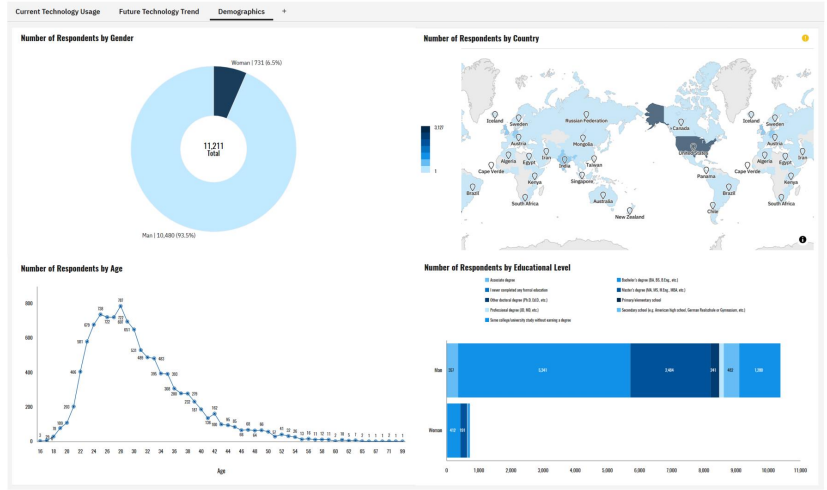

Section 3
Dashboard

DASHBOARD

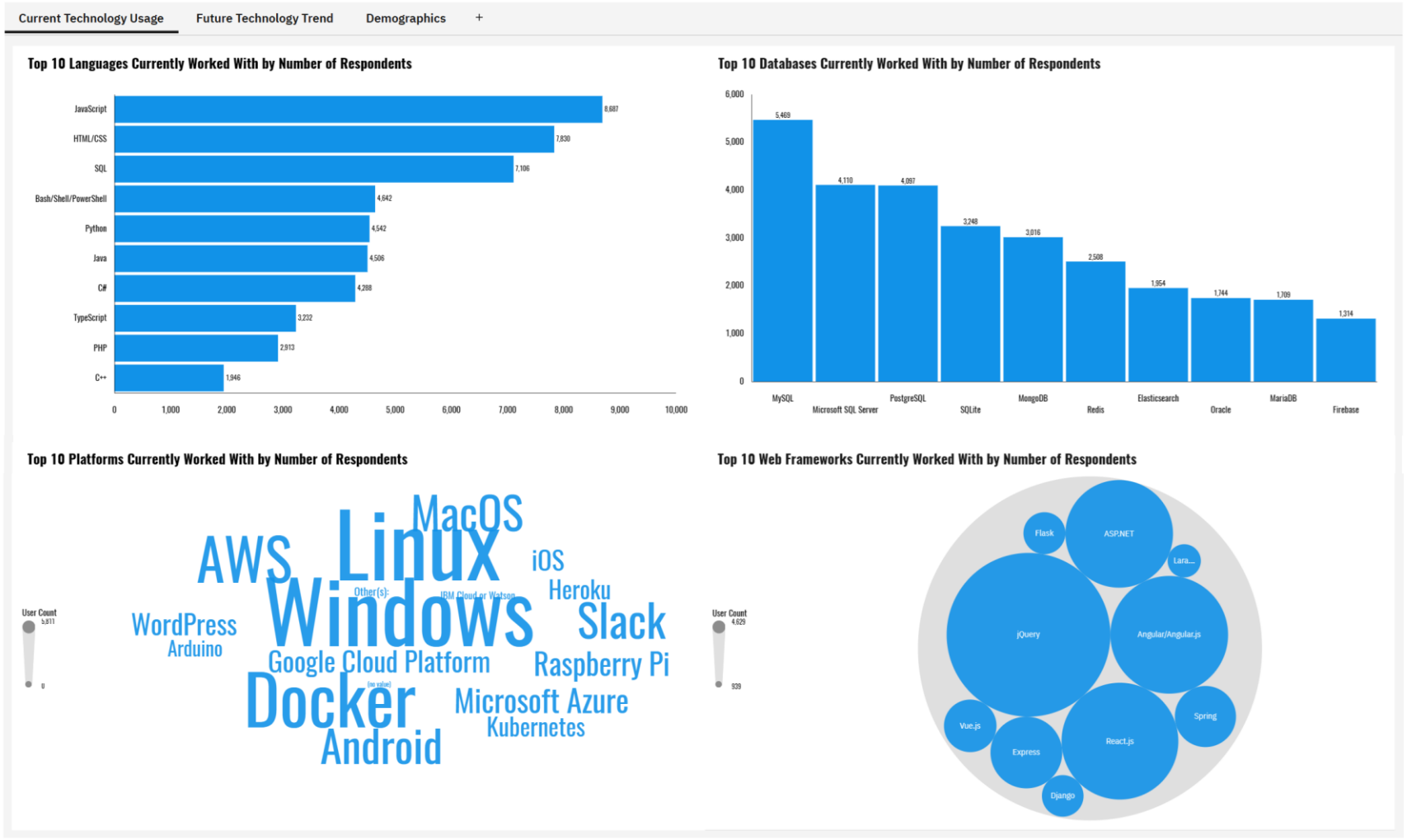
- The GitHub URL for the completed IBM Cognos dashboard presented in PDF format can be accessed here.



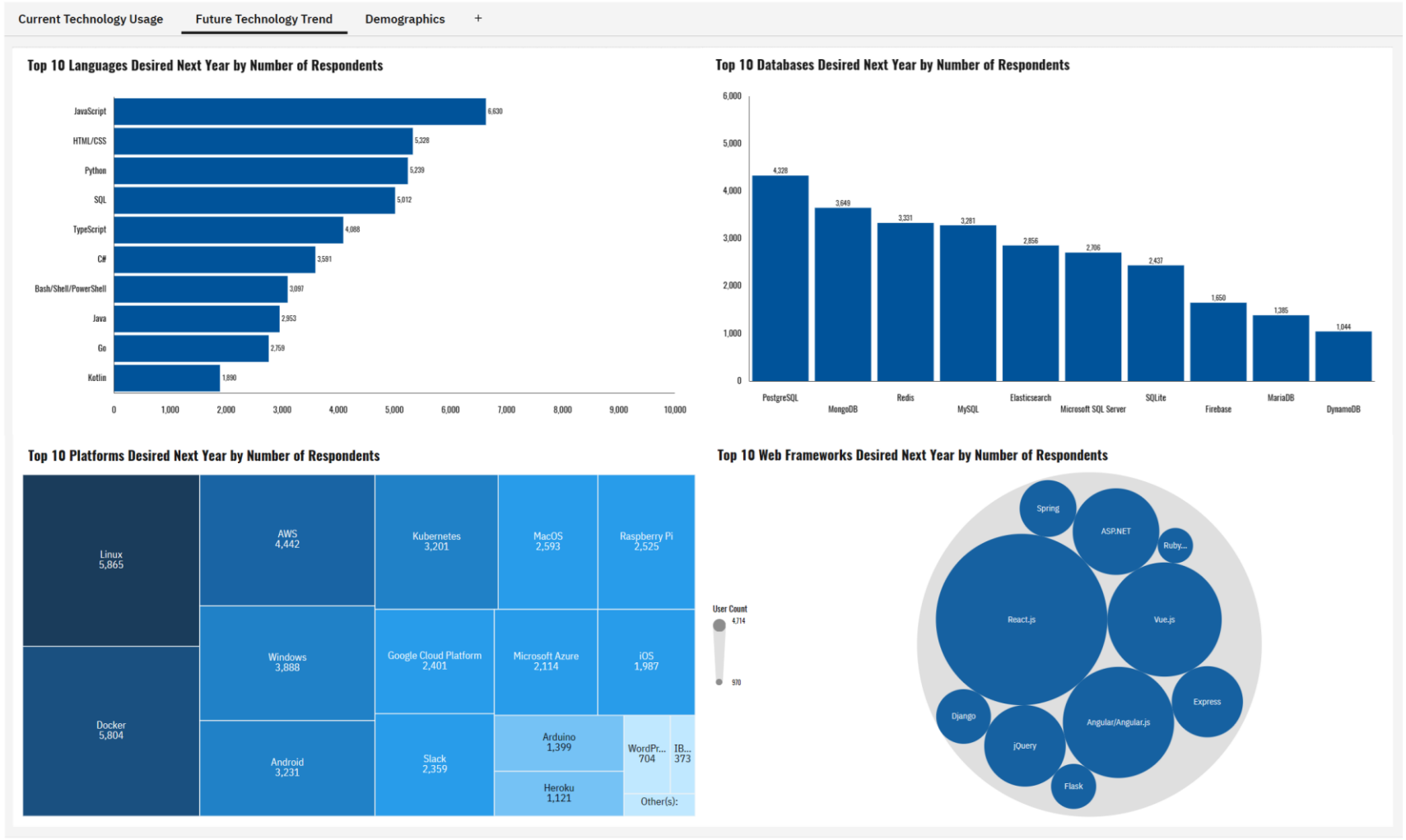




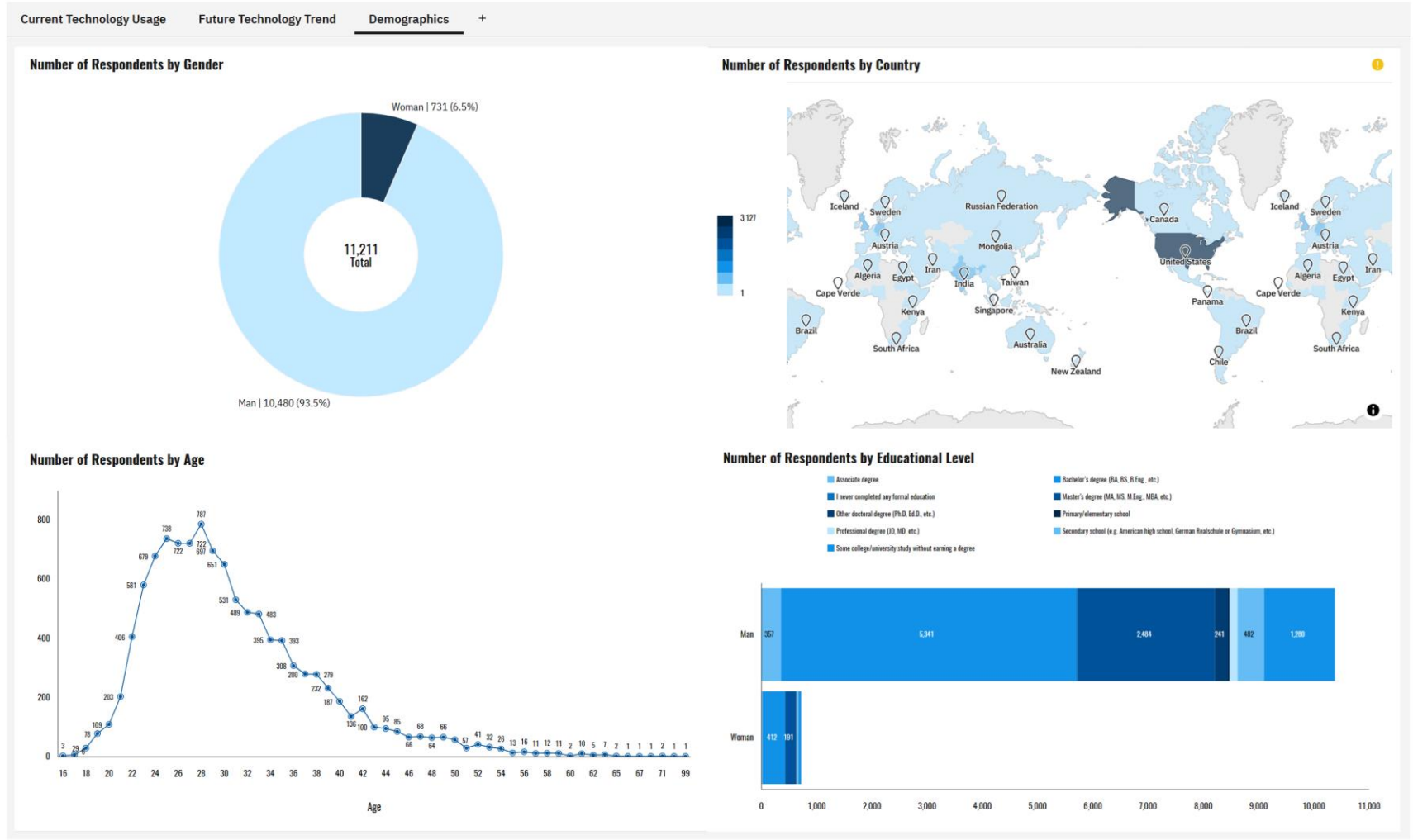
DASHBOARD TAB 1



DASHBOARD TAB 2



DASHBOARD TAB 3



Section 4

Summary

DISCUSSION

- Analysis results highlighted the trending demand for skills involving transformative technologies including general purpose programming languages, non-relational databases, open-source platforms and more flexible web frameworks.
- These findings demonstrated how IT professionals acknowledged the continually evolving technology landscape and how they must evolve with it to remain relevant and effective. Stagnation in IT skills can hinder an individual's career progression and impact an organization's ability to adapt and thrive in a digital world.
- Based on the perceptions of the survey respondents, continuous skill updates are not just advisable but imperative in the dynamic realm of information technology. IT professionals who commit to ongoing learning and skill development will be better equipped to navigate the ever-changing technology landscape and contribute to the progress of society and business alike.

OVERALL FINDINGS AND IMPLICATIONS

- Key findings from the study were as follows:
  - Both legacy and modern programming languages continue to be in high demand and remain significant as reflected by the higher compensation for IT professionals with these skills.
  - Majority of the IT professionals possess particular characteristics belonging to a dynamic workforce with the need to continuously adapt to changing industry needs.
  - There were differences between the currently used and desired technologies among IT professionals opting for more innovative, efficient and flexible programming languages, databases, platforms and web frameworks.
- Taken together, the overall implications of these observations are the following:
  - IT professionals must continuously update their skills amidst the relentless pace of technological advancements. Those who fail to stay current with these developments risk becoming obsolete and ineffective in a world where technology drives progress.
  - The integration of transformative technologies can greatly enhance efficiency and innovation. IT professionals who embrace the latest tools and practices are better equipped to streamline processes, reduce operational costs, and drive innovation within their organizations.

CONCLUSION

- Data collection for the analysis involved API requests, HTML web scraping and gathering survey data among target respondents.
- Appropriate pre-processing methods including remedial procedures to address duplicate, missing, outlier and non-normalized data were applied to prepare the data for subsequent analysis.
- EDA using visualization and SQL presented the various distributions, compositions and comparisons among technology indicators.
- Interactive visual analytics using IBM Cognos demonstrated the demographic patterns among survey respondents and the relationships between their technology preferences.
- Overall analysis findings were discussed and their practical implications highlighted.

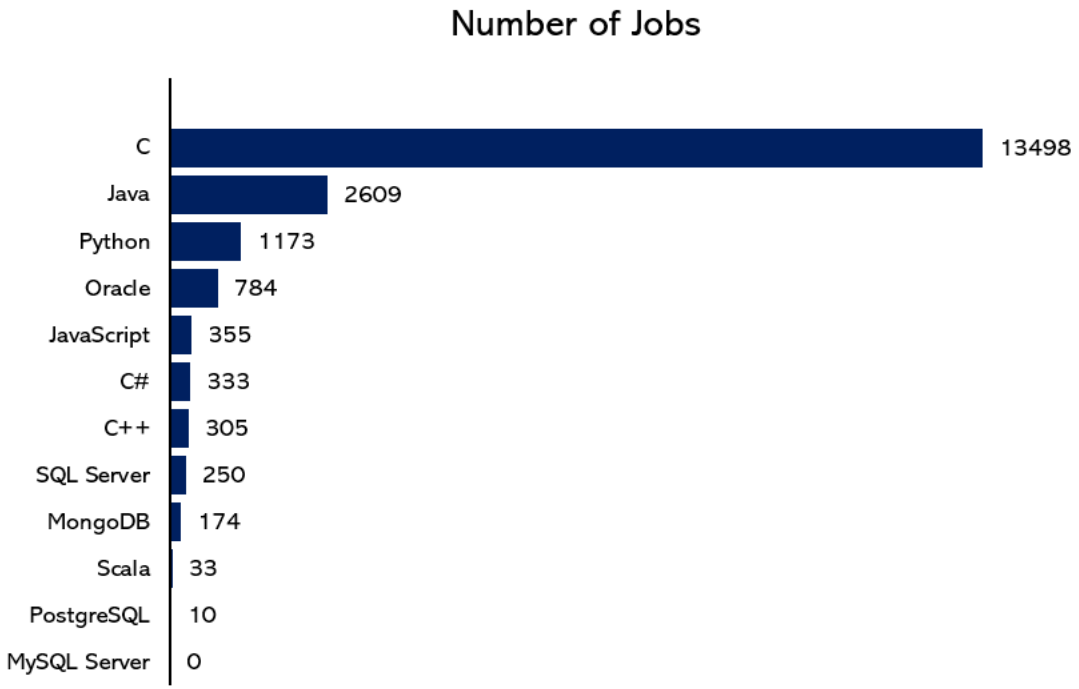
Section 5

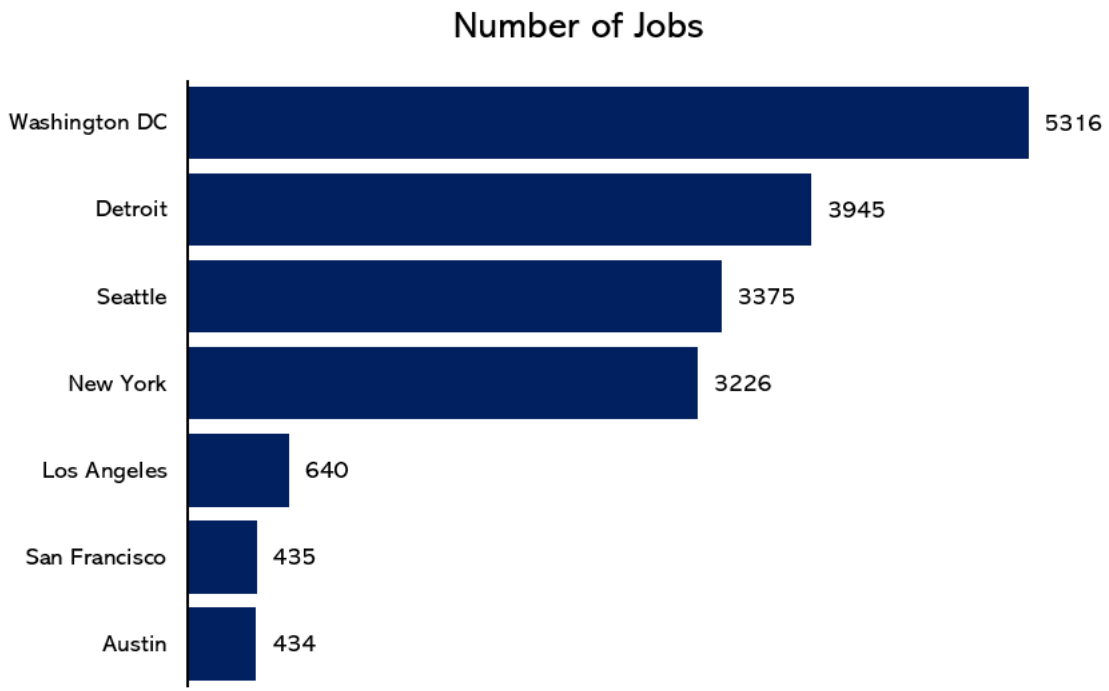
Appendix

APPENDIX

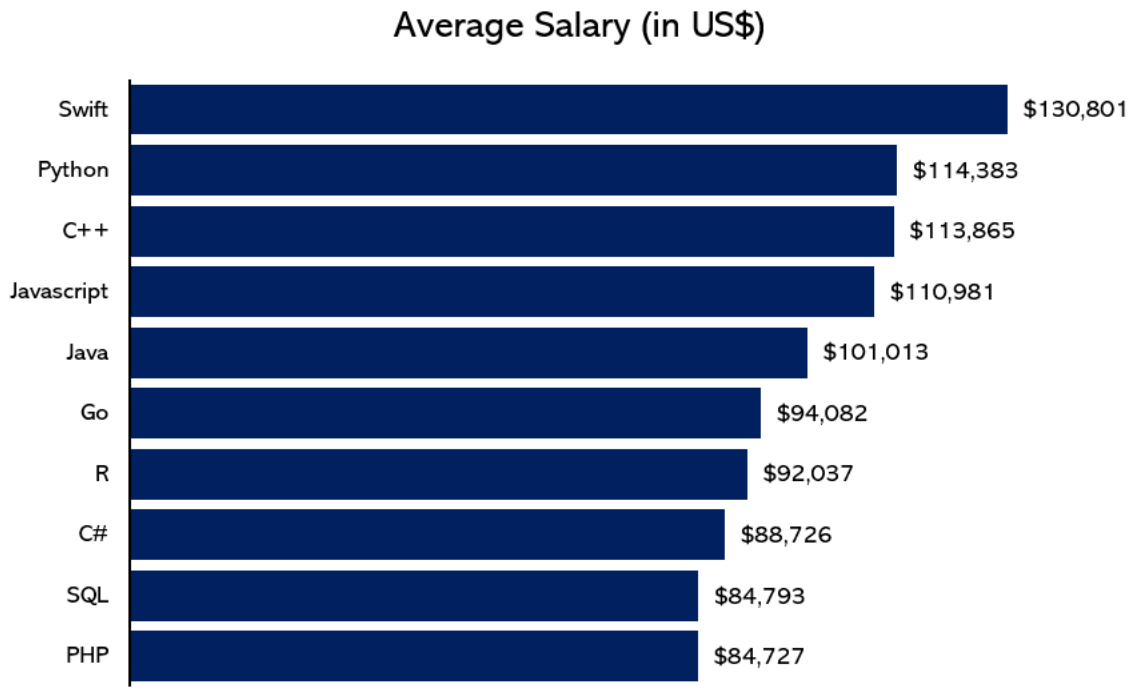
- Source Data
  - API URL: Job Postings
  - Webpage URL: HTML Table
  - Survey Data: CSV File 1 | CSV File 2 | CSV File 3
- Python Notebooks | Codes
  - GitHub URL: API Calls
  - GitHub URL: Web Scraping
  - GitHub URL: Survey Data Collection
  - GitHub URL: Data Wrangling
  - GitHub URL: EDA with Data Visualization
  - GitHub URL: EDA with SQL
  - GitHub URL: Interactive Visual Analytics with IBM Cognos

JOB POSTINGS





POPULAR LANGUAGES




Thank You!