

# POPULARITY OF PROGRAMMING LANGUAGES

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**Abstract:** Programming languages have evolved significantly since their beginning, allowing developers to communicate with machines much more quickly. From assembly languages to modern tools like Python and Rust, the IT landscape continues to grow and diversify. This paper examines the popularity and usage trends of programming languages by analyzing three prominent ranking systems: the PYPL index, the TIOBE index, and the Stack Overflow Developer Survey. These metrics provide us with insight into how many different languages are being studied and used in projects, as well as their general popularity and relevance. By comparing the data, this study shows Python's clear dominance in the last few years, high interest in newer languages like Rust and Go, as well as the continued relevance of older languages like Visual Basic, Fortran, and PHP. This analysis highlights how programming languages are constantly evolving and shaping technological advancements.

**Keywords:** Language popularity trends; Software development; Python; Javascript

## 1. Introduction

With modern society's increasing reliance on digital technologies, the virtual world has become just as important as the physical one. Behind every digital platform we use lies a foundation of code written in different programming languages [1].

Unlike humans, machines don't understand languages like English. They instead communicate using a binary system. This system represents information as a series of 0s and 1s. Machines are given instructions by combining these binary digits(bits) into complex patterns, which allows them to perform many valuable activities, such as calculations and data storage. This way of communicating with machines turned out to be too complicated and time-consuming for humans, and in an attempt to simplify this process, programming languages were invented [2].

One of the first programming languages was assembly language, developed in the 1940s. Assembly languages allowed symbolic representation of machine instructions. For example, now ADD could be used instead of 110010. Over the years, programming languages have started to look more and more like the English language. COBOL was developed in 1959

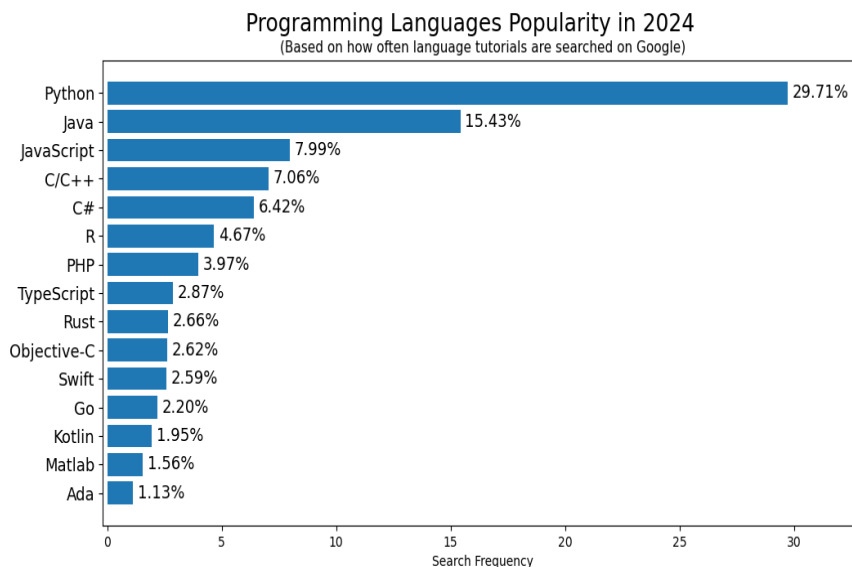
precisely to resemble English for easier readability. Today's modern languages like Python and Ruby still very much resemble English but are much more versatile than their predecessors [3].

With the increased number of programming languages, it is essential to classify them based on their functionality or popularity. This study will focus on analyzing data regarding the study trends of these programming languages, their search frequency on the web, and their real-world usage by developers. This will be done by analyzing and comparing three different language ranking systems: the Popularity of Programming Language (PYPL) index, the TIOBE index, and the Stack Overflow Developer Survey [4,5].

## 2. PYPL index

The PYPL index provides insight into the number of different programming languages being studied. It is based on the number of Google searches for tutorials in specific programming languages. This is important as it helps researchers, educators, and industry professionals predict which languages will become more critical for future tech development.

In addition to tracking overall popularity, the PYPL index offers yearly trends indicating which languages are gaining or losing interest, regional preferences, and historical data that allows the analysis of long-term trends [4].



**Figure 1.** Programming languages popularity in 2024: Google search trends for language tutorials

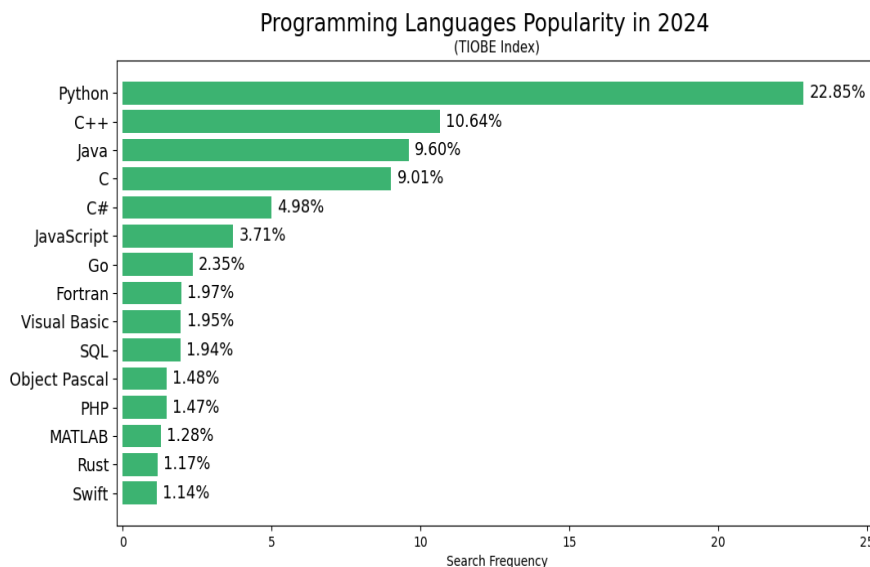
**Python's dominance.** Python's popularity has been on the rise for many years now due to its versatility and ability to help with almost any coding challenge. This programming language is the go-to option when it comes to creating AI tools and machine learning models. With the rise of new AI technologies, Python has firmly established itself as the leading language currently being studied [4].

**Java vs Kotlin.** Java remains the most widely used language for mobile app development, but Kotlin is steadily gaining recognition among developers. Its clarity and ease of code maintenance make it an increasingly popular alternative [6].

### 3. TIOBE index

TIOBE index is created and maintained by TIOBE Software BV, a software quality consulting firm based in the Netherlands. This acronym stands for “The Importance of Being Earnest,” the title of a comedy played by Oscar Wilde. It reflects the company's professional and sincere attitude towards customers and colleagues [5].

TIOBE index ranks the popularity of a programming language based on online searches across multiple search engines. Unlike the PYPL index, which focuses on study trends, the TIOBE Index shows how generally relevant and recognized different languages are. Besides general popularity ranking, this index provides us with yearly and historically long-term shifts in specific language popularity [4,6].



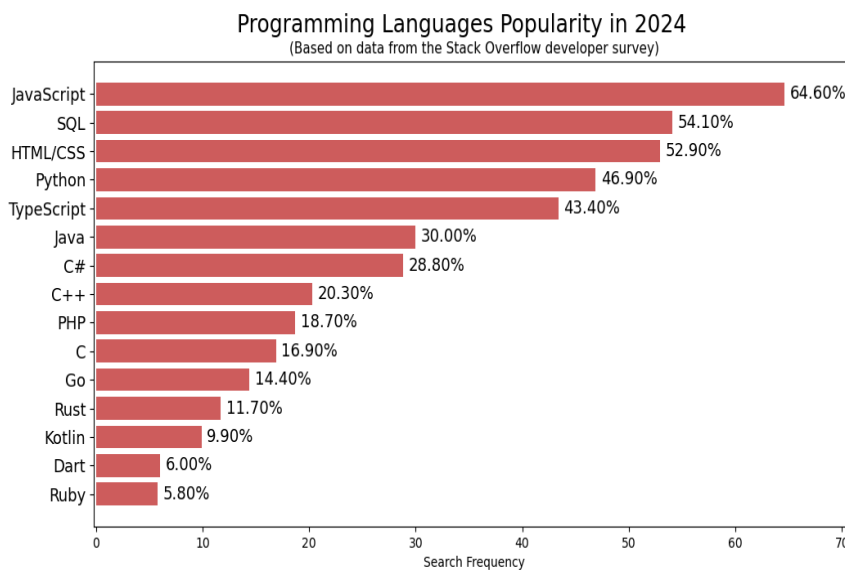
**Figure 2.** Programming languages popularity in 2024: insights from the TIOBE index

The index reflects the rise of newer languages like Go and Rust. Even though these languages are still not dominant in usage, this statistic shows growing interest in them. Go, developed by Google, is gaining traction for its simplicity and efficiency in cloud-based systems. Rust is often considered a modern alternative to C++. It is known for its high-speed performance, and it is being used more frequently, but it still has a long way to go before reaching the popularity of its predecessor [7].

Older languages like Visual Basic and Fortran are still highly ranked. While these languages are no longer a primary focus for modern student developers or new projects, they continue to be supported by large institutions, government organizations, and industries reliant on their stability and extensive libraries [8].

#### 4. Stack overflow survey

The Stack Overflow survey asks developers which programming, scripting, and markup languages they have extensively worked with in the past year. This is the most crucial statistic as it accurately describes which languages professional developers use in their day-to-day tasks [9].



**Figure 3.** Programming languages popularity in 2024: insights from the Stack Overflow developer survey

**Front-end development.** It comes as no surprise that JavaScript is the most used programming language. It is widely popular for front-end development, mainly due to its powerful frameworks like React and Angular. However, it is also capable of handling back-

end development through Node.js, making it a versatile language for both client-side and server-side applications. TypeScript is the superset of JavaScript that adds many more additional options and features. In addition to these front-end technologies, HTML and CSS are used to form the foundation of a webpage's structure and appearance, determining how the page is displayed and styled [10].

**Back-end development.** Most developers opt for Python, Java, and C# with the .NET framework for back-end development. The popularity of the Personal Home Page is steadily declining, and the language is now mainly used to maintain legacy systems and older websites built with it, such as many WordPress sites [11].

**Database management.** The final piece of the puzzle is databases, which store and manage data, allowing web applications to retrieve and manipulate information efficiently. SQL is the most popular language for manipulating databases [12].

Although IT, especially web development, has faced some challenging years, this statistic demonstrates that it remains the most widespread form of software development and will not disappear for the foreseeable future.

**Beyond web development.** The only highly ranked language on the list that is not commonly used for web development is C++. It is known for its efficiency, thus making it ideal for systems that require high-speed execution, like operating and embedded systems, as well as for creating software for hardware devices. This high-performance language plays a key role in the gaming industry, powering many game engines such as Unreal engine. Despite being older than many languages on this list, it remains one of the most potent languages due to its massive number of libraries and frameworks [13].

## 5. Conclusions

The PYPL index, TIOBE index, and Stack Overflow Developer Survey all paint a picture of programming languages as a constantly shifting and evolving field. Python stands out as the top choice thanks to its versatility and its leading role in AI and machine learning. JavaScript continues to dominate front-end development, while newer languages like Go and Rust are gaining traction for their efficiency and performance in specific areas. Meanwhile, older languages like Visual Basic and Fortran are still hanging on in legacy systems. The growing use of Kotlin in mobile apps and TypeScript in web frameworks shows how developers are leaning towards tools that make their work easier and more maintainable.

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