

# Computer Science Basics

## Introduction to Computer Science

Computer Science is the study of computers and computational systems. It encompasses both theoretical foundations, such as algorithms and data structures, and practical applications, such as software development and artificial intelligence.

### Key Concepts

- **Algorithm:** An algorithm is a set of instructions designed to solve a specific problem. For example, a sorting algorithm like QuickSort arranges a list of numbers in ascending order.
- **Data Structure:** Data structures organize data for efficient access and modification. Common examples include arrays, linked lists, and binary trees.
- **Binary System:** Computers use the binary system (base-2) to represent data. A bit is the smallest unit of information, which can be either 0 or 1.
- **Time Complexity:** This measures the efficiency of an algorithm. For example, a linear search has a time complexity of  $O(n)$ , while a binary search has a time complexity of  $O(\log n)$ .

### Programming Languages

A programming language allows humans to communicate instructions to a computer. Some popular languages include:

- **Python:** Known for its simplicity and readability, often used in data science and automation.
- **Java:** A versatile, object-oriented language used in enterprise applications.
- **C++:** A high-performance language used in system programming and game development.

### Conclusion

Understanding these foundational concepts is crucial for anyone entering the field of computer science. They provide the building blocks for more advanced topics like machine learning, cybersecurity, and distributed systems.