



华南理工大学  
South China University of Technology

## The Programming Layer Chapter 6&7&9

# Intro to Computer Science and Software Engineering

# Programming Languages

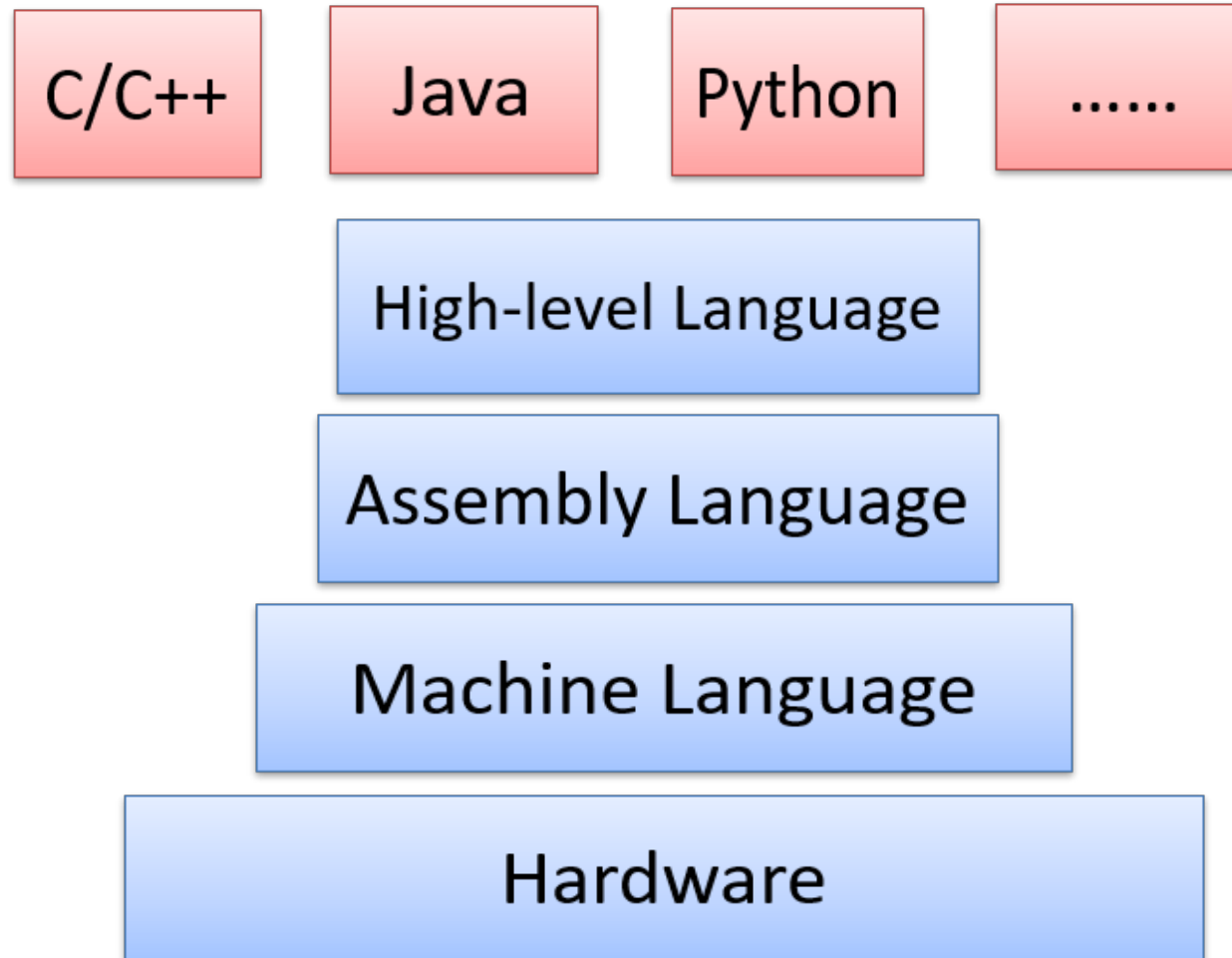
---



- **Instructions to the machine directly relate to these operations**
  - **Computer :Store ,retrieve and process,display data**
  - **User : enter data**
- **Machine Languages**
  - **A set of instructions executed directly by a computer's CPU**

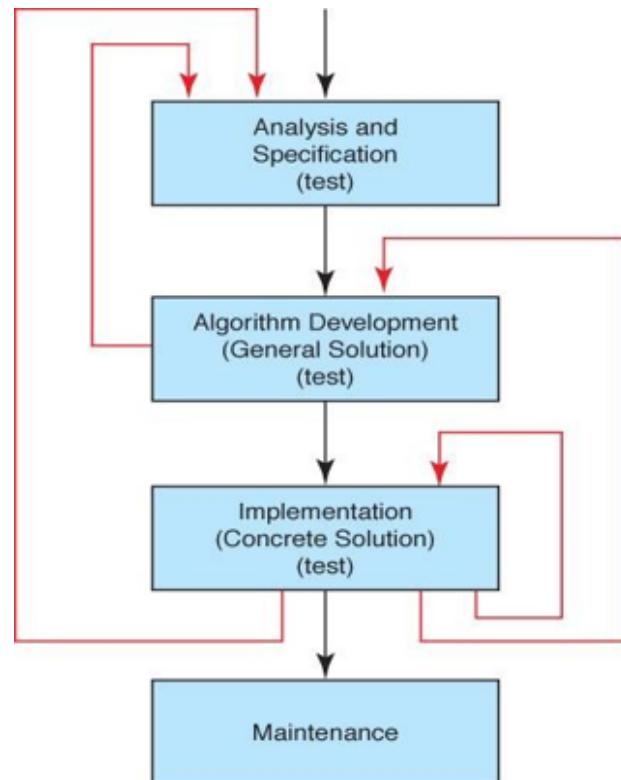
所有图片均来自网络

# The layer of languages



所有图片均来自网络

# Computer problem-solving process



## Abstract Step

An algorithmic step containing unspecified details

## Concrete Step

An algorithm step in which all details are specified

所有图片均来自网络

# Algorithm and pseudocode

---



- Algorithm
  - an **ordered set of unambiguous steps** that **produces a result and terminates in a finite time.**
- Pseudocode
  - an Englishlike representation for algorithm

所有图片均来自网络



## Algorithms with Simple Variables: Three constructs

- Sequence, Decision and Repetition (loop)

```
do action 1  
do action 2  
...
```

Sequence

A variable must be used to store the value of current condition!

Simple variable is enough, e.g.  
`int count = 0;`

If a condition is true  
Then

do a series of actions

Else

do another series of action

Decision

While a condition is true,

```
do action 1  
do action 2  
... ..
```

Repetition

所有图片均来自网络

# Basic Algorithms



- **Searching Algorithms**
  - Sequential searching
    - Unordered list
    - Ordered list
  - Binary searching (ordered list)
- **Sorting**
  - Basic Sorting
    - Selection sort
    - Bubble sort
    - Insertion sort
  - Other sorting algorithm

所有图片均来自网络

# Recursive Algorithms



- a process in which an algorithm called itself
  - Quick sort
  - Shell sort
  - Factorial example

## Factorial

Input: a positive integer `num`

```
1. if (num is equal to 0)
  then
    1.1 return 1
  else
    1.2 return num * Factorial (num-1)
End if
End
```

所有图片均来自网络



# Compilers



所有图片均来自网络

2022 Intro to CS and SE



**Imperative(命令式)**

**Declarative(声明式)**

所有图片均来自网络

# Programming Language Paradigms

---



- Categorized according to the approach they use in solving a problem and the category of problem they solve.
  - Procedural (imperative)
  - Object-Oriented
  - Functional
  - Logic (declarative)

所有图片均来自网络

# Key Points



- **Chapter 6**

- Programming Language (Machine Language, Assembly Language, High-level Language)
- CPU instructions and Programs
- Algorithm and Expressing Algorithm using Pseudocode

- **Chapter 7**

- Simple variables and Composite variables (Array and Record)
- Concepts of Sorting and Searching
- Sequential Searching and Binary Searching (Array-based and Tree-based)

所有图片均来自网络

# Key Points

---



- **Chapter 9**
  - Translation Process (Compiler and Interpreter)
  - Programming Language Paradigms (Imperative and Declarative)

所有图片均来自网络

