CSCE 110
Programming I

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Course Introduction

Instructions, algorithms, interpreter
What is the outcome of this course?

- Develop an understanding of programming
- Understand the value of programming
- Appreciate the value of experimentation
- Acquire problem solving skills
- Learn the Python programming language

What is programming?

Programming is the action of writing code to give a computer instructions to perform some tasks.
To program is to solve problems

What is programming Language?

- A programming language is a **formal language**.
- Programming languages specify a **set of instructions** that can be used to perform various actions.
- Programming languages can be used to create programs that implement specific **algorithms**.
Programming languages classification

Computer Languages

Low Level Language (Machine Language)
- Use 1’s & 0’s to create instructions
- Ex: Binary Language

Middle Level Language (Assembly Language)
- Use mnemonics to create instructions
- Assembly Language

High Level Language
- Similar to human languages
- COBOL, FORTRAN, BASIC
  - C, C++, JAVA

Programming languages classification
What is the best way to learn a language?

What is an algorithm?

An algorithm is a finite sequence of steps that solves a problem.

Computational complexity:
How much computing resources are needed to solve a problem? How long (time) and how much memory (space) does it take? We observe the behavior of algorithms as the input size grows.
Problem

Given a list of positive numbers, return the largest number on the list.

Activity

<table>
<thead>
<tr>
<th>List 5 programming languages</th>
<th>List 5 algorithms</th>
</tr>
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<tbody>
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</table>
How is code executed?

Code .c, .c++ ...

Compiler

Machine code 01010

Processor ARM

Processor Intel 8086

Processor IBM PowerPC

How is Java code executed?

Code .java

Compiler

Java ByteCode

JVM

Machine code 01010

Processor ARM

Processor Intel 8086

Processor IBM PowerPC
How is Python code executed?

Compiler vs. Interpreter

- A compiler is a computer program that converts an entire program into binary code (machine code) targeted to a specific CPU.

- An interpreter is a computer program that directly executes instructions written in a programming or scripting language, without compiling it into machine code.
Interpreter vs. compiler

Interpreting code is **different** from compiling code.

The interpreter executes **one instruction at a time**.

<table>
<thead>
<tr>
<th>Interpreter</th>
<th>Compiler</th>
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<tbody>
<tr>
<td>Translates program one statement at a time.</td>
<td>Scans the entire program and translates it as into machine code.</td>
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<tr>
<td>No intermediate object code is generated</td>
<td>Generates intermediate object code</td>
</tr>
<tr>
<td>Continues translating the program until the first error occurs</td>
<td>Generates the error message only after scanning the whole program.</td>
</tr>
<tr>
<td><strong>Python</strong>, Ruby, Perl, Matlab etc.</td>
<td><strong>C</strong>, <strong>C++</strong> etc.</td>
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Why Python?

- Easy to learn
- Solve problems in less time, fewer lines of code
- Elegant, intuitive syntax and dynamic typing
- Efficient high-level data structures
- Ideal for scripting and rapid application development
Why Python?

Applications of Python

• Machine learning
• AI
• Data Science
• Visualization
• Web Applications
How to configure your computer?

1. Install the Python distribution

Anaconda is a free open source python distribution that provides packages and libraries out of the box for data science.

- The core python language
- Python packages/libraries
- Package manager

Install Anaconda (Python 3.7 version)
https://www.anaconda.com/products/individual
2. Install the IDE

An Integrated Development Environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development.

- An editor designed to handle code
- Build, execution, and debugging tools
- Version control

**Install PyCharm (Community version)**
https://www.jetbrains.com/pycharm/download/
2. Install the IDE

The PyCharm community version is open-source and free. It is available for major operating systems:

- Windows
- MAC
- Linux

About Python

- Python was developed in 1989 by Guido van Rossum in the Netherlands.
- Python was released for public distribution in early 1991.
How did Python begin?

- van Rossum was having a hard time getting the job done with the existing tools available.
- He envisioned that there was an easier way to get things done.
- Python has been around for over 30 years, it is still relatively new to general software development.
- Python has lots of support from the community.