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 that specifies 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

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Programming languages classification

**High-Level Languages (Basic, Java, FORTRAN)**

- **low-Level Languages**
  - Assembler

**Compiler or Interpreter**

- Machine Code (Binary)
  - Hardware
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.

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
- Intel 8086
- IBM PowerPC

How is Python code executed?

Code .py → Interpreter → Runtime libraries → Processor
- ARM
- Intel 8086
- IBM PowerPC
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>
</tr>
</thead>
<tbody>
<tr>
<td>Translates program one statement at a time.</td>
<td>Scans the entire program and translates it as into machine code.</td>
</tr>
<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>Python, Ruby, Perl, Matlab etc.</td>
<td>C, C++ 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
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/download/

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 WingWare IDE 101
2. Install the IDE

WingWare 101 is 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.