Week 4 - Lecture Notes

Welcome to Week 4!

A central concept to programming that we will review over the next few weeks is the idea of data structures and algorithms. Algorithms, in computer science, are a very big subject, and generally have whole classes dedicated to them. We will touch upon both algorithms and data structures in much briefer way, but these concepts are necessary building blocks for a lot of what you will learn about programming going forward. This week, we will primarily be focusing on algorithms; next week, we'll finish this section up by going over data structures.

An algorithm, as you may know, is a step-by-step procedure for performing a calculation or solving some problem. Typically, an algorithm has a set of inputs, a clear and precise set of instructions to run, and a set of output values. For example, a cooking recipe would count as an algorithm: you have a set of inputs (ingredients), a set of instructions (i.e. 'Pre-heat the oven to 330 degrees F') and an output (i.e. a cake). Also, in IS210, you should have seen a few algorithms and should already implemented a bubble sort.

Many of you might be thinking: "Well, this sounds very familiar to the definition of a function. Are they the same thing"? They are indeed very similar, but there is a very subtle difference between the two. A function is a block of executable code in a computer program, in our case a chunk of code written in Python. However, an algorithm is an abstract concept whose purpose is to describe how to solve a given problem. Certainly, we can *implement* algorithms as functions, but algorithms are an abstract concept.

Another core concept to algorithms and computer science is analysing algorithms to find out how well they perform as you increase the size of the algorithm's input. For example, using this analysis, we can compare different sort algorithms to see which one would perform better as the size of data increases. This is helpful when choosing which algorithm you might want to implement in your solutions.

There are some very common algorithms you will see in your programming career, many of them dealing with sorting and searching lists of data.

In this week's reading, you will cover some of these important algorithms. Also, this week we will very cover 'analysis of algorithms', and learn some new algorithms for searching and sorting a list of data. For this week's assignment, you'll be asked to TODO describe assignment