Week 01 Course Introduction

CSE 382

> Understanding of life begins with the understanding of patterns.
>
> - Fritjof Capra

> Smart data structures and dumb code works a lot better than the other way around.
>
> - Eric S. Raymond

The Why of Patterns and Data Structures

Welcome! You are about to embark on a learning adventure that will change the way you design and write code. The generations of programmers that came before you have exprimented, learned, grown, and shared what they've learned with each other and you. In this class, you step out of being limited by a single language and start to explore what is already known about language-free functional programming.

This class is just the beginning of your learning adventure. All through your career you will experiment, learn, grow, and share what you have learned. This is part of being a professional that cares about their craft. A portion of this adventure laying in your path is to explore the vast set of writings on patterns and data structures, both professional and academic.

As your understanding of previously discovered patterns and data structures increases and improves, your professionalism and skill will also increase and improve. Gone will be time wasted rediscovering something already in this body of knowledge created by others. Eventually, you too will contribute to that body of knowledge as you share new patterns and data structures you discover as you solve significant problems for companies for whom you work.

Some Definitions

Pattern: a particular way in which something usually happens or is done

Data Structure: a defined pattern for efficiently storing, accessing, and processing data

Are you ready for the ride? Then strap on your seat belt, and let's begin! Take notes on your impressions regarding what you are about to read. You will need these notes when you meet with your team on Friday of this week.

Patterns and Data Structures and Algorithms...Oh My!

These big three parts of programming, regardless of the language you choose, are related. An Algorithm is a pattern consisting of a series of steps that is known to accomplish a specific task with a known efficiency. A Data Structure is a pattern that lays out how to store, retrieve, and manipulate data with a known efficiency. This connection between patterns, data structures, and algorithms means that we can, and will, use the more abstract word pattern to describe both of the other two types, reserving the more detailed words, algorithm and data structure, when they illuminate the topic.

As time goes by, you will realize that algorithms and data structures interact as well. Useful algorithms use or produce one or more data structures, and data structures use one or more algorithms. Such is the complexity and recursiveness

of life. Nothing is actually independent of everything else. Instead, everything is dependent, directly or indirectly, on everything else. The lives of mothers and fathers change the lives of their children and the lives of the children change the lives of their mothers and fathers. Families, of all kinds, are complex systems.

> All complex systems continually and recursively modify themselves... One part of any recursive routine is the routine itself. Or in terms of complex systems, part of a complex system's existence is to bring itself into existence anew - to continuously emerge - or as expressed by Kampis, to evolve. This evolution results in the increasing complexity of complex systems.(Barney and Maughan)

A Few Books on Complexity Theory

An Introduction

A Detailed Computer Science and Mathematical Description

Let's get out of cold philosophy and into the realm of the gospel where greater warmth, truth, and light lies. Elder Oaks taught in a conference talk about how The gospel of Jesus Christ challenges us to become.

> The Final Judgment is not just an evaluation of a sum total of good and evil acts - what we have done. It is an acknowledgment of the final effect of our acts and thoughts - what we have become. It is not enough for anyone just to go through the motions. The commandments, ordinances, and covenants of the gospel are not a list of deposits required to be made in some heavenly account. The gospel of Jesus Christ is a plan that shows us how to become what our Heavenly Father desires us to become. (Dallin H. Oaks)

The gospel of Jesus Christ teaches us that the only thing that can change us is us. As we become what we can, should, and need to become, our becoming opens up the ability to become even more. Light begets light until we are filled with light. Or, if we turn from Christ, darkness begets further darkness until we loose all that we once had. Each of us is complex and part of a greater complexity that is our family, friends, aquaintances, those we don't know, nature, space, galaxies, and universes.

Exploring the complexity that is algorithms, data structures, and patterns is the journey we now begin.