

CMSC 351: Introduction

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May 25, 2023

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1 Introduction

This course is a brief introduction to algorithms. It covers the basics of algorithm design, many common algorithms related to sorting and searching of lists, arrays and graphs, and ends with a brief discussion of the abstraction of time complexity.

2 Learning to Write Algorithms

I'm thinking of the course as an algorithms analogy to MATH310 which is an introduction to proofs. In fact I think of writing algorithms much like I think of writing proofs. It's hard to give a simple and straightforward explanation of "how to write an algorithm to do X" much the same way as it is to give a simple and straightforward explanation of "how to prove X". Rather the best approach is to learn some basic techniques while studying existing algorithms (or proofs) and initially practicing modifications of those algorithms (or proofs).

3 Course Goals

In broad strokes the goals of the course include:

1. Understand the algorithms.
2. Apply the algorithms to various input data.
3. Calculate various operation counts.
4. Calculate pseudocode time complexity in reasonable situations.
5. Make simple modifications to these algorithms in various ways.
6. Points 1,2,3,4 for simple modifications of these algorithms.
7. Understand common algorithmic approaches (linear, divide-and-conquer, etc.)
8. Understand and modify the nuances of some proofs related to algorithms.
9. Apply general recursion approaches - trees, the Master Theorem, constructive induction.
10. Understand how algorithms can be applied in real-world situations.
11. Understand new algorithms whose fundamental underpinnings are similar to familiar ones.
12. Understand the notions of Turing machines and of P and NP.