CSC 236 Learning Outcomes

Summer 2023

1. Mathematical Tools

   a. Mathematical Objects

      i. Functions

      ii. Graphs

      iii. Prove properties of the above mathematical objects

      iv. Model problems using the above mathematical objects

   b. Proving $\forall n.P(n)$.

      i. Apply the Principle of (Simple) Induction.

      ii. Apply the Principle of Complete Induction (CI).

      iii. Apply the Well Ordering Principle (WOP).

      iv. Understand the Principle of Structural Induction (SI).

      v. Understand the equivalence of the above 4.

2. Algorithm Analysis

   a. Understand the correctness of an algorithm in terms of preconditions and post-conditions.

   b. Recursive correctness

   c. Runtime

      i. Find asymptotic runtime of iterative algorithms

      ii. Set up and solve recurrence relations.

      iii. Apply the substitution method and recursion tree methods.

      iv. Apply the Master Theorem to analyze the runtime of divide and conquer algorithms.

   d. Iterative correctness

      i. Loop Invariants

      ii. Partial Correctness

      iii. Termination

3. Formal Language Theory

   a. Understand the following terms

      i. Alphabet

     ii. String

    iii. Language

b. Automata

      i. Define/Analyze/Construct Deterministic Finite Automata (DFAs)

     ii. Define/Analyze/Construct Nondeterministic Finite Automata (NFAs)

    iii. Define/Analyze/Construct Regular Expressions

c. Regular languages

      i. Define Regular Languages.

     ii. Show the "equivalence" of DFAs/NFAs/Regular Expressions

    iii. Understand and apply closure properties of regular languages.

    iv. Prove languages are regular.

     v. Understand the Pumping Lemma and apply it to prove certain languages are NOT regular.