

# CPSC 320: Intermediate Algorithm Design & Analysis

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## Course Learning Goals

- Design algorithms for computational problems
  - + Techniques for thinking iteratively and recursively
- Evaluate correctness/performance of algorithms
  - + Mathematical tools for handling recurrence relations and summations
- Derive lower bounds on the time (or space or other resources) it takes to solve a problem
  - + Approaches for assessing a problem space and the fit of a solution to the problem

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## Representative Problem: Residency Insanity

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## Accomplishments in Resident Matching

- Clearly defined meaningful terms and symbols (e.g., preference, matching, stable matching)
- Stated and related versions of the problem with differing complexity and abstractions (e.g., 1-to-1 vs. many-to-1 matching)
- Formally established whether the problem is solvable in general
- Formally established properties of our algorithmic approach, including performance

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## CPSC 320 Terms to Define As We Go

- Problem
- Instance
- Algorithm
- Machine model

Note: in 320 we write algorithms to clearly express a solution to other humans. So, we may use pseudo-code, words, or even pictures, and we often ignore error-checking.

## What's Next?

- Read course policies on the website
  - You are expected to become familiar in the next week with the complete website, including e.g. grading policies
- CLRS Sections 1, 2, and 3.2 and Appendices A.1 and B.1-B.3

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## On Your Own

Use the readings to:

- Review CPSC 221
- Consider Insertion-Sort, Selection-Sort, Merge-Sort, and Stable-Marriage from the perspective of alternate algorithm design approaches:
  - Insertion: Consume input iteratively, maintaining a complete solution-so-far
  - Selection: Produce output iteratively, always producing correct output-so-far
  - Stable-Marriage: Iterative construction and repair of a solution (a bit like each of insertion and selection)
  - Merge: Divide the problem into pieces, solve the pieces, and merge the solutions (Divide-and-Conquer)