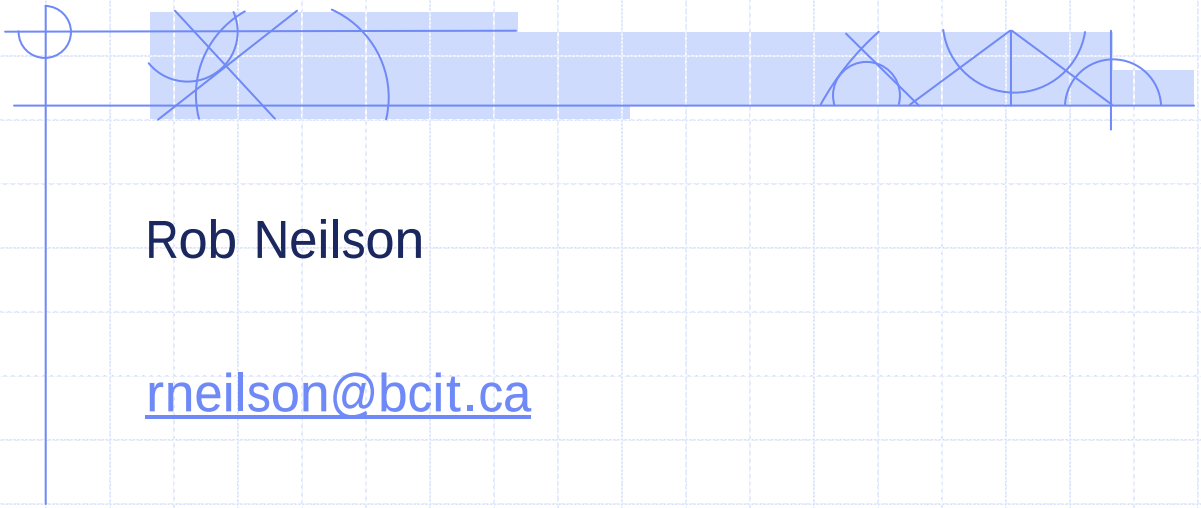
COMP 3760: Algorithm Analysis and Design

Lesson 13: Midterm Preparation



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Exam Details

Date: Wednesday Oct 22, 2008
Time: 12:30-2:30
Room: SW5-1850

No 3760 labs next week (for any sets)

Office hours (next week only):

Monday	8:30-10:30
Tuesday	9:30-11:30
Wednesday	8:30-10:30

Of course WebCT questions are encouraged at any times.

Examination Rules

- you are allowed a single 8.5”x11” handwritten sheet for formulas etc
  - (you will have to hand this in with your exam)
- during the exam you cannot share notes with other students
- no electronic devices (calculators, phones, MP3 players etc)
- no books or other notes
- sit in alternating seats, alternate rows, with an empty seat between each student, so that you do not have a direct view of someone else’s paper

Types of Questions

- No multiple choice
- No definitions / rote memorization
- No pure math questions
- Focus is problem solving
- There will be six equal-weight questions
- You will likely be asked things like this ...
  - apply known algorithms to a set of data (ie: show that you know how an algorithm works)
  - draw a data structure after inserting/deleting data in it
  - devise an algorithm to solve a small problem and determine its complexity
  - given a pseudocode algorithm:
    - explain what it does
    - count the number of basic operations as a function of input size
    - suggest improvements to the algorithm

Scope of the Exam

- The exam may include material from:
  - textbook
  - lectures
  - labs
  - homework
  - assignments
  - in-class handouts
  - material from pre-requisite courses
  - the internet
  - other?

Chapters Covered

1.1-1.4 ... introduction

2.1-2.3 ... analysis of non-recursive algorithms

3.1-3.3 ... selection+bubble sort / sequential search / string matching / brute force algorithms

3.4 ... exhaustive search problems

4.3 ... binary search / divide and conquer

5.4 ... generating permutations / decrease and conquer

6.4 ... heaps & heapsort / transform and conquer

7.1 ... input enhancement / space&time tradeoffs

7.3 ... hashing

Analysis Topics

- determining input size n
- finding/counting basic operations
- setting up and solving summations to get closed form
- efficiency classes
- big-Oh

Data Structure Topics

- arrays
- lists, queues, stacks
- maps and sets
- hash tables
- priority queues and heaps

You should know:

- how these things can be implemented
- the efficiency class of typical operations performed on these (insert, remove, find, traverse etc)
- how to write algorithms that operate on these
  - eg: find the middle element in a list
- how to devise solutions that use these structures
  - eg: use a list to store the words in a sentence

Algorithm Design Techniques

- Brute Force
- Divide and Conquer
- Decrease and Conquer
- Transform and Conquer
- Space-Time Trade-offs

Types of Problems

We have covered a variety of types of problems, but some of the main ones include:

- sorting
- searching
- string matching
- permutations
- counting
- mapping
- distinct element
- k^{th} smallest element
- finding max, min, median

there are probably other types, but these are some of the more common ones

Common Exam Writing Mistakes

1. Just duplicating something from your hint sheet
   - … which you need to submit with your exam
2. Incomplete, messy, unclear diagrams or code
   - if it is ambiguous to me you will lose marks
3. Writing java code instead of pseudocode
   - we have had lots of practice with pseudocode
4. Not enough detail in pseudocode when the question asks for "detailed pseudocode"
5. Not showing your work … ie … just putting down an answer with no supporting work
6. Not providing a convincing argument or justification when a question asks you to "explain"
7. Using a diagramming technique from a different course
8. Using the wrong algorithm altogether
9. Not reading the exam before you begin
   - sometimes people do not finish because they spend too much time on a question they do not know the answer to
   - questions are not in any particular order

Good Luck!!

The End