Work will always be due the next Monday, Wednesday, or Friday that regular classes are in session. This means no work is due during breaks but work will be due after breaks. Snow days are an exception and work is still expected to be due then.

Homework 1 – 1/26/15 (Monday)

1. What are the best-case and worst-case tree heights for weighted quick-union and weighted quick-union with path compression? Give your answers in terms of order of growth.
2. Textbook: 1.5.1, 1.5.2, 1.5.3

Homework 2 - Wednesday

1. Textbook 1.4.4
2. Fall 2010 Midterm, #1d
3. Fall 2011 Midterm, #2

Programming Assignment 1 - Friday

Write a program to estimate the value of the percolation threshold via Monte Carlo simulation.

Homework 3

1. Textbook 1.3.6
2. 1.3.3
3. 1.3.22, then 1.3.23
4. Understand why the we prevent loitering by adding the line A[N] = null in Algorithm 1.1 on page 141 of the book. Why do we not have a special purpose line like this for our linked list implementation (page 149, algorithm 1.2).

Homework 4

1. Final 2008 midterm, #9

Give a worst case and best case input for insertion sort and selection sort.

Programming Assignment 2

Write a generic data type for a deque and a randomized queue. The goal of this assignment is to implement elementary data structures using arrays and linked lists, and to introduce you to generics and

iterators.

Homework 5

Give a worst case and a best case input for mergesort.

Homework 6

1.Give a worst-case input for non-random quicksort that chooses the leftmost element as a pivot. Why is a best case input hard to think of?
2.Textbook 2.3.8
3.Textbook 2.3.11
4.Spring 2013 midterm, #4a

Programming Assignment 3

Write a program to implement autocomplete for a given set of N strings and positive weights. That is, given a prefix, find all strings in the set that start with the prefix, in descending order of weight.

Homework 7

1.Textbook 2.4.2 (assume we'd also like to support delete operations)
2.Textbook 2.4.4
3.Textbook 2.4.11, 2.4.12
4.Textbook 2.4.14
5.Spring 2008 #5, Fall 2008 #4, Fall 2009 #3, etc.

Homework 8

1.What is the best case BST height? Worst case?
2.If shuffling guarantees log N tree height (probabilistically), why don't we simply shuffle our input data before building our BST based symbol table to avoid worst case behavior?
3.Textbook 3.2.3, but give only two orderings.
4.Textbook 3.2.4

Programming Assignment 4

Write a program to solve the 8-puzzle problem (and its natural generalizations) using the A* search algorithm.

Homework 9

Programming Assignment 5

Programming Assignment 5

Create a symbol table data type whose keys are two-dimensional points. Use a *2d-tree* to support efficient *range search* (find all of the points contained in a query rectangle) and *nearest neighbor search* (find a closest point to a query point). 2d-trees have numerous applications, ranging from classifying astronomical objects to computer animation to speeding up neural networks to mining data to image retrieval.

Homework 10

1.Given an LLRB, is there exactly one corresponding 2-3 tree? Given a 2-3 tree, is the exactly one corresponding LLRB?
2.Draw a 2-3 tree with all 3 nodes. Why is the height log3(N)?
3.How many compares does it take in the worst case to decide whether to take the left, middle, or right link from a 3 node?
4.Fall 2010 Midterm, #4. Fall 2011 Midterm, #6. Spring 2012 Midterm, #5. Spring 2013 Midterm, #2. Fall 2008 Midterm, #6. Fall 2009 Midterm, #4.

Homework 11

1.Textbook 3.4.5
2.Fall 2010 Midterm, #5, Fall 2012 Midterm, #6a

Homework 12

Midterm

Homework 13

1.Fall 09 Final, #2a
2.Textbook: 4.1.12

Homework 14

1.Spring 08 Final, #1a, #1b
2.Fall 08 Final, #1a, #1b
3.Fall 10 Final, #3a
4.Spring 12 final, #3a, #3ab

Homework 15

1.Spring 08 Final, #2a, #2b
2.Fall 08 Final, #2a, #2b
3.Fall 09 Final, #1b
4.Fall 09 Final, #3a, #3c
5.Fall 10 Final, #4a, #4b
6.Fall 10 Final, #3a, #3b
7.Spring 12 Final, #4a, #4b
8.Would Kruskal's or Prim's algorithm work with edge-weighted digraphs?

Homework 16

1.Fall 2009 Final, #4
2.Fall 2010 Final, #5
3.Textbook 4.3.1 and 4.4.1

Programming Assignment 6

Implement WordNet

Homework 17

1.Fall 2011, #11
2.Spring 2012, #11
3.Fall 2012, #6

Homework 18

1.Spring 2012 Final, #6

Programming Assignment 7

In this assignment, you will create a data type that resizes a W-by-H image using the seam-carving technique.

Homework 19

1.Spring 2008 Final, #5
2.Spring 2008 Final, #4
3.Fall 2011 Final, #8
4.Fall 2012 Final, #8
5.Textbook 5.2.3, 5.2.4

Homework 20

1.Spring 2008 Final, #6
2.Fall 2009 Final, #6
3.Fall 2012 Final, #10

Homework 21

1.Spring 2008 Final, #8
2.Fall 2008 Final, #8
3.Fall 2009 Final, #7
4.Fall 2010 Final, #9
5.Spring 2012 Final, #10
6.Spring 2012 Final, #11
7.5.4.1, 5.4.2

Homework 22

1.Spring 2008 Final, #4
2.Fall 2008 Final, #7
3.Fall 2011 Final, #10b
4.Textbook 5.5.3

Homework 23

None

Homework 24

Final

Programming Assignment 8

Implement the Burrows-Wheeler data compression algorithm.