CSCI 104L Midterm Review Topics

ALGORITHMS:

- Recursion: Programming and Analysis
- Sorting Algorithms: Runtimes, Loop Invariants, Stability
- Search Algorithms: Linear, Binary, Interpolation

DATA STRUCTURES:

- Linked Lists
- Arrays and ArrayLists
- For all data structures:
  - The functions they provide.
  - How and where to use them.
  - How they are implemented.
  - How fast the operations are.
- ADTs
  - Lists
  - Queues
  - Stacks
  - Maps
  - Sets

RUNTIME ANALYSIS:

- Definition of worst-case runtime.
- How to provide upper and lower bounds
- How to perform calculations with $O, \Omega, \Theta$.
- Setting up sums for loops.
- Setting up recurrences for recursion.
• Basic sums
  – Arithmetic
  – Geometric
  – Harmonic

• Amortized runtime (averaging runtime over multiple calls).

C++ PROGRAMMING:

• Object-oriented design

• Abstraction and Encapsulation (packing common-purpose elements into the same class).

• Structs and classes: public, protected, private.

• Constructors and destructors: shallow and deep copies.

• Pointers, passing by value and reference.

• Operator overloading and friend access.

• Inheritance and polymorphism
  – Virtual functions
  – Abstract classes
  – Scoping (BaseClass::function)

• The const keyword, how and why to use it.

• Exceptions