CSCB63 – Design and Analysis of Data Structures

Anya Tafliovich[1]

[1]with huge thanks to Anna Bretscher and Albert Lai

who I am

- Dr. Anya Tafliovich — Anya
- 2002: Hon.BSc: Specialist in CS, major in Math
- 2004: MSc in Computer Science
- 2010: PhD in Computer Science
- since 2010: Assistant Prof Teaching Stream at CMS
- since 2016: Associate Prof Teaching Stream at CMS
- since 2022: Professor Teaching Stream at CMS
- Research Interests (in no particular order):
  - Formal Methods of Software Design, Software Verification, Automated Reasoning, Quantum Computing, Programming Languages, Computer Science Education, Software Engineering Education
- Teaching: variety of courses
  - A08/A48, A20, B07, B63, C01, C24, D01, D72, D92, D94/95

who I am

- rock climbing, running, reading, learning to play piano
- should really start practising yoga again...
- two children — 15 and 12 years old
- two cats — 5 year-old

who you are

- program of study?
- year of study?

who you are – prerequisites

- Exclusions: CSC263H, CSC265H
- Prerequisites: CSCB36H3 and [CGPA of at least 3.5, or enrolment in a CSC Subject POSt, or enrolment in a non-CSC Subject POSt for which this specific course is a program requirement].
- It is your responsibility to ensure you have all prerequisites for the course.

written communication

- All communications:
  - Use full sentences. Use correct capitalisation and punctuation.
  - Use a spellchecker.
  - Proof-read your message before sending/posting.
- Emailing your professor:
  - Use your official UofT email.
  - Include an appropriate greeting (e.g., "Dear professor So-and-so").
  - Include a signature that contains your full name, your UTORID, and your student number.
- Asking a question on piazza:
  - Search before posting! There is a good chance your question has already been answered.
  - If your question is closely related to an already posted/answered question, please start a "follow up discussion" rather than creating a new post.
  - **Make sure you do not reveal even part of your solution in your question!** UofT considers this an academic offence.

written communication

- Answering a question on piazza:
  - Please, contribute!
  - Please ensure that we maintain a positive, collaborative, and supporting atmosphere on piazza (and everywhere else!). Your classmates will likely be your colleagues for several years, and maybe (and hopefully!) lifelong friends.

course title

Design and Analysis of Data Structures

- a specialized format for organizing, processing, retrieving and storing data

Design and Analysis of Data Structures

- study how the data is stored, added, retrieved, etc.

Design and Analysis of Data Structures

- how long does adding, removing, finding, etc. take?
  - in the worst case?
  - in the best case?
  - on average?

- how much space does it take?

data structures

- some examples you already know:

- are some of these more "abstract" than others?
- let's separate the "what" from the "how"

ADTs

- So what's an ADT? Abstract Data Type
- An ADT defines:
  - a set of objects
  - set of operations that can be performed on these objects
  - maybe also their time costs and space costs
  - but **not how** they are implemented
- Some examples of ADTs and their implementations?
- What do we call these implementations? Data Structures

ADTs

- provides the specification
- modularity:
  - usage depends only on the definition, not on the implementation
  - implementation can be changed (corrected or improved) without changing the rest of the program
- reusability:
  - implemented once and used in many different programs

main course topics

in no particular order:

- Balanced Trees
- Hash Tables
- Graphs
- Disjoint Sets
- Priority Queues
- Amortized Analysis