Algorithm Analysis

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Chapter 1: Introduction and Overview

- What is an algorithm?
  - An algorithm is very important (never would've guessed)
  - It is "at the heart of computing"
    - Not a definition, just stated to make sure we know how important it is
  - Algorithms aren't scary, thank goodness
  - You can think of an algorithm as a box that turns input into output
    - For example, your input can be two numbers and your ouput can be the product of those two numbers
  - An algorithm is a sequence of simple steps that turns the input into the output
  - From Zackary Hoyt in the chat: "a function is a construct wherein an input is turned into an output, e.g. f(x) = y. An algorithm is how x is turned into y"
    - To me it kinda sounds like the function is doing the thing and the algorithm is how you do the thing
    - In my head it's always been that a function is like actual code and an algorithm is just pseudocode
  - Different types of algorithms:
    - Video compression (string algorithm)
    - Traffic routing (graph algorithm)
    - Security (computational number theory)
    - Error correcting code (computer algebra)
      - Fun fact, last year when I was in this class I thought he was saying "error cracking code" and I was so confused
    - Artificial Intelligence (deep learning algorithm)
    - Compiler (parsing algorithm)
    - Computer graphics (computational gemoetry)
    - Database (sorting/searching algorithm)
- What is a program?
  - A program describes an algorithm in formal languages
- Something else about algorithms:
  - Deterministic (parallel), randomized (sequential), or heuristic (not always correct...?)
  - I think these are different charactersitics that algorithms can have
- Three **very important algorithm properites**
  - Your algorithm must terminate
  - Your algorithm must be correct (unless it is a heuristic algorithm)
  - Your algorithm should be efficient (aka don't code like me)
    - You have both time, space, and randomness efficiency
- According to change, algorithm research is exciting. I'm currently inclined to disagree but I'll humor him
  - Something about fairness in algorithms idk
    - Wow I'm already putting "idk" in my notes this is going to be a rough semester
- "Have you heard about Edward Snowden?"
  - What the fuck are we even talking about right now
  - Now he wants a social network for your enemies

        * "In this social network, you try to friend me, but you actually try to enemy me. If we're friends you're not allowed to friend me"
        * Ohh the point here was to talk about a Recommendation Algorithm. I see you, Cheng.
- Recommendation Algorithm
    - Something about making people spend more time?
    - Tiktok: Analyzes what you prefer and recommends you new videos to watch to keep you on the app longer
    - A successful social media application needs a strong recommendation algorithm