REPROGRAMMING ALGORITHMS

THE IMPERATIVE NEED FOR CIVIC & SOCIAL ENGAGEMENT IN GREEDY & DIVIDE-&-CONQUER CONCEPTS

Created by: Zubeyda Shute
Teammates Auiannce Euwing, Chloe Xufeng, Emma Zhang
Advisor: Jean Salac

Introduction

Traditional CS education often separates technical skills from social impact. This project bridges that gap by creating educational materials that connect algorithm design with civic responsibility and ethical considerations. My contributions focused on proofs, implementation, tests, and comprehensive assessments that make algorithms relevant to real-world community needs.

Problem Statement

Computer science education often treats algorithms as abstract mathematical concepts, disconnected from their real-world impacts on communities and individuals.

Overview

- Provided greedy algorithm solutions
- Created COMPAS Key
- In-Class Lecture: Proofs & Binary Search Implementation
- Several Real World Connections within Lectures & Methodology
- Comprehensive Testing: Merge Sort

Testing Merge Sort

I built a testing tool that checks student code through specific stages. It starts with basic file setup and progresses to full algorithm validation. When students make errors, the system provides clear explanations and step-by-step fixes rather than technical error messages.

- Progressive validation from basic syntax to complex algorithm logic
- Automated creation of test datasets with COMPAS
- Real-time implementation progress tracking
- Helpful error messages and implementation guidance
- Compatibility scoring with actionable next steps

In-Class Lecture

DAY 2: Proofs Deep Dive

- Real-world proof impacts
- Healthcare.gov case: insurance errors
- Emergency response: binary search for shelter matching

DAY 3: Implementation of Binary Search

- Hands-on binary search with civic context
- Community resource finder using real data or scenarios
- Ethical algorithm discussions
- Bias in data systems: COMPAS case study
- Invariant method vs formal induction for better understanding

Reflection

I designed prompts that challenge students to examine algorithmic bias, systemic inequalities, and ethical responsibilities, turning technical implementation into social analysis

Greedy Algorithms Solution

Provided greedy algorithm solutions with teammates for unified approach of shared testing