Ethical Integration in Greedy Algorithm Curriculum Design

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Objectives

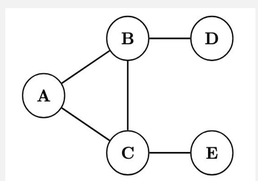
Computer science education often teaches algorithms as neutral problem-solving tools rather than as human-made systems that shape the world. Our project addresses this ethical awareness gap by embedding social and civic responsibility into the algorithm curriculum design, focusing on the topics of Greedy and Divide-and-Conquer.

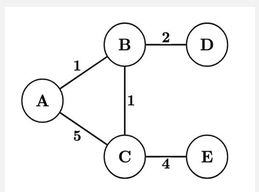
We pair traditional learning goals such as optimization, correctness, and proof with critical reflection on their real-world contexts. Understanding algorithms from both perspectives helps students recognize the power and peril of algorithmic decision-making.

In-Class:

- ➢ Day 1: Greedy Algorithm — Introduction & Proof
- ➢ **Day 2: Greedy Implementation & Lab**
- ➢ **Day 3: Greedy in Graph Algorithms**

Day 3 Worksheet:
Information Spread

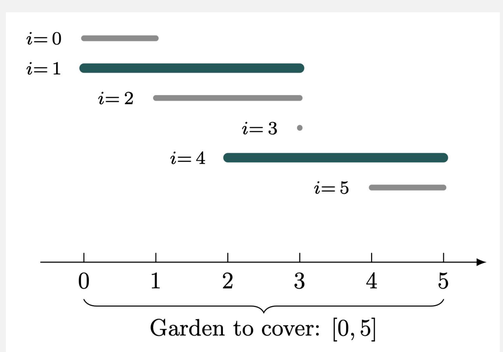




- ❏ Real life implementation
  - ❏ Represent the shortest-path problem as information spread in a social network.
  - ❏ Introduce Dijkstra's algorithm through comparison with BFS.
- ❏ Learning Objectives
  - ❏ Understand how algorithmic features such as weights can represent social-cultural factors like trust, access, or language barriers.

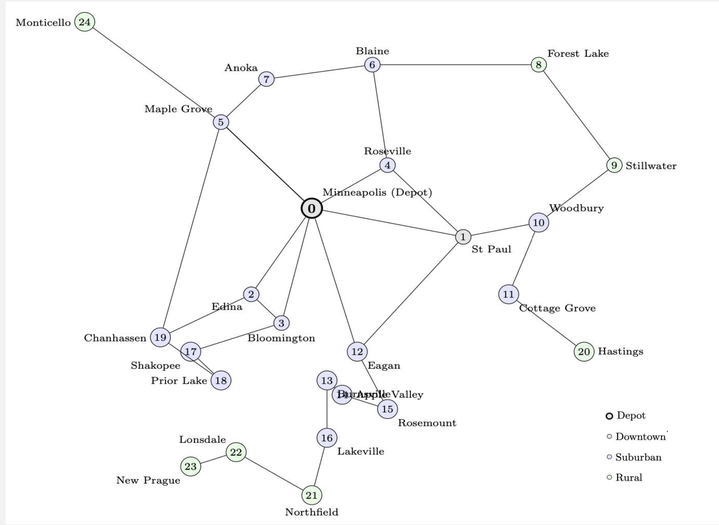
Day 2 Lab:
Garden Irrigation System

- ❏ Real life implementation
  - ❏ Model an interval-coverage problem by setting up an irrigation system for a drought-affected town.
  - ❏ Evaluate whether this algorithm is a viable real-world strategy.
- ❏ Learning Objectives
  - ❏ Reflect on the assumptions and simplifications within algorithms and how they may reinforce potential injustices
  - ❏ Recognize that real-life algorithm design is based on iteration, evaluation, and prototyping.



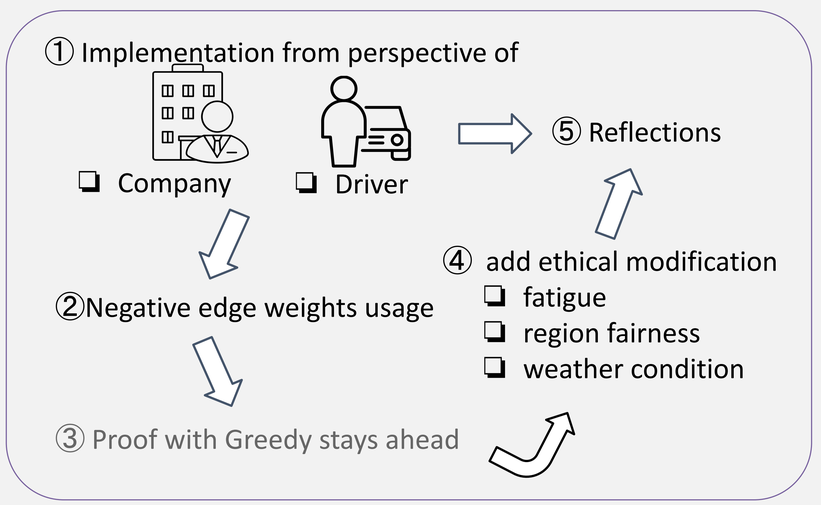
Assignment:
Cheapest Route Planner

- ❏ Real-life Implementation



- Mode based on MN cities and highways
- Nodes contain descriptive attributes of information
- Edge weights calculated from Node attributes

- ❏ Assignment Breakdown:
  - ❏ Implement Dijkstra's algorithm to find the minimum-cost path between two given cities.



- ❏ Learn Objectives
  - ❏ Recognize that algorithms are not value-neutral procedure. They are embedded with civic decisions and social values.
  - ❏ Learn to design and evaluate algorithms with attention to their societal impacts.