

Ethical Integration in Greedy Algorithm Curriculum Design



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In-class Redesign

Day 1

- Basic Introduction to Greedy Algorithm
- Techniques could be used for Greedy Proof



Day 2

- Interval Cover Example Implementation
- Ethical Considerations. Leading students to think beyond the pure theory. (e.g. resources fairness)

```
Python
while watered <= n:
    farthest = max(right of all intervals starting ≤ watered)
    if no such interval: return -1
    count += 1
    if farthest ≥ n: return count
    watered = farthest + 1
```

Red Arrow Step 1

Green Arrow Step 2

Why Important?



- Traditional algorithm teaching focuses on pure mathematical optimality, ignoring social or human contexts.
- The “optimal” path in computation may translate to fatigue, inequality, or safety risks in real life.
- Pure optimization assumes a world where constraints are numeric and neutral—but real systems involve people, resources, and trade-offs.
- This approach prepares students to design algorithms that are not only efficient, but also responsible, transparent, and aware of societal impact.

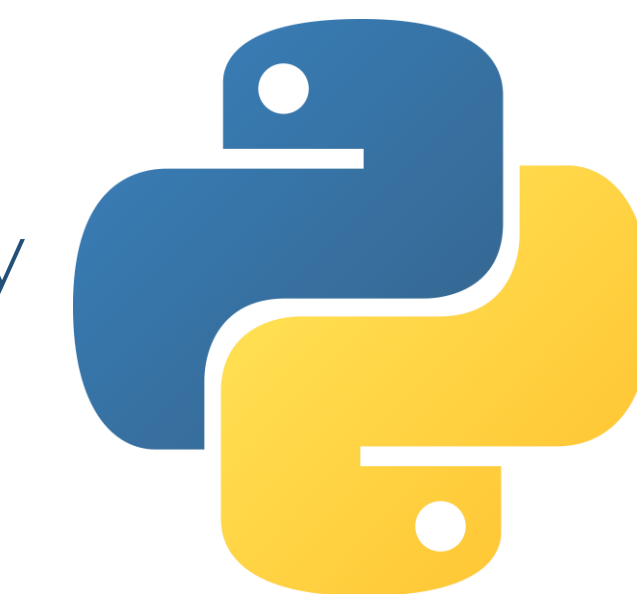
Assessment

? Basic Return Type

? Path Validity

? Right Cost Calculation

? Exact Sequences of Path



Part A Code



Part D Code

? Fatigue
? Avoid long Distance

Fairness
? Receive subsidy
+ Still positive?

Weather Safety
? Avoid storm area

✓ Path Changes
✓ Cost Changes

Proof:

- Proficiency and Mastery Grading system
- Induction is on the finalized set S
- The feature of $P = s \rightsquigarrow x \rightarrow y \rightsquigarrow u$

Student Facing Assignment

Part A: Implement Dijkstra for different stakeholder
Part B: Add subsidy (negative weight).
Part C: Proof
Part D: Modify algorithm for 1 ethical rule – fatigue, fairness, weather safety.
Part E: Reflection on Impact

- which stakeholder the “optimal solution” should serve
- various subsidies, or external policies that break the fundamental assumptions
- many additional factors, which means that even if assumptions are satisfied, it is still difficult to implement a truly optimal solution.

