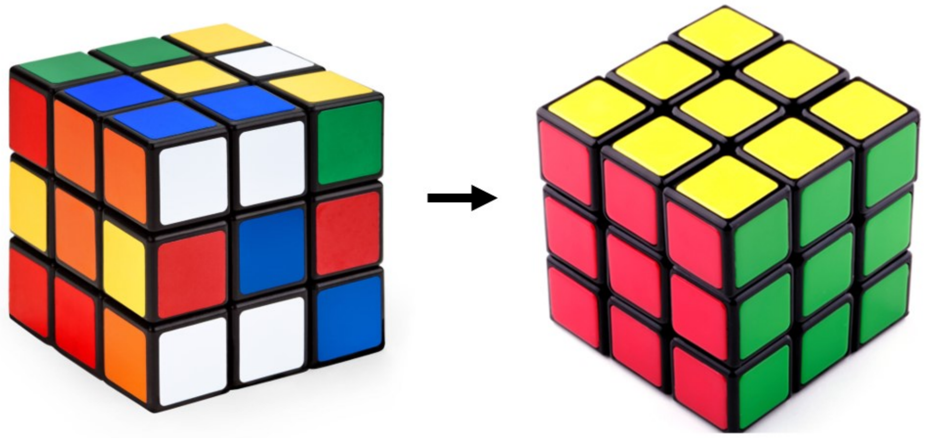
Q1 Rubiks Cube

5 Points

There are many applications of Shortest Path Algorithms.

For example, Google Maps uses a Shortest Path Algorithm to calculate the fastest way to walk from your house to the Roux Institute

Consider the problem of solving a jumbled Rubik's Cube in the fewest number of moves.



I claim that this problem can be solved using a Shortest Path Algorithm.

Determine whether this statement is TRUE or FALSE. Justify your answer

p.s. For a fascinating demo, check out the website of the Moving AI Lab (https://movingai.com/rubik.html).

The statement is True.
This question is also be summarized as a graph modeling question, which has those following features:
First, nodes are the states of the cube, and there is an edge between any two nodes a and b. If we can go from a to b or from b to a in one single move.
Then, we'll get the shortest path between the current state and the initial state to the final state using those famous shortest path algorithm like Dijkstra's algorithm.

No files uploaded

Q2

2 Points

In the Activity Selection Problem, there are many ways to design a Greedy Algorithm.

In the textbook, you saw how this Greedy Algorithm guaranteed an optimal solution: choose the activity with the earliest finish time, eliminate all activities that conflict with that choice, and then repeat these steps on the activities that are remaining.

Here are five other ways we can design the choice function of our Greedy Algorithm. Determine which of these Greedy Algorithms is optimal. Answer one of A, B, C, D, or E.

- ○ `Choose the activity with the latest finish time`
- ○ `Choose the activity with the earliest starting time`
- ◉ `Choose the activity with the latest starting time`
- ○ `Choose the activity with the shortest duration`
- ○ `Choose the activity with the longest duration`

Q3

3 Points

You have a knapsack that can hold 20 pounds.

You can fill your knapsack with any items from the following list.

Item	Weight	Value
Object A	4 pounds	$480
Object B	5 pounds	$500
Object C	6 pounds	$480
Object D	7 pounds	$490
Object E	8 pounds	$520

Your goal is to pick the objects that maximize the total value of your knapsack, with the condition that the chosen objects weigh at most

20 pounds.

In the 0-1 Knapsack Problem, the solution is easily seen to be Objects B + D + E, which has a total weight of 5+7+8 = 20 pounds, and a total value of $500+$490+$520 = $1510.

In the Fractional Knapsack Problem, you are allowed to take f of each object, where f is some real number between 0 and 1. For example, you can take all of Object A, 1/2 of Object C, all of Object D, and 3/4 of Object E.

This leads to a solution with total weight 4 + 1/2 × (6) + 7 + 3/4 × (8) = 20 pounds and a total value of $480 + 1/2 × ($480) + $490 + 3/4 × ($520) = $1600.

Can you do better?

For the Fractional Knapsack Problem, determine the maximum total value of your backpack.

$480+$500+480+$490*5/7= $1810

Q4
3 Points

Consider the following array of twelve numbers:
$[6, 5, 6, 5, 1, 7, 7, 5, 1, 5, 7, 3]$

For each of these twelve numbers, you may highlight them in dark red. You may highlight as many numbers as you wish.

The only rule is that you are not allowed to highlight two adjacent numbers. In other words, if you highlight $A[i]$, you cannot highlight $A[i-1]$ or $A[i+1]$.

Add up the numbers you've highlighted to produce your total score.

For example, $[6, 5, 6, 5, 1, 7, 7, 5, 1, 5, 7, 3]$ gives me a total score of $6 + 6 + 1 + 7 + 1 + 3 = 24$.

Can you do better?

Determine the maximum possible score.

32

Quiz 3-Greedy Algos

GRADED

STUDENT
Kejian Tong

TOTAL POINTS
13 / 13 pts

QUESTION 1
Rubiks Cube — **5** / 5 pts

QUESTION 2
(no title) — **2** / 2 pts

QUESTION 3
(no title) — **3** / 3 pts

QUESTION 4
(no title) — **3** / 3 pts