

Question No. 1.

You are managing a co-working space with three meeting rooms, and you have to schedule meetings for different teams. Each team has specific time slots they are available for, and no two teams can use the same room simultaneously during overlapping time slots. Write a Python script to find a valid schedule for all the teams using CSP.

Constraints

1. Each team must be assigned to exactly one room.
2. A room cannot host more than one meeting at the same time.
3. A team can only be scheduled during its available time slots.

Example Data

- Rooms: Room1, Room2, Room3
- Teams: TeamA, TeamB, TeamC, TeamD
- Available time slots for each team:
 - TeamA: ['9-10', '10-11']
 - TeamB: ['9-10', '11-12']
 - TeamC: ['10-11']
 - TeamD: ['11-12']

Question No. 2

You are tasked with detecting a specific object (template) in a larger image using OpenCV's template matching technique. Write a Python script that takes an input image and a template, identifies all the regions in the image that match the template, and marks them.

Requirements

1. **Input**
 - A source image (e.g., a photo containing multiple objects).
 - A template image (e.g., one of the objects in the photo).
2. **Output**
 - The source image with bounding boxes drawn around all matching regions.

3. Steps to Follow

- Load the source and template images using OpenCV.
- Perform template matching using one or more matching methods (e.g., `cv2.TM_CCOEFF`).
- Identify the locations of matches with a confidence above a threshold.
- Draw bounding boxes around the detected regions.
- Display the final result.

Question No. 3

You are tasked with helping a delivery company optimize its delivery route. The company needs to find the shortest possible route to visit a set of delivery locations and return to the starting point. Write a Python script to solve this problem using a Genetic Algorithm (GA).

Requirements

1. Input Data

- A list of locations represented as coordinates (e.g., (x, y)).
- Example: `locations = [(0, 0), (2, 3), (5, 2), (7, 6), (3, 7)]`

2. Objective

- Minimize the total distance of the route.

3. Genetic Algorithm Components

- **Chromosome Representation:** A sequence of location indices representing a route.
- **Fitness Function:** The negative of the total route distance (shorter routes = higher fitness).
- **Selection:** Roulette wheel or tournament selection.
- **Crossover:** Ordered crossover (OX).
- **Mutation:** Swap mutation (swap two random locations in the route).
- **Termination:** Stop after a fixed number of generations or when the fitness converges.