Homework 01: Working with Images

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Handout: 2025-09-01

Due: 2025-09-08, 11:59pm, on Canvas

General Instructions:

- You should solve the homework and submit your report **individually**. Identical submissions will receive a grade of zero.
- Getting help from others or checking your answers with other students (not the TAs) is okay and encouraged.
- Ask any questions on **Ed Discussion** (instead of emailing).
- **Before** the homework due date, TAs are strictly prohibited from **pre-grading** your homework. Do not expect the TAs to help you verify if your answers are correct or give you the problem solution.
- **After** the homework due date, if you do not know how to solve a problem, reach out to the TAs. They will walk you through the solution and help you understand it. Note that homework solutions will **not** be posted because some problems will be used in next year's class.
- **Exams** may contain questions related to homework, so make sure you learn how to solve the homework problems correctly.
- The deliverables are outlined for each problem, and you should carefully **follow the instructions**. Failing to follow instructions will result in **points being subtracted**.
- You will submit a **single PDF** file to Canvas as your homework report. The PDF must contain your **answers** and any requested **outputs** (e.g., printouts, snapshots of code, or GUIs). If requested, follow the instructions specified by the problem to provide your **code** (e.g., in a compressed .zip or .tar file) in addition to the PDF file.
- **Grading:** Each homework in this class will contribute **5pts** to your final grade (there will be 12 homework assignments, each 5pts, leading to 60pts for all assignments). A detailed grading **rubric** will be posted on **Canvas** after the homework due date. Any bonus points will be added to your overall course bonus points, which will be added to your final grade.
- **Late submission:** Late or missed submission will not be accepted and will receive a grade a zero. Any excused absence must be documented and disclosed to the instructor (extensions will be granted on a case-by-case basis). Three or more missed homework lead to an INC grade.

IMPORTANT NOTE:

From now on, please make sure to carefully read and follow the instructions provided in each homework problem. For instance, this assignment specifically asks you to use a photo of yourself. This requirement helps us verify that the work is your own. Using any other photo will result in a deduction of points.

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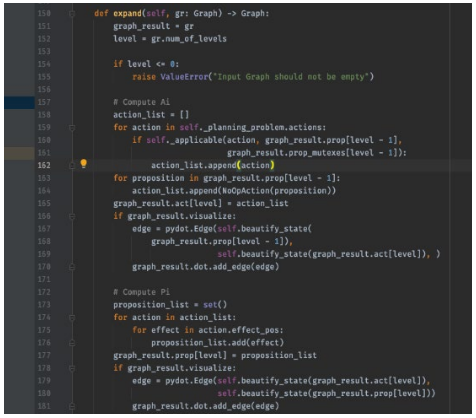
EXERCISE 1 (5pts) – The objective of this homework is for you to set up and test the course Conda environment on your machine (instructions provided in the course GitHub page). While you can do this homework outside this environment (e.g., using Google Colab), we will need/use this environment later in the course. Therefore, please set it up and debug any issues now rather than later. Do **NOT** use generative AI to solve this homework; otherwise, you will not learn to code!

Steps:

- Take a picture of yourself (e.g., a phone selfie) or use an existing headshot. Make sure your face is visible in the image.
- Using the `skimage` package in Python (included in our CV Conda environment) load your image.
- Convert the image into grayscale and into the `float32` format.
- Display the image on the screen (you can use the `matplotlib` library). Make sure to adjust the color map so that it is displayed in grayscale correctly.
- Print out the pixel values of the grayscale image as a matrix for the 3x5 pixels in the top left corner.
- What is the value of the pixel with x coordinate of 1 and y coordinate of 2 (assuming that pixel indexing starts at 1)? Print out this value.

Deliverables:

- Snapshot of your entire code, e.g.,



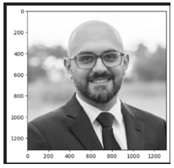
```
def expand(self, gr: Graph) -> Graph:
    graph_result = gr
    level = gr.num_of_levels

    if level <= 0:
        raise ValueError("Input Graph should not be empty")

    # Compute Ai
    action_list = []
    for action in self._planning_problem.actions:
        if self._applicable(action, graph_result.prop[level - 1],
                            graph_result.prop_mutexes[level - 1]):
            action_list.append(action)
    for proposition in graph_result.prop[level - 1]:
        action_list.append(NoOpAction(proposition))
    graph_result.act[level] = action_list
    if graph_result.visualize:
        edge = pydot.Edge(self.beautify_state(
            graph_result.prop[level - 1]),
                          self.beautify_state(graph_result.act[level]), )
        graph_result.dot.add_edge(edge)

    # Compute Pi
    proposition_list = set()
    for action in action_list:
        for effect in action.effect_pos:
            proposition_list.add(effect)
    graph_result.prop[level] = proposition_list
    if graph_result.visualize:
        edge = pydot.Edge(self.beautify_state(graph_result.act[level]),
                          self.beautify_state(graph_result.prop[level]))
        graph_result.dot.add_edge(edge)
```

- Snapshot of your grayscale image, e.g.,



- 3x5 pixel value matrix for the top left corner.
- Pixel (1,2) value.