Homework 04: Edge Detection

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Handout: 2025-09-22

Due: 2025-09-29, 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.

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EXERCISE 1 (5pts) – The objective of this homework is to understand the Canny edge detection algorithm. Do **NOT** rely on generative AI to code!

Steps:

1. Download the template Canny edge detection code, called "hw04_template", from the course repo: https://github.com/ariarobotics/cv/tree/main/code
2. Load your **headshot image** (used in previous assignments). Convert it to the appropriate type, color, or resolution as needed (the image must be a minimum of 100 pixels in each dimension).
3. Complete the template functions called "gaussian_blur" and "sobel_gradients" in the code to generate the output Canny edge image.
4. Use the existing Canny edge detector algorithm in scikit-image library (https://scikit-image.org/docs/0.25.x/auto_examples/edges/plot_canny.html) and compare your results.
5. Report all deliverables below. Make sure your report is clear, organized, and well-explained.

Deliverables:

- Snapshot of your entire code.
- Snapshot of your headshot input image.
- Snapshot of your Canny edge image output
- Snapshot of the skimage Canny edge image.