

In this HW, you explore the gradient (and its use in Harris and other feature detectors). Since it is eventually important to move your code to a more efficient language like Python, you will implement gradient in Python/OpenCV (also because image gradient is implemented for you in Matlab using `imgradientxy` and `imgradient`).

## Question 1: image gradient in Python

Implement image gradient in Python/OpenCV. You should include a gradient magnitude function and a gradient direction function with the following prototypes:

Deliverables:

- Python code `gradient.py`
- a thresholded gradient magnitude image (w the associated function call)
- a thresholded gradient direction image (and the associated function call), both using your favourite image (different from the ones I have provided) (provide your original image so that the TA can replicate the result)

## Question 2: finding lines with the gradient

Using the image gradient code from Q1, make your best attempt to find just the lines in the skyscraper image and the brick image that I have given you.

## Question 4 (673 only)

Using MATLAB, write code to display an example of Harris, SIFT, and SURF on your favourite image (and save these images as deliverables too).

## Question 5 (673 only)

Prepare a 1-page report on **Harris and Stephens, A Combined Corner and Edge Detector, 1988**, answering the following questions.

- what is their motivation?
- what are some of the problematic issues in solving their problem?
- what work is Harris built upon?
- what are the main problems with Moravec's corner detector?
- how does Harris implement nonmaximal suppression?
- how does Harris find edges?

Here is **Moravec's tech report** if you want to compare.