

# Mathematical Foundations for Computer Vision and Machine Learning

Byung-Woo Hong

Computer Science Department, Chung-Ang University

# Assignment 5

## Jupyter Notebook

- Create a new notebook for Python 3
- Include your name and the student ID in the notebook
- Write python 3 codes for the given assignment
- Try to separate the codes into meaningful blocks
- Write a comment for each block of codes
- Plot the important intermediate results
- Write a short description for each graphical result
- Use LaTeX for mathematical comments in the notebook
- Save the notebook file as [assignment05.ipynb](#)
- Download the notebook as a PDF file [assignment05.pdf](#)

# Assignment 5

## github

- Start a project or a directory for the [assignment05](#)
- Include the link to the giuhub for the assignment in the notebook
- Upload the notebook [assignment05.ipynb](#) to the github after the deadline (Note that your github project is visible to public)

# Assignment 5

## Submission to *eclass*

- Submit the PDF file [assignment05.pdf](#) to [eclass](#)
- Deadline is 11:59 pm on next Thursday. No extension
- Score ranges from 0 to 5

# Assignment 5

## Score Table

- The results should be correct
- The codes should be written in a modulated way
- The comment should be made for each block of the codes
- The important intermediate results should be presented
- The link to the github project should be included

# Assignment 5

$$f(x, y)$$

$$\nabla f = \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix}$$

slide 8.1에  
분량만 넣을 것임

## Computation of Image Features using Convolution

- Define kernels for computing image gradients
- Define kernels for smoothing image
- Define kernels for your own purpose

(2차원 배열이 많은 것 같은데  
그것에 맞는 커널을 만들어라)



# Assignment 5

## Essential Functions and Definitions: Convolution

- Definition of the convolution kernel for computing the derivative in x-direction
- Definition of the convolution kernel for computing the derivative in y-direction
- Function for computing the magnitude of the gradient
- Function for computing the direction of the gradient

(length of vector)

# Assignment 5

## Essential Visualisation: Convolution

- input color image
- input gray image
- derivative in x-direction
- derivative in y-direction
- absolute value of gradient
- direction of gradient
- result image with smoothing kernel
- result image with your own kernel