

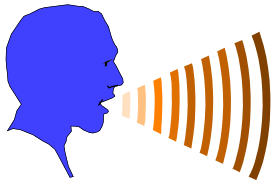


Image and Video Processing

Overview

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Image Processing vs. Computer Vision

- Image/video processing
  - Low level processing to
    - Enhance original data (denoising, contrast enhancement, increase sampling rate, deblurring, stabilization)
    - Compression: to reduce the data rate for storage/transmission
- Computer vision
  - High level processing to
    - Detect and classify objects, Semantic level segmentation
    - Recover 3D structure/scene from 2D
- In between (Intermediate level)
  - Feature detection, low level (color based) segmentation
  - Image alignment (generating panoramas, image registration)
  - Motion estimation (to enable video compression, object tracking, object detection)
  - Depth estimation (to enable 3D reconstruction from stereo)
- This class will focus on low and intermediate level

Applications

- Social media and entertainment (content creation, delivery, and presentation)
- Visual Communications (video chat and conferences)
- Medical Image analysis (tissue/organ/tumor segmentation, image alignment, change detection)
- Robotics (recognizing objects, mapping the environment)
- Law Enforcement (deblurring of video, face detection and recognition, license # recognition, fake media detection)
- Education/training (online teaching, video tutorials)
- Advertising
- …

Breakdown of the Course

- Image processing basics
- Video processing basics
- Feature extraction
- Image alignment and stitching based on feature correspondence
- Image segmentation
- Stereo and multiview image/video basics
- Image and video compression
- Deep learning based image processing and classification
- Both theory and practical implementation in python
- See Syllabus for more details.

Class Requirement

- Weekly lectures
- 2 tutorials related to programming
- Weekly written homework (10%)
  - To encourage you to review the lecture material, many are not covered in programming assignment
- Six programming assignment (in Python) (30%)
  - We will provide partially completed Jupyter notebooks to guide you. You can either complete the Jupyter notebooks, or write your python code from scratch to challenge your self!
- Team Projects (30%)
  - 2 or 3 people in a team (2 preferred)
  - Exploring project ideas and meeting with instructor (week 6)
  - Proj proposal (week 8)
  - Proj presentation and report (week 15)
- One exam (30%), week 12
- Lots of work but you will learn a lot and you can do it!

Class Attendance

- In-person or synchronous remote attendance via Zoom is encouraged.
  - Help your time management and your concentration
  - Get your questions answered right away
  - Turn on your cameras if possible so we can see each other
  - Feel free to interrupt and ask questions during the lectures
  - Will have in-class short quizzes that everyone is expected to participate
- You can attend asynchronously due to significant time zone difference. Please email me for approval and for me to make special arrangements regarding in-class quizzes.
  - Review the lecture material at a regular preset time weekly (within 24 hrs of the class time) will help you stay on schedule
- Office and tutorial hours set to accommodate students in different time zones

Homework Policy

- Written HW will be assigned after each lecture and due before the the following lecture time (to be uploaded through NYUclasses). Programming assignment will be due as posted and will be submitted through NYUclasses. The assignment is typically given 2 weeks ahead of due time. Each assignment counts for 10 points.
- Late submission of written assignment and programming assignment will be accepted up to 3 days late, with 2 pt deduction for each day.
- Students can work in teams, but you must submit you **own** solutions.
- If there are special circumstances that make it hard you to complete in time, please email me to discuss alternatives.

Office Hours

- Please come see us! We are here to help.

- Yao Wang: Mon 4-5 PM, Tue 8-9 AM, Wed 4-5 PM or appointment by email.
- Zhipeng Fan: Tue 4-5 PM and Fri 3-4 PM.
- Yicheng Ma: Thu 8-9 AM and Wed 8-9 AM.

- Zoom links in NYU classes.