Deep Learning for Image Processing

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HANDONG GLOBAL UNIVERSITY

Today's Agenda

1

Introduction

Instructor &
student introductions

2

Course Overview

Curriculum, evaluation,
class format

3

Survey

Background &
interest areas

Course Information

Schedule

Thursdays 1:00 – 3:45 PM
(2 hrs 45 min)

Enrollment

6+ students (small seminar)

Prerequisites

Data Structures

Objective

Understanding recent advances
in DL-based image processing

Contact khna@handong.edu | Messenger/chat channel TBA

Curriculum Overview

** Subject to change based on survey results*

Wk 1	OT + Survey
Wk 2	DL Fundamentals / Image Processing
Wk 3	Convolution Neural Networks
Wk 4	Vision Transformer
Wk 5	Object Detection
Wk 6	Segmentation
Wk 7	Self-Supervised Learning & Foundation Models
Wk 8	Review Literacy + Role Explanation
Wk 9	Diffusion for Image Processing + Paper #1
Wk 10	Conditional Image Generation + Paper #2
Wk 11–14	Survey-Based Topics + Paper #3–#6
Wk 15–16	Final Project Presentation (Miniconference)

Lecture Lecture + Paper Presentation Miniconference

Grading

** Proportions may be adjusted based on class size and feedback*

30%

Paper Presentation

Author role (1x)
Presentation quality, paper understanding, rebuttal

30%

Role Performance

Weekly role participation (Reviewer, AC, etc.)
Pass/Fail based

30%

Final Project

Research paper / Survey paper / Challenge participation

10%

Attendance & Participation

Deductions for absence or non-participation

Paper Presentation + Mock Review System

Experience the conference review process firsthand in class.

Author

Present the paper as your own work + Rebuttal

Reviewer ×2 (Pro, Con)

Submit written review using conference form

Archaeologist

Research prior work & provide context briefing

Area Chair

Synthesize reviews (Writing Meta-review) Accept/Reject decision

Future Researcher

Identify limitations Propose follow-up research

Implementation Wk 8: Review Literacy + Role Explanation (prep week) →
Wk 9–14: Full system (6 sessions, all roles rotated once per student)

References:

University of Bonn, Seminar Vision and Graphics (WS 2024)
University of Washington CSE 599: Generative Models (Winter 2023)
Stanford University CS324 (Winter 2022)
Raffel (UNC Chapel Hill) & Jacobson (University of Toronto), “Role-Playing Paper-Reading Seminars” (2021)

Mock Review Scenario

Preparation

D-14~
Instructor: releases paper pool (3–4 papers)
or
Student: suggests paper (w/ approval)

D-7~
Author: selects paper, shared with all

D-1~
Reviewers: submit written reviews
Archaeologist: completes prior work survey
Area Chair: write preliminary meta-review

Day of
Author: reads reviews → prepares Rebuttal
Area Chair: finalizes meta-review and makes decision

In-Class Session

60–70 min	Lecture
10 min	Break
5 min	Archaeologist Briefing
25–30 min	Author Presentation
10 min	Reviewer Summary (5 min × 2)
10 min	Author Rebuttal
15–20 min	AC-Led Discussion
5–8 min	AC Decision + Future Researcher

** Archaeologist Briefing → Future Researcher: Paper Presentation Session (~80 min)*

Final Project

Choose a track that fits your situation. All tracks are graded on equal quality standards.

Track A: Research Paper

Write a submission-ready conference/journal paper

Connect your research topic with image processing

Track B: Survey Paper

Write a survey paper at the intersection of your field & image processing

Systematic literature analysis & research direction proposal

Track C: Challenge

Participate in a relevant challenge & write a technical report

Experiment design, result analysis, improvement proposals

Survey

Please complete the survey to help finalize the curriculum.

[https://forms.gle/jw4e2pxubpTaGFMq7]

Approx. 5–10 minutes

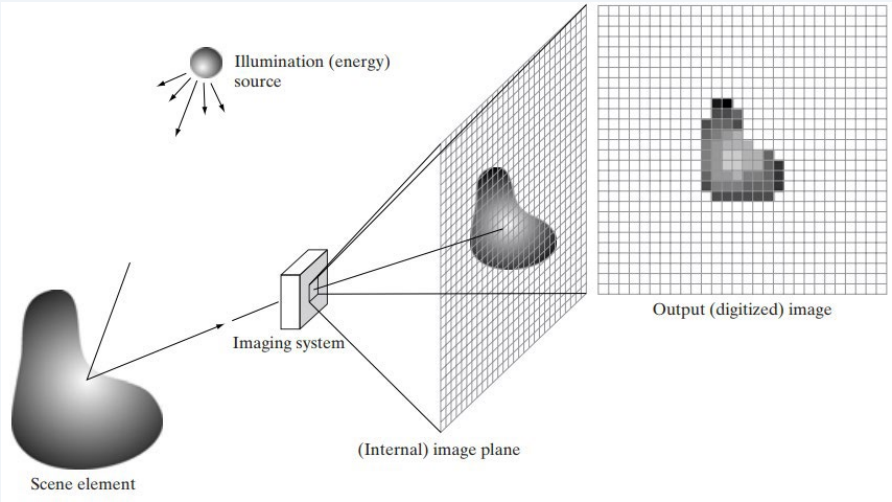
What is Image Processing?

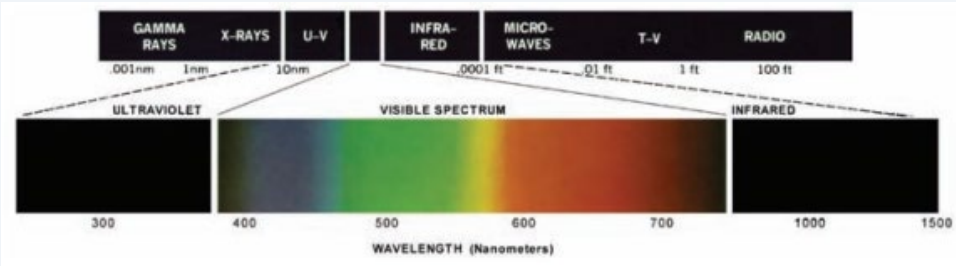
Processing digital images through algorithms to extract information or produce new images.

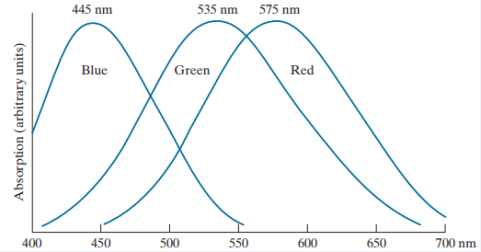
Image
and/or other info

Image Processing

Category, Values, or Image







From early digitization (Bartlane, 1921) to modern deep learning — the core idea remains the same.

Image Processing Tasks

- Classification / Recognition
- Localization / Object Detection
- Semantic / Instance / Panoptic Segmentation
- Conditional / Unconditional Image Synthesis
- Super Resolution
- Image to Image translation
- Style Transfer
- Automatic caption generation
- Image inpainting
- Harmonization

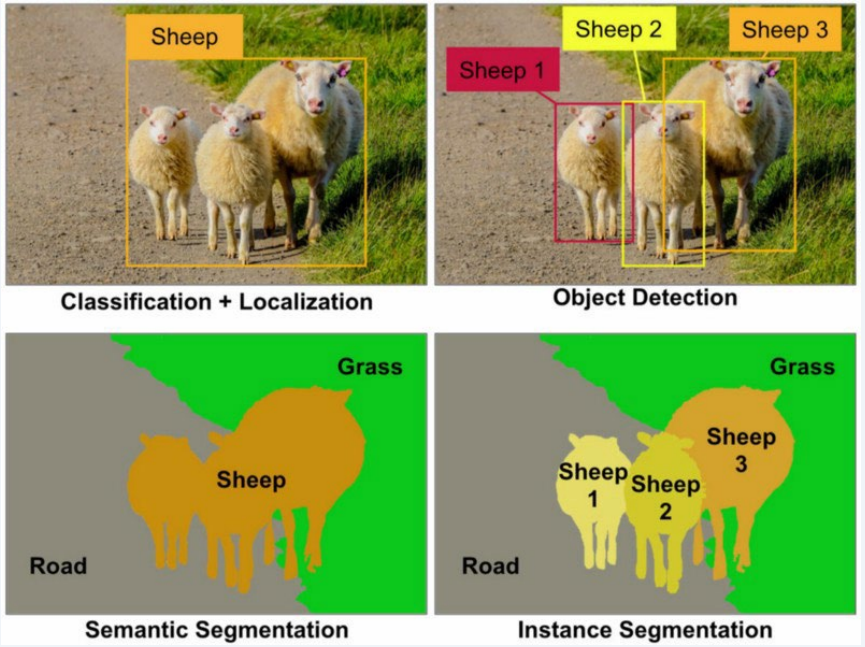


Image Processing Tasks

Understanding: What's in the image?

Classification

Assign a category
label to an image

Wk 3: CNN
Wk 4: ViT

Object Detection

Locate and classify
multiple objects
with bounding boxes

Wk 5

Segmentation

Pixel-level labeling
Semantic / Instance / Panoptic

Wk 6

Image Processing Tasks

Generation & Restoration: Creating and recovering images

Image Synthesis

Generate new images from noise or conditions (text, sketch, etc.)

Wk 9–10

Super-Resolution

Reconstruct high-res image from low-res input

Wk 9–10

Inpainting

Fill in missing or corrupted regions of an image

Wk 9–10

TBD

TBD

Wk 11–14

TBD

TBD

Wk 15–16

** Topics in Wk 11–14 will be selected based on your survey responses.*