Lecture 1. Class Introduction

ECEN 5283 Computer Vision

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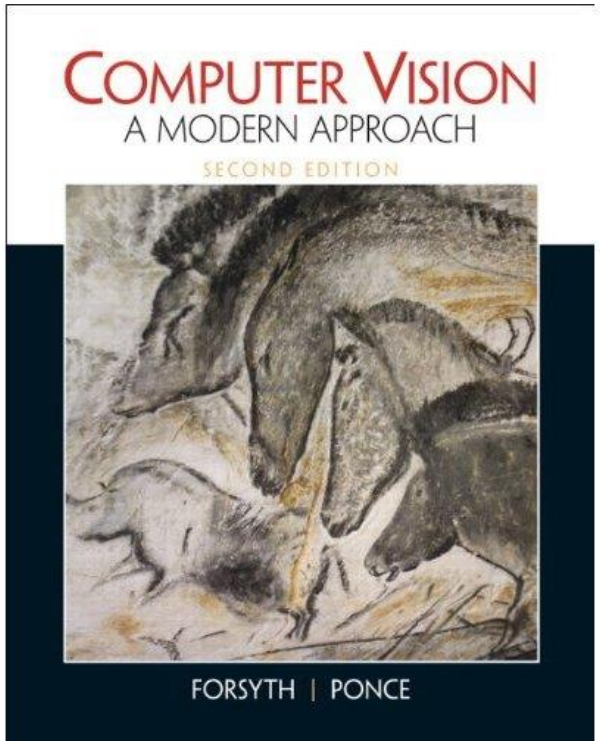
Goals

- To get general information about this course
- To introduce basic problems in this class.
- To know the basic requirements of this course

Textbook

- Computer Vision: A Modern Approach (2nd Edition)
  - Authors: David Forsyth and Jean Ponce
  - Publisher: Prentice Hall ISBN: 0-13-085198-1



Prof. David Forsyth
CS @ UIUC

Prof. Jean Ponce
CS @ ENS, France

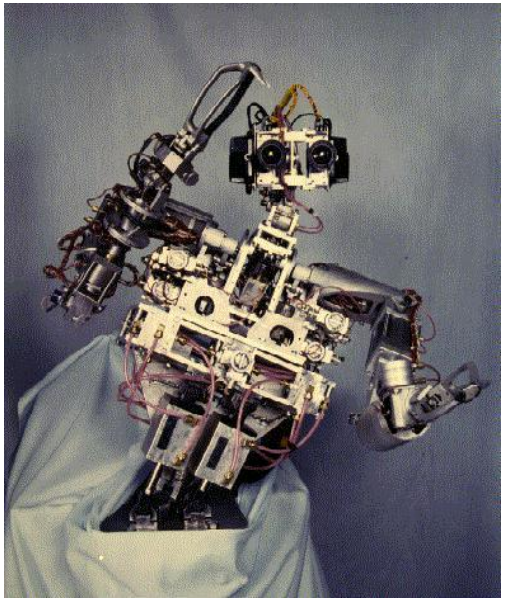
Grading Policy

- The final grade is based on
  - All class projects (75%)
  - Class presentation (15 %)
  - Attendance & quiz (10%)

- The letter grade is based on
  - >=90: A
  - 80-89: B
  - 70-79: C
  - 60-69: D
  - <60: F

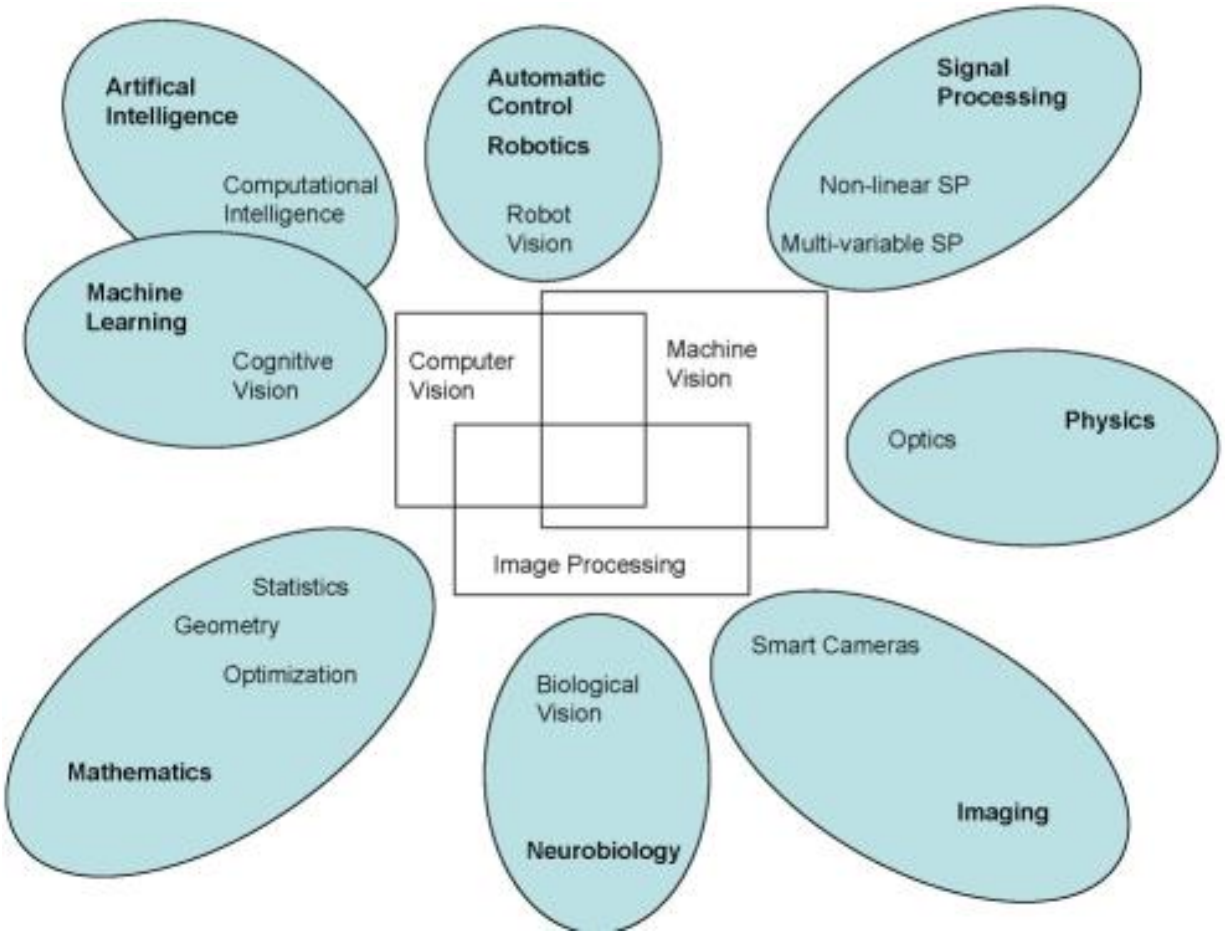
What is Computer Vision?

- **Computer vision** is the science and technology of machines that see.
  - As a scientific discipline, computer vision is concerned with the theory for building artificial systems that obtain information from images or videos.
  - As a technological discipline, computer vision seeks to apply the theories and models of computer vision to the construction of real computer vision systems.



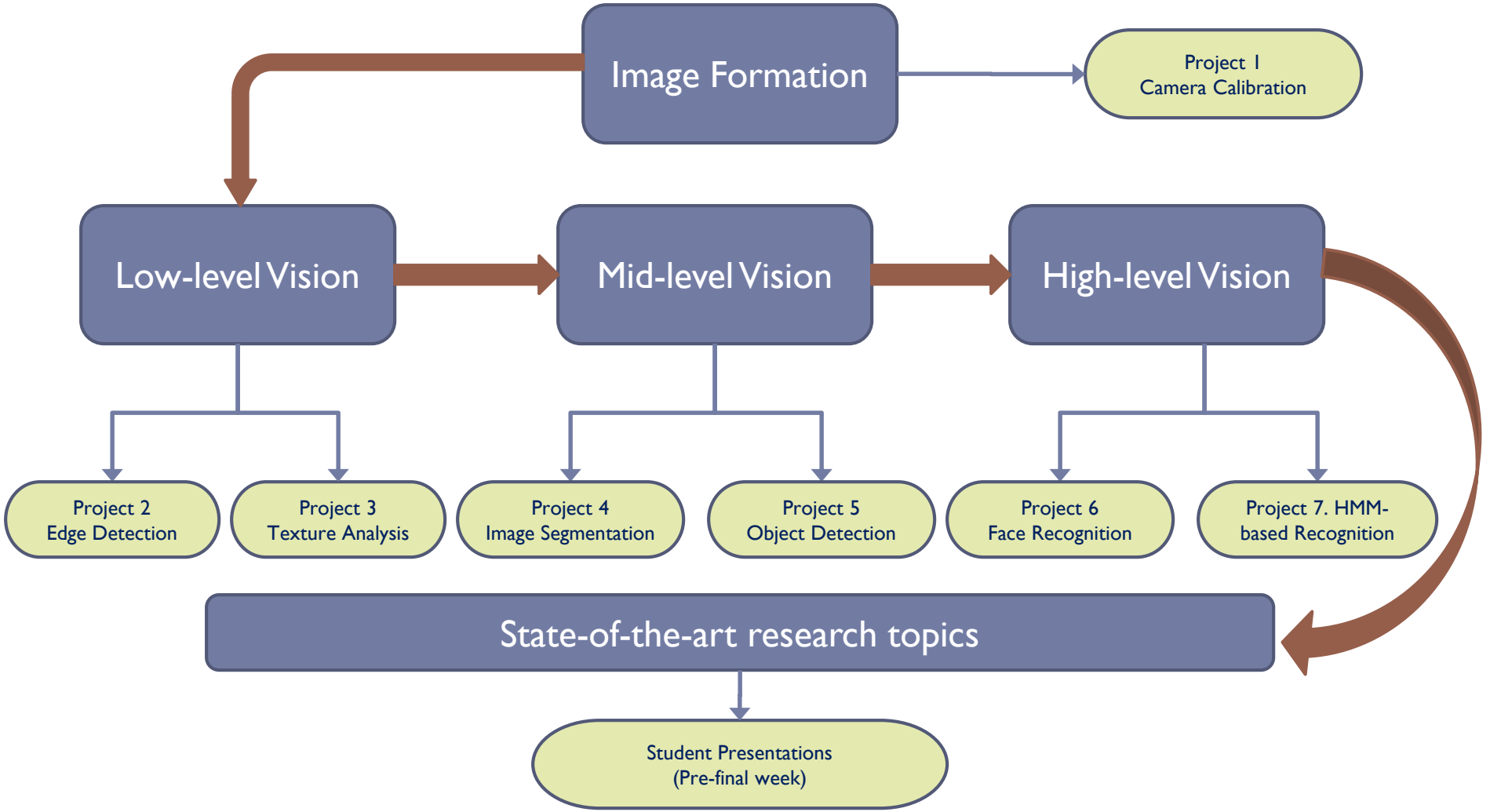
- Every computer vision system is goal-oriented and application-dependent.

Relation with Other Fields



http://en.wikipedia.org

Class Structure



Class Projects

- Project 1: Geometric camera calibration
- Project 2: Edge detection and its applications
- Project 3: Texture analysis and classification
- Project 4: Clustering for image segmentation
- Project 5: Object detection
- Project 6: Face recognition
- Project 7: Hidden Markov Models-based recognition
- In-class oral presentation

Moderate Matlab skills are needed!

Project 1: Camera Calibration

- To build the geometric mapping between the 3D world with the 2D images.

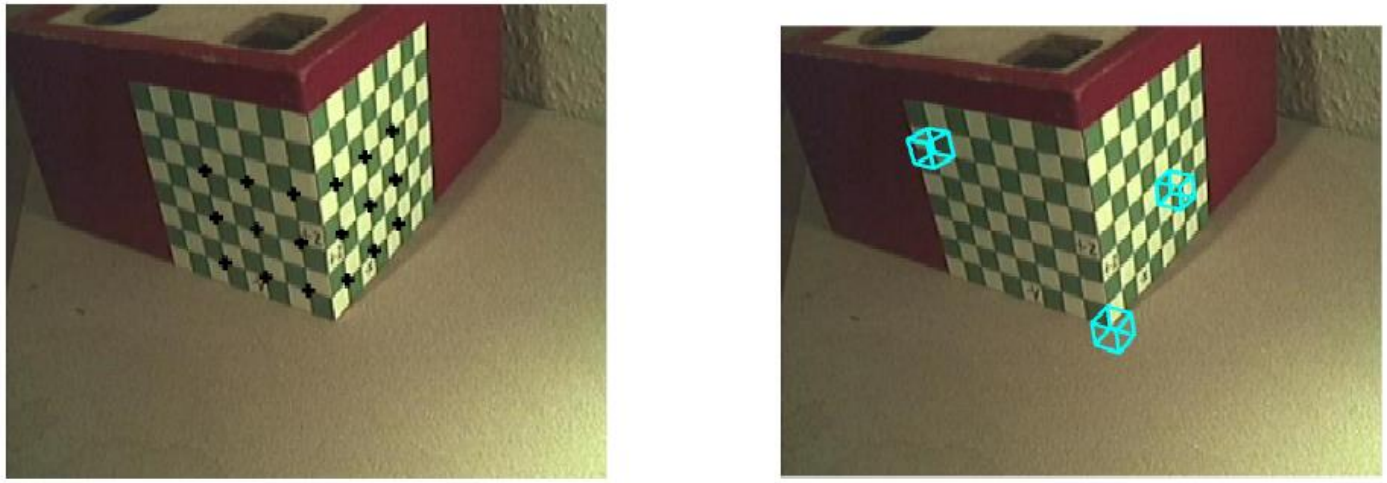
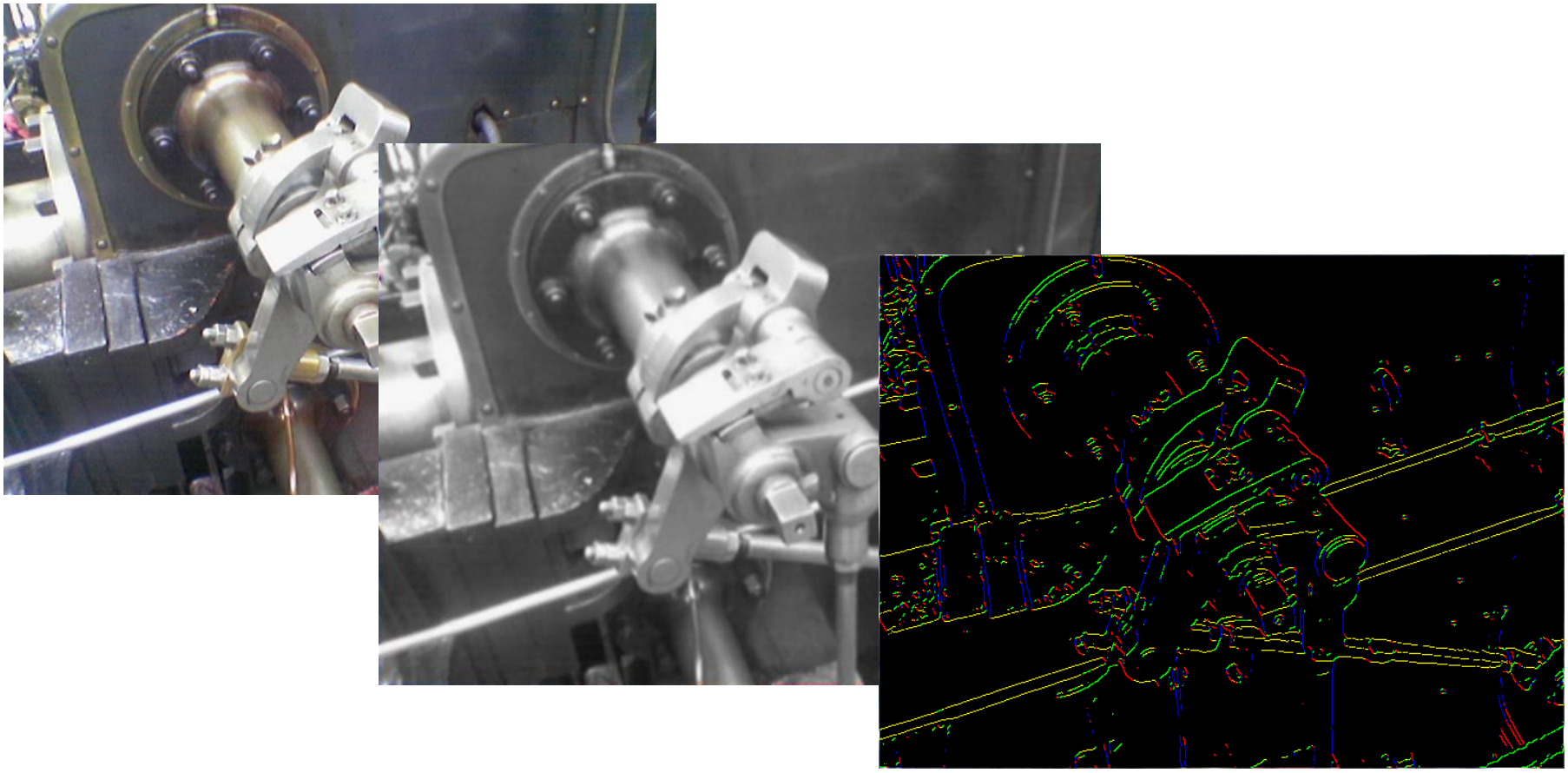


Figure 1: An image of a calibration rig, left with calibration points, right with cubes to check the calibration.

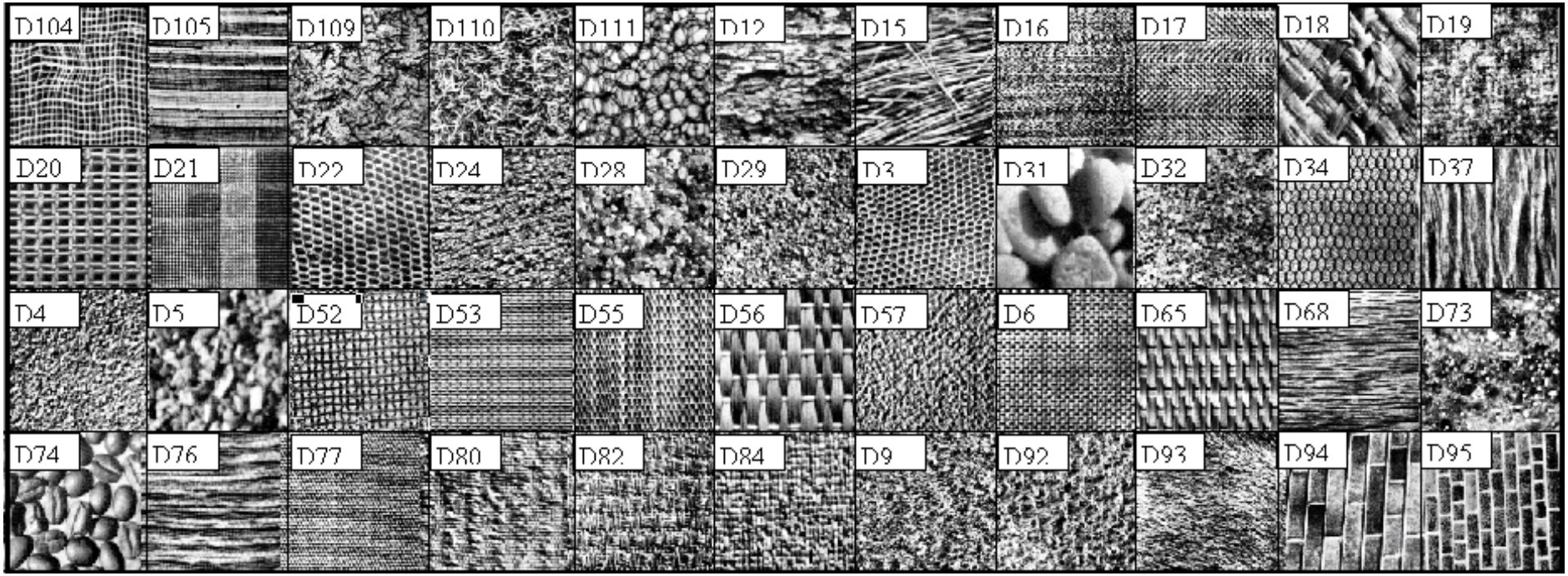
Project 2: Edge Detection

- To identity pixels in a digital image where the image brightness changes sharply (or has discontinuities).



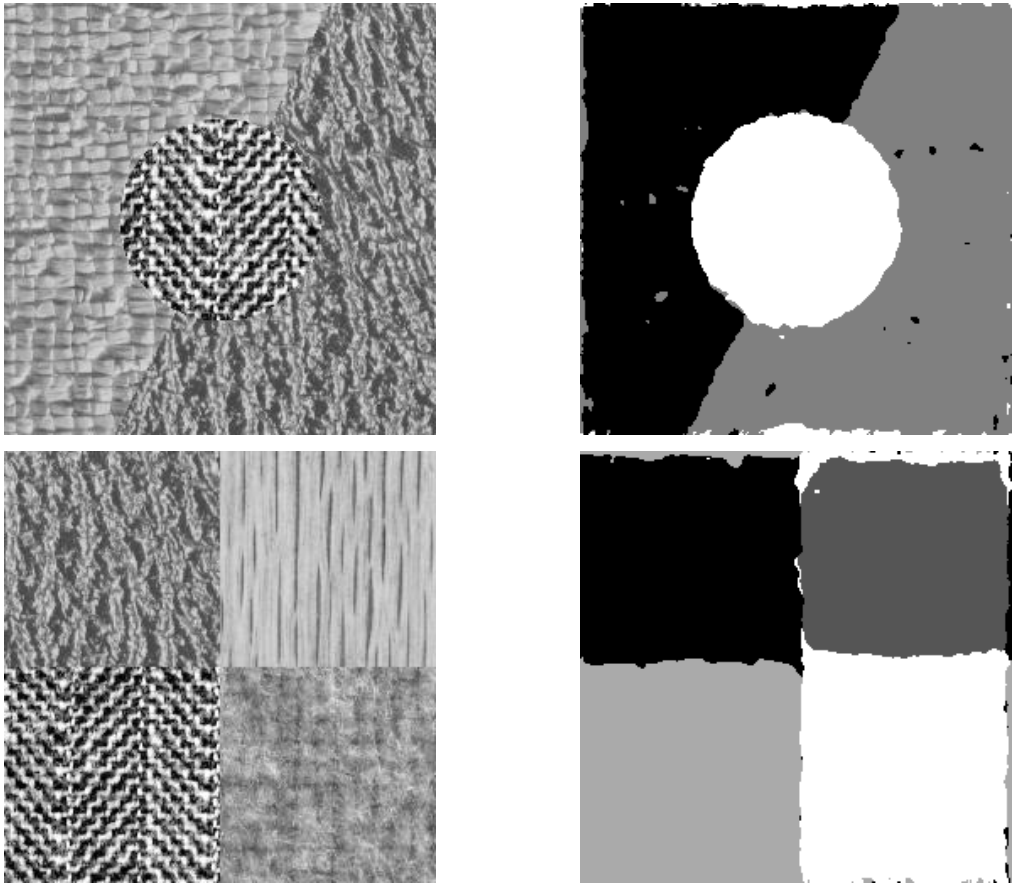
Project 3: Texture Analysis

- To classify different textures according to some quantitative representations.



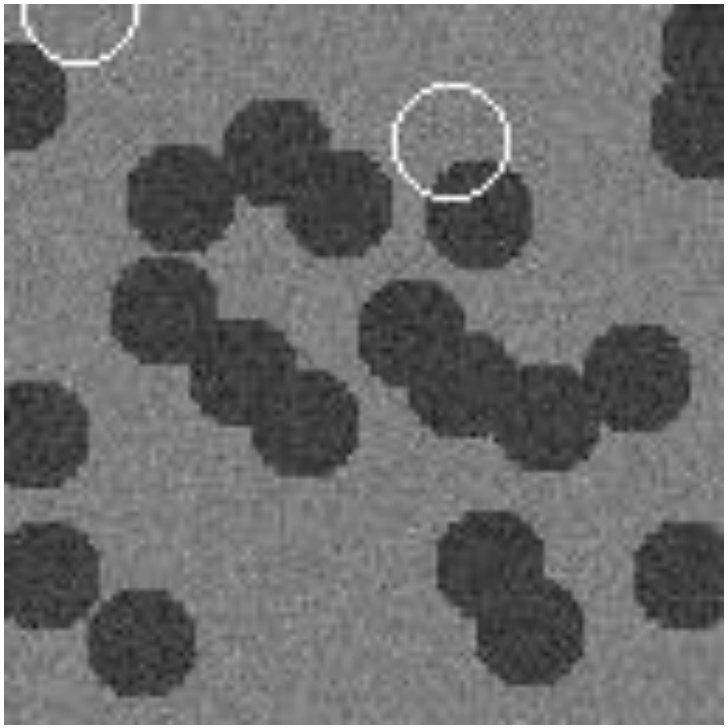
Project 4: Clustering for Image Segmentation

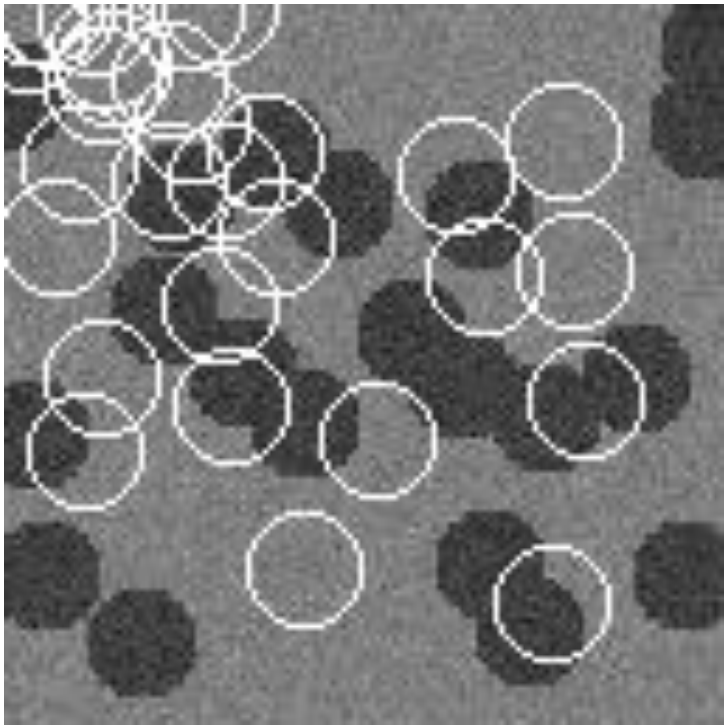
- To segment an image into different regions of different homogeneous behaviors.



Project 5: Object Detection

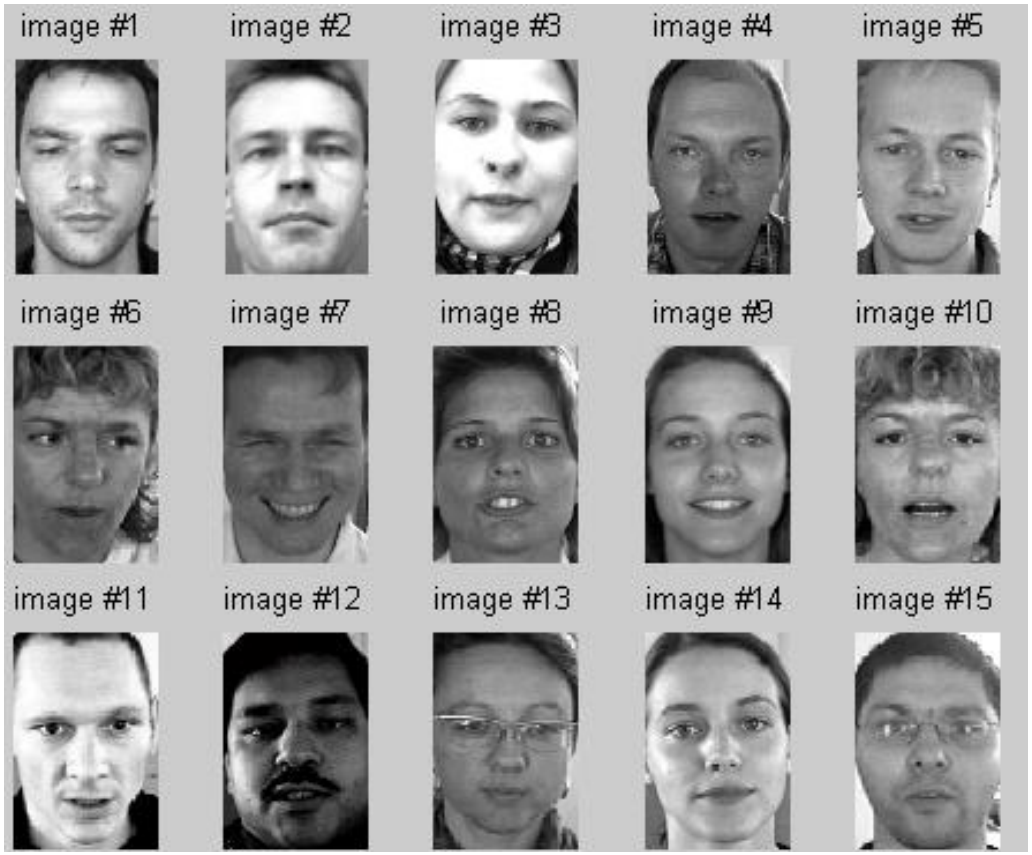
- To detect and localize a given object in an image.





Project 6: Face Recognition

- To recognize a given face image by projecting it into a low-dimensional linear space.



Project 7. HMM-based Recognition

- To apply the hidden Markov model (HMM) for recognition problems from a temporal sequence.


Hand-Waving-Both


Hand-Waving-Right


Hand-Waving-Left


Top-Right


To-Left


To-Top


To-Bottom


Round-Clockwise


Round-Counterclockwise


Stop


Come

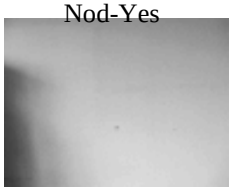

Nod-Yes


Nod-No


Clapping


Kotow


Spin


Go-Left


Go-Right


Turn-Right


Turn-Left