CS 231A Section: Course Project Outline

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Overview

• Project Logistics
• Types of Projects
• Class Coverage and Ideas
• Where to Get Projects
• Helpful Resources
Project Logistics

• Teams of **1-3**: Number of people is taken into account when grading project
  • More members → More work

• Suggestions for project direction
  • Replicate an interesting paper
  • Compare different methods to a benchmark
  • Use a new approach to an existing problem
  • Implement an interesting system
  • Original research
Sharing a Project with Another Class

• Sharing projects is generally allowed
• Specify in reports
• Must be approved by both our staff and the other course staff
• Project must be profound enough that you can clarify which parts of the project were done for which class
  • Each part must be substantial enough to hold as a single project
  • Technical parts and experiments should sufficient and different
  • If using CNN for flower classification include some other components related to this course (e.g. geometry, ...)
• Will need a separate write-up for each class
Project Grading - Important Dates

- Course project: 38%
  - Project proposal 1% (due April 21)
  - Midterm progress report 5% (due May 12)
  - Presentation 7% (will be held on June 7)
  - Final report 25% (due June 9, 11:59 pm)
Project Proposal

• Maximum of 2 pages
• Submit the report as a PDF document through Gradescope
• Include the following:
  • Title and authors
  • Sec. Introduction: Problem you want to solve and why
  • Sec. Technical Approach: How do you propose to solve it?
  • Sec. Milestones (dates and sub-goals)
  • References
• You will be assigned a project mentor
Project Milestone Report

- Maximum of 4 pages
- Submit the report as a PDF document through Gradescope
- Include the following:
  - Title and authors
  - Sec. Introduction: Problem you want to solve and why
  - Sec. Technical Approach: How do you propose to solve it?
  - Sec. Milestones achieved so far
  - Sec. Remaining Milestones (dates and sub-goals)
  - References
Project Presentations

• Short presentation with time for a brief Q&A
• Include the following:
  • Problem Motivation/Description
  • Technical Approach
  • Results
Project Final Report

• Maximum of 10 pages
• Submit the report as a PDF document through Gradescope
• Email your code to TBA.
• Include the following:
  • Title and authors
  • Abstract
  • Sec. Introduction
  • Sec. Previous work
  • Sec. Technical Approach
  • Sec. Experiments
  • Sec. Conclusions
  • References
Class Coverage: **Geometry, Recognition**

- Camera models and calibration
  - Single camera and how we model it
- Single view metrology
  - Estimating geometry from a single view
- Epipolar Geometry (Stereo Vision)
  - Estimating geometry from two viewpoints
- Structure from Motion
  - Using motion/several viewpoints to estimate structure
- Volumetric Stereo
  - Using multiple views to map 3D points
View Morphing

Image morphing techniques can generate compelling 2D transitions between images.

View Morphing
Automatic Photo Pop-Up

A fully automatic method for creating a 3D model from a single photograph

Photo Tourism

Browsing and exploring large unstructured collections of photographs of a scene using a novel 3D interface

Novel Hardware
Mobile Devices

Can you take an existing vision algorithm and adapt it to a mobile device to make it more useful?
Course Coverage: Geometry, Recognition

- Fitting and matching
- Detectors and descriptors
- Object classification
- 2D/3D object detection
- 2D/3D scene understanding
Recognizing Panoramas

Image Segmentation

Partition an image into multiple segments (sets of pixels) in order to make it easier to analyze.
Image Completion

2D/3D Object Recognition

Can you recognize an object in a 2D image?

Or a 3D point cloud?
Tracking
Face Detection – Face Identification
Other Topics

- Pose Estimation: Estimate the skeleton angles for a person from an image/video
- Action and Gesture Recognition: Is a person standing, walking, or sitting in an image/video? Is he/she waving?
- Scene Understanding: Can you classify a scene? Can you recognize and/or segment each component of the scene?
- Trajectory Forecasting
- ...
Negative project examples

• Projects without components related to the course
• Applying Alexnet for image classification
• Finding and running an existing Github code
• Only running OpenCV libraries for a task
• ...

Where to get Project Ideas

- Course Staff: Posted on website and/or Piazza
- Computer vision papers and conferences
  - CVPR
  - ICCV
  - ECCV
- Computer vision research groups at Stanford
  - Silvio Savarese
  - Fei-Fei Li
- Last year’s projects: See course website
- Come up with your own!
Datasets

• Many are available on the web
• See the following aggregators:
  • CV Datasets on the Web
  • Yet Another Computer Vision Index To Datasets (YACVID)
• References found in papers
• Course CA’s
Project Advice

• Choose your team well
• Make sure the scope of your project fits a quarter
  • Set a minimum goal, desired goal, and a moonshot
• Constrain your problem smartly
• See what datasets are available if you are doing a recognition project
• You may need to plan ahead/learn outside materials
• Use software when available
  • OpenCV, MATLAB, Deep learning frameworks
• Come ask questions – We’re happy to talk!
Any Questions?