

# **Project Overview + Project Proposal**

Ishikaa Lunawat

CS231A

04/18/2025

# Overview

- Project Overview - recap from Section 2
- Project Proposal

# Project Logistics

- Overview [here](#)
- Teams of **1-3**: Number of people is taken into account when grading project
  - More members = More work expected
- 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 be sufficient and different
  - For example, if you want to use CNN for flower classification, you can include some other components related to this course (e.g. geometry, ...)
- Will need a separate write-up for each class

# Project Components

## Proposal

- Maximum of 2 pages
- Submit the report as a PDF document through Gradescope
- Some things to include:
  - 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

## Milestone

- Maximum of 4 pages
- Submit the report as a PDF document through Gradescope
- Some things to include:
  - 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

## Report + Presentation

- Length of 6-8 pages
- Similar sections as proposal and milestone, but more detailed
- Submit code
- Short presentation with time for a brief Q&A
- Some things to include:
  - Problem Motivation/Description
  - Technical Approach
  - Results
  - Maybe demo (+)!

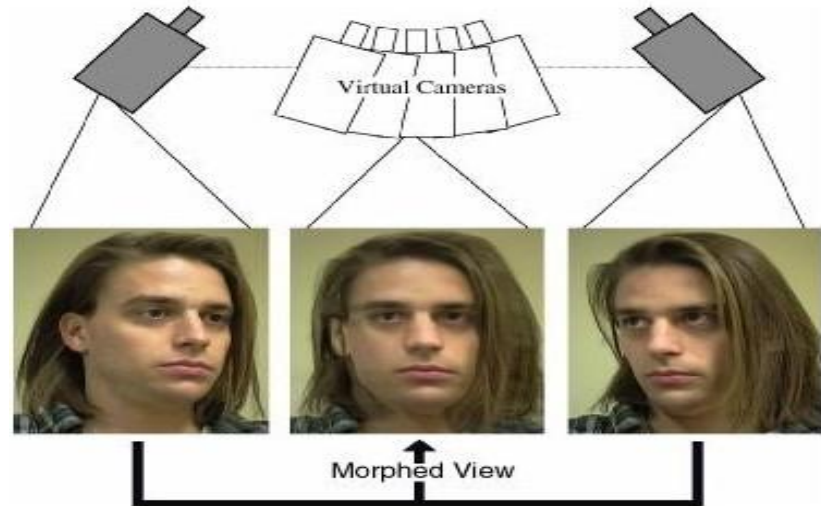
# Class Coverage

1. **Camera models and calibration** – Single camera and how we model it
2. **Single view metrology** – Estimating geometry from a single view
3. **Epipolar Geometry** (Stereo Vision) – Estimating geometry from two viewpoints
4. **Structure from Motion** – Using motion/several viewpoints to estimate structure
5. **Volumetric Stereo** – Using multiple views to map 3D points
6. **Representations and Representation Learning** – Extracting features from 2D images for downstream applications
7. **Monocular Depth Estimation & Feature Tracking** – Estimating depth in images, tracking of pixels in videos
8. **Optical and Scene Flow**
9. **Neural Radiance Fields**

# Examples

## View Morphing

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



# Examples

## Automatic Photo Pop-up



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

Hoiem, D., Efros, A. A., and Herbert, M, "Automatic Photo Pop-Up", SIGGRAPH 2005.



# Examples

## Hardware Applications

Can you take an existing vision algorithm and adapt it to a mobile device to make it more useful?



# Examples

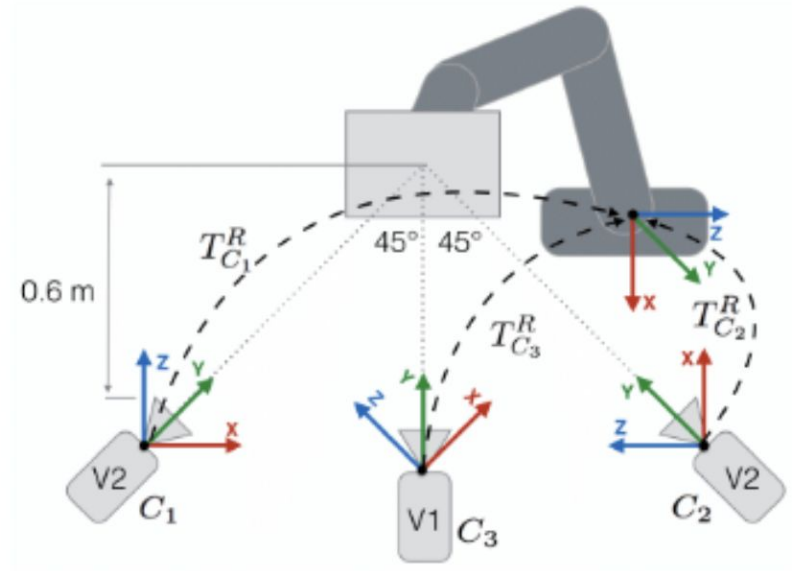
## Depth Estimation



Figure 10. Snapcode of publicly available community lens

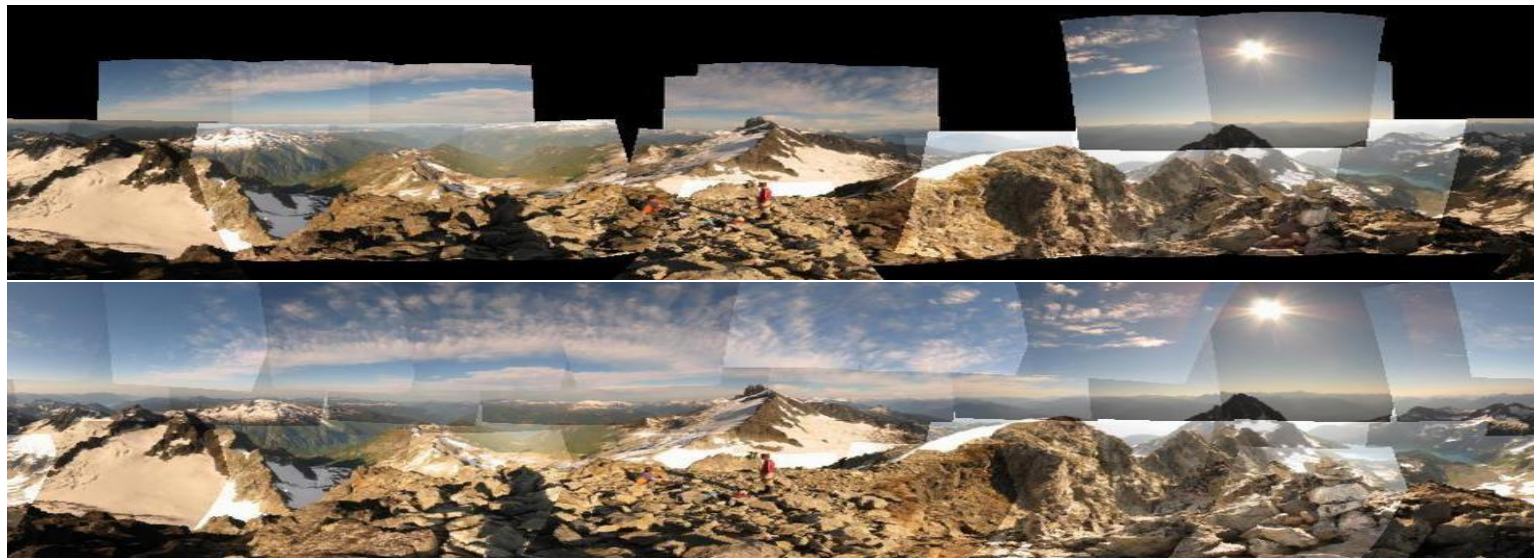
# Examples

## Camera Calibration for robots



# Examples

## Panoramas

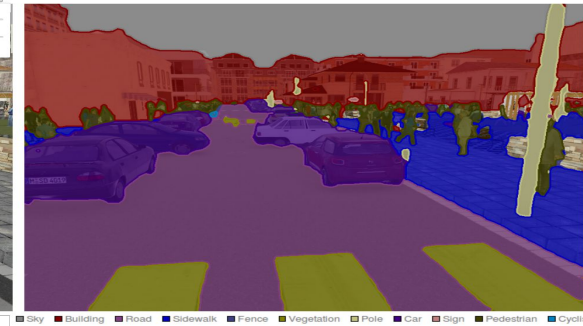
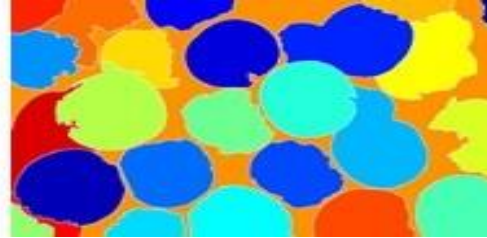


Brown, M. and Lowe, D. G., "Recognizing Panoramas", ICCV 2003.

# Examples

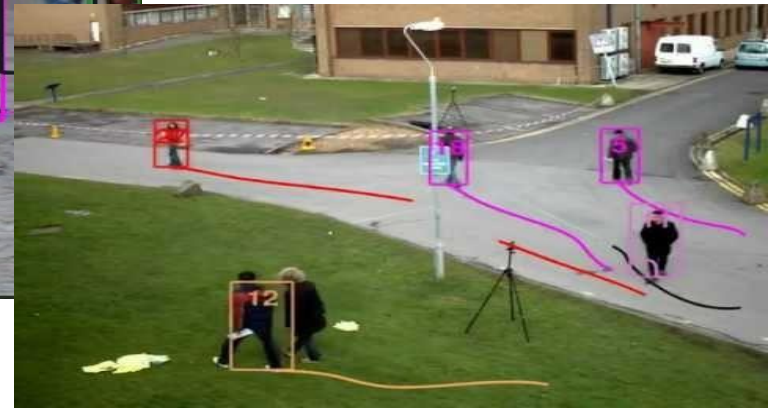
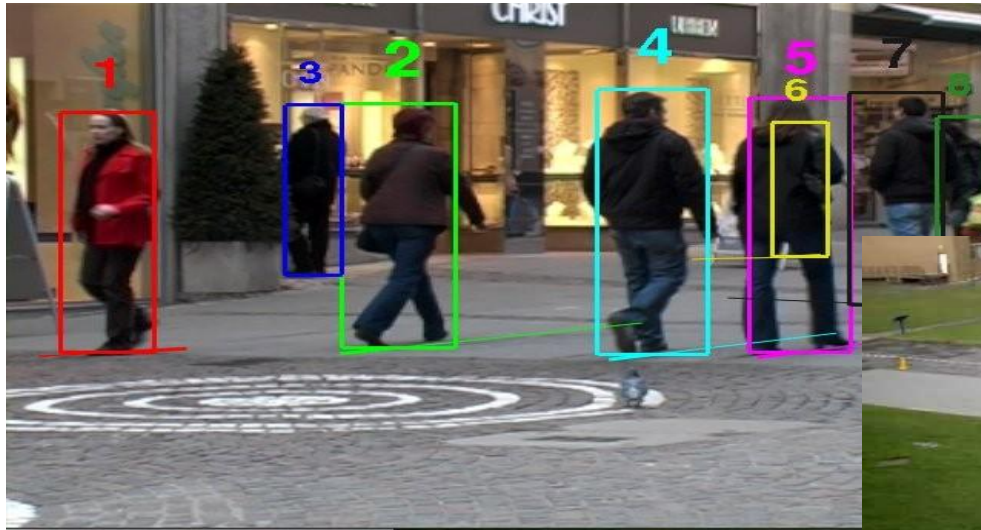
## Image Segmentation

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



# Examples

## Tracking





# Examples

## Some other areas

- **Pose Estimation:** Estimate the skeleton angles for a person from an image/video
- **Action/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**

# Invalid Project Examples

**aka.**, these are not fully valid for the course requirements

- Projects without components related to the course
  - Has to have some 3D or projective Geometry component rather than only processing single images for example
- Applying Alexnet for image classification
- Finding and running an existing Github code
- Only running OpenCV libraries for a task



# Project Ideas

- Course Staff: Office hours, ideas posted on website, Ed
- Computer vision papers and conferences
  - CVPR
  - ICCV
  - ECCV
- Computer vision research groups at Stanford
  - Silvio Savarese
  - Fei-Fei Li
  - Juan Carlos Niebles
- Past projects: See course webpage ([CS 231A Projects 2024](#))
- Check out: [Papers with Code: Computer Vision](#)
- Come up with your own!

# Datasets

- Many are available on the web directly (Google search)
- See the following aggregators:
  - [CV Datasets on the Web](#)
  - [Kaggle](#)
  - [Yet Another Computer Vision Index To Datasets](#) (YACVID)
- References (found in papers)

# 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
- Specially for deep learning projects
- 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!

# Project Proposal

## Project webpage info:

The project proposal should be up to 2 pages and should contain the following:

- What is the problem that you will be investigating? Why is it interesting?
- What reading will you examine to provide context and background? Additionally, has is some prior work related to this problem? Please provide at least 2 specific citations.
- What method or algorithm are you proposing? If there are existing implementations, will you use them and how? How do you plan to improve or modify such implementations?
- What data will you use, if any? If you are collecting new datasets, how do you plan to collect them?
- How will you evaluate your results? Qualitatively, what kind of results do you expect (e.g. plots or figures)? Quantitatively, what kind of analysis will you use to evaluate and/or compare your results (e.g. what performance metrics or statistical tests)?
- By what dates will you complete certain parts of your project? List specific goals for the midterm progress report.

We highly recommend submitting a project proposal and talking to the course staff about your proposed project throughout the quarter. Generally, we find that students who do this end up with very strong, and even publishable, final projects.

If your proposed project is joint with another class' project (with the consent of the other class' instructor), make this clear in the proposal.

# Project Proposal

- Maximum of 2 pages
- If you haven't found a team, check out the Team Forming Thread on Ed
- Due 11:59 PM, April 24
  - Check announcements for updates on deadlines, etc., via Ed
  - Submit the proposal as a PDF document through Gradescope
- Include the following sections:
  - Title and authors
  - Introduction
  - Prior Work
  - Dataset
  - Technical Approach
  - Evaluation Metrics
  - Milestones (dates and sub-goals)
  - References

**Thanks!**