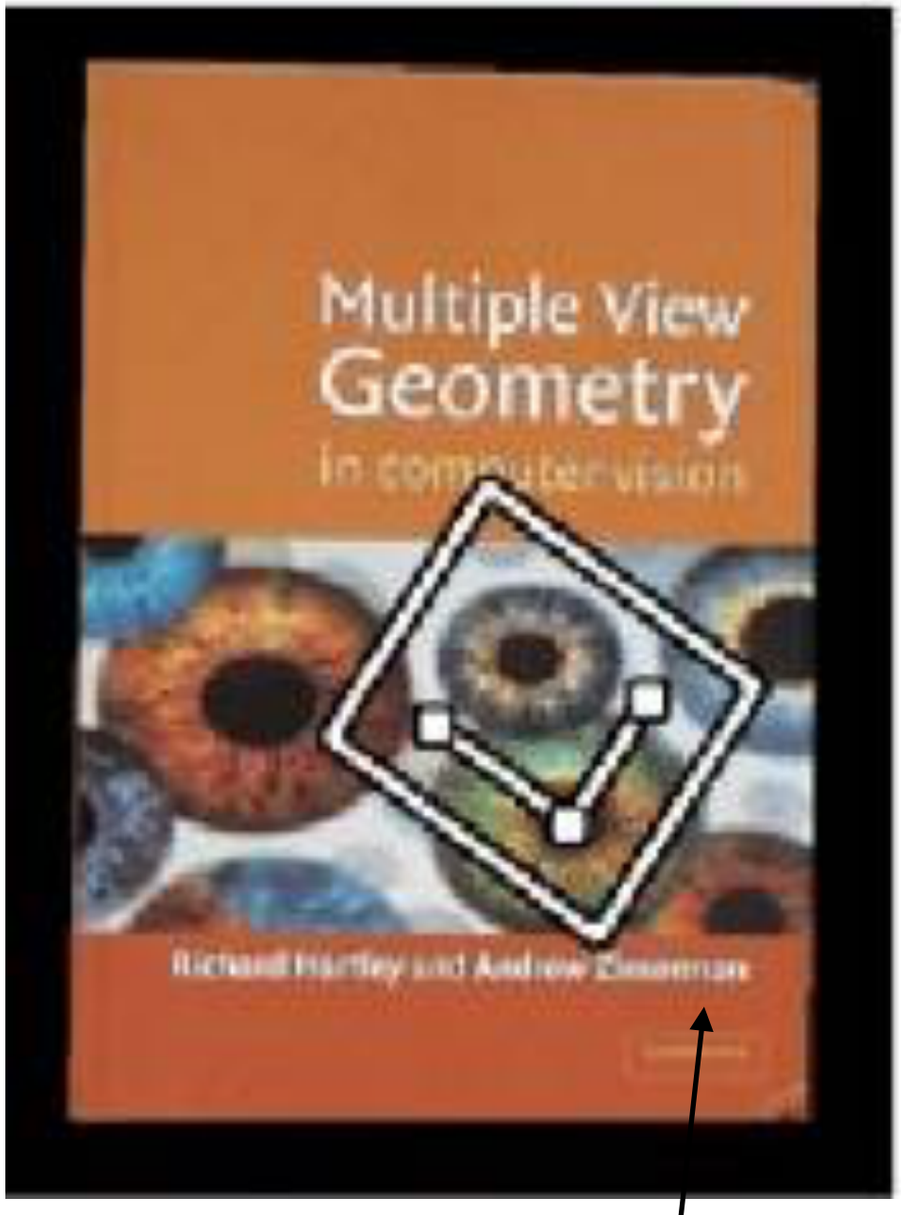
Image Matching



is this thing...

the same as this thing?

Applications: Panorama Stitching

Stitching multiple images into a seamless panorama
(Project 2)

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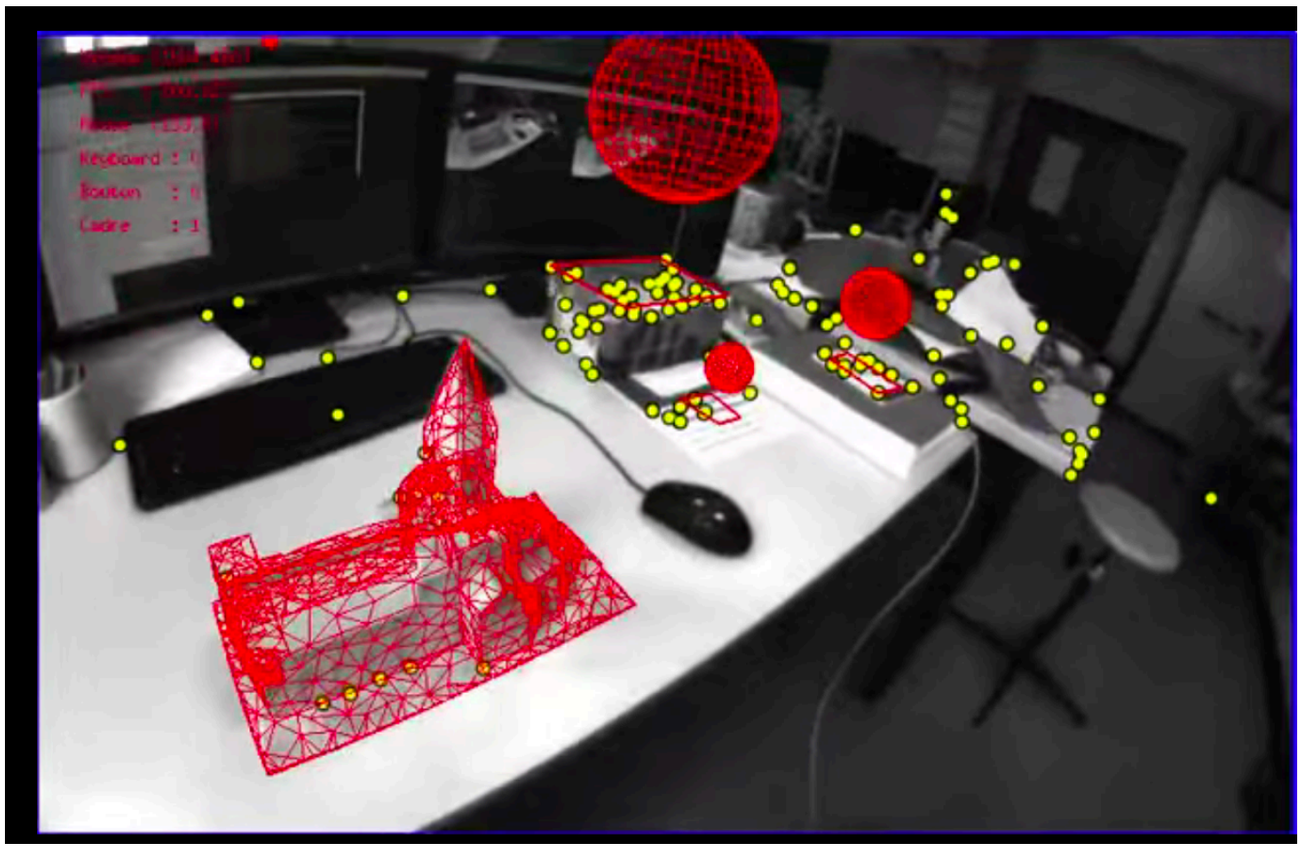
Applications: Tracking

- Motion analysis
  https://youtu.be/1rZNb-affQg

- Augmented reality

- Segmentation

- Robot navigation



https://youtu.be/5I5pbSs-yrU

Running motivating example: Panorama Stitching

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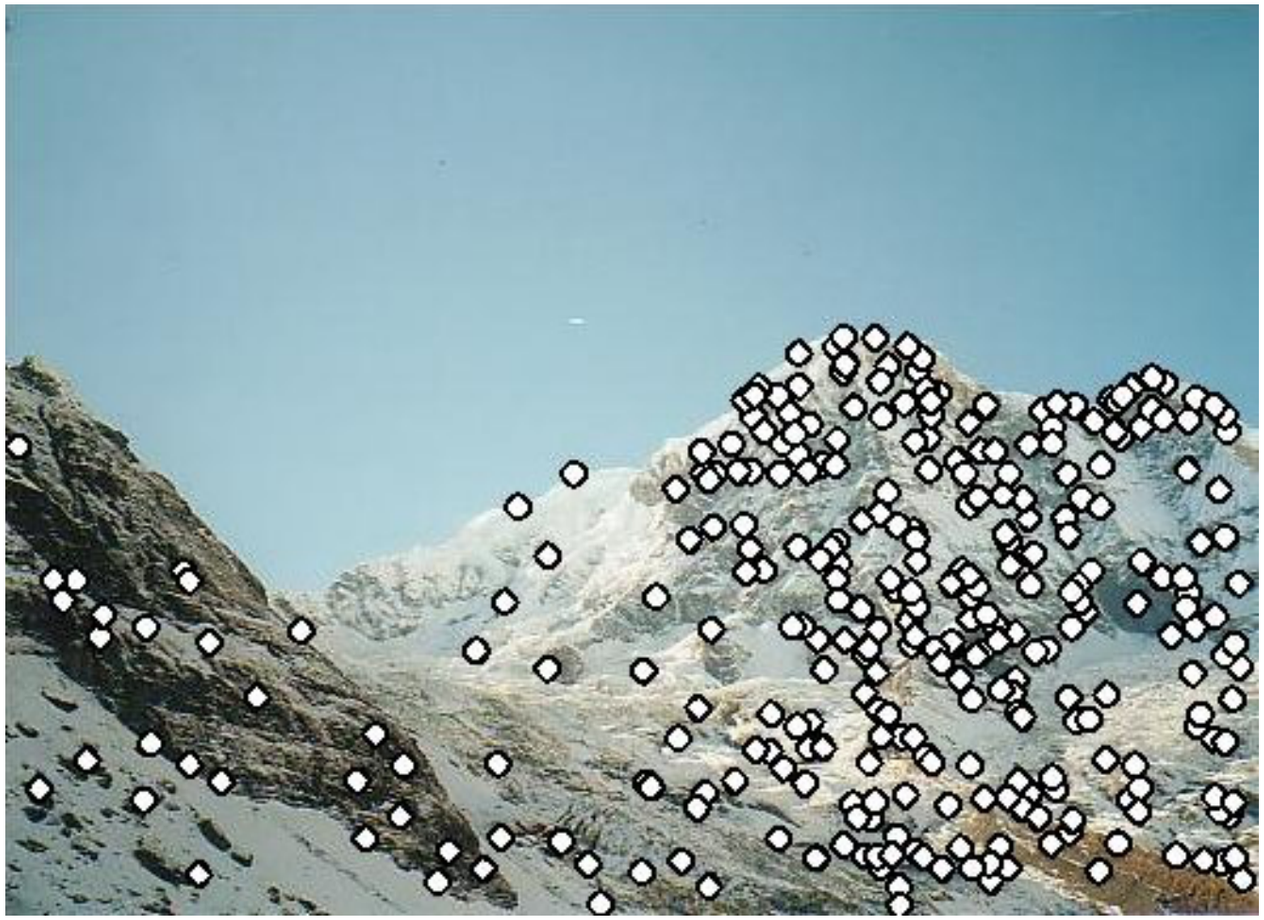
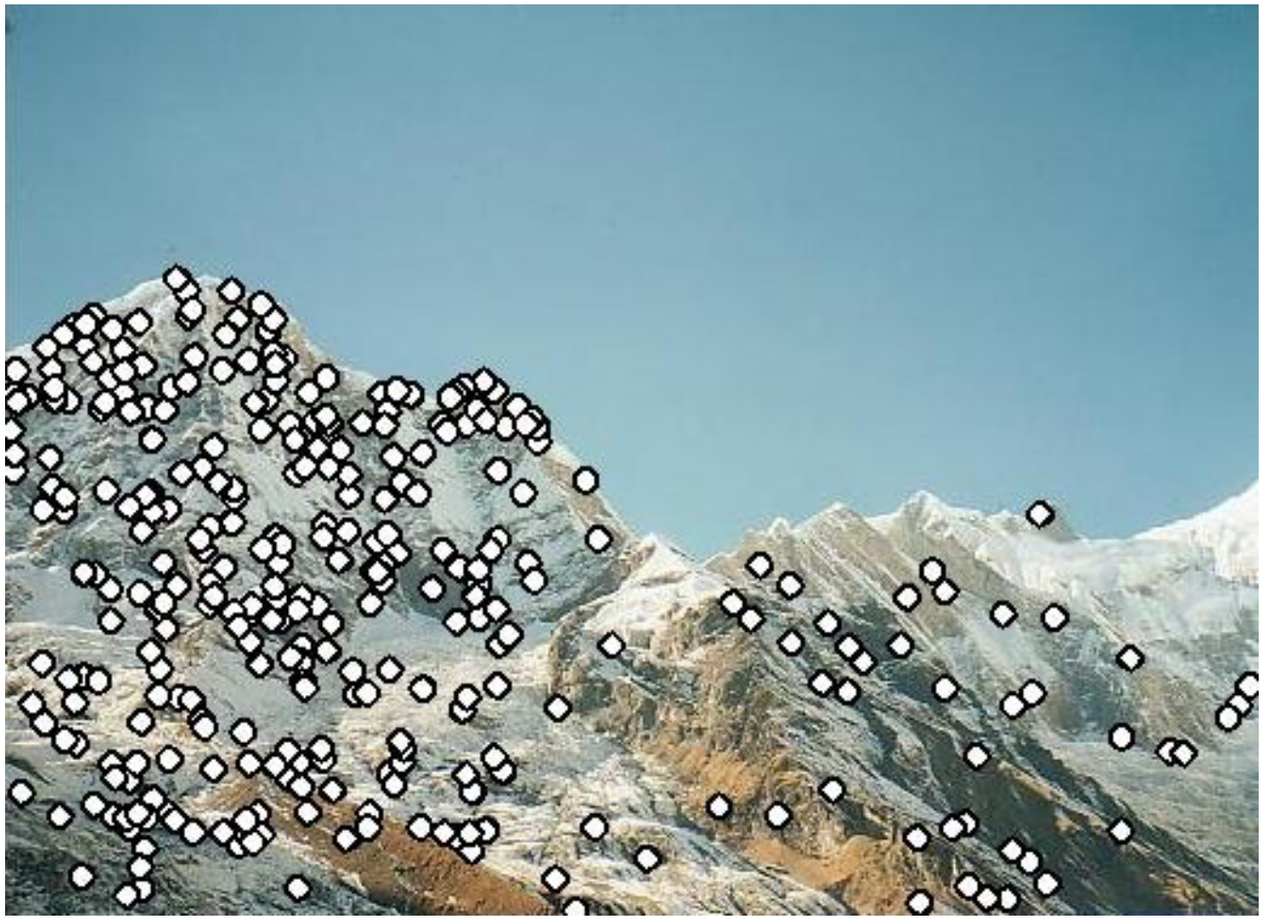
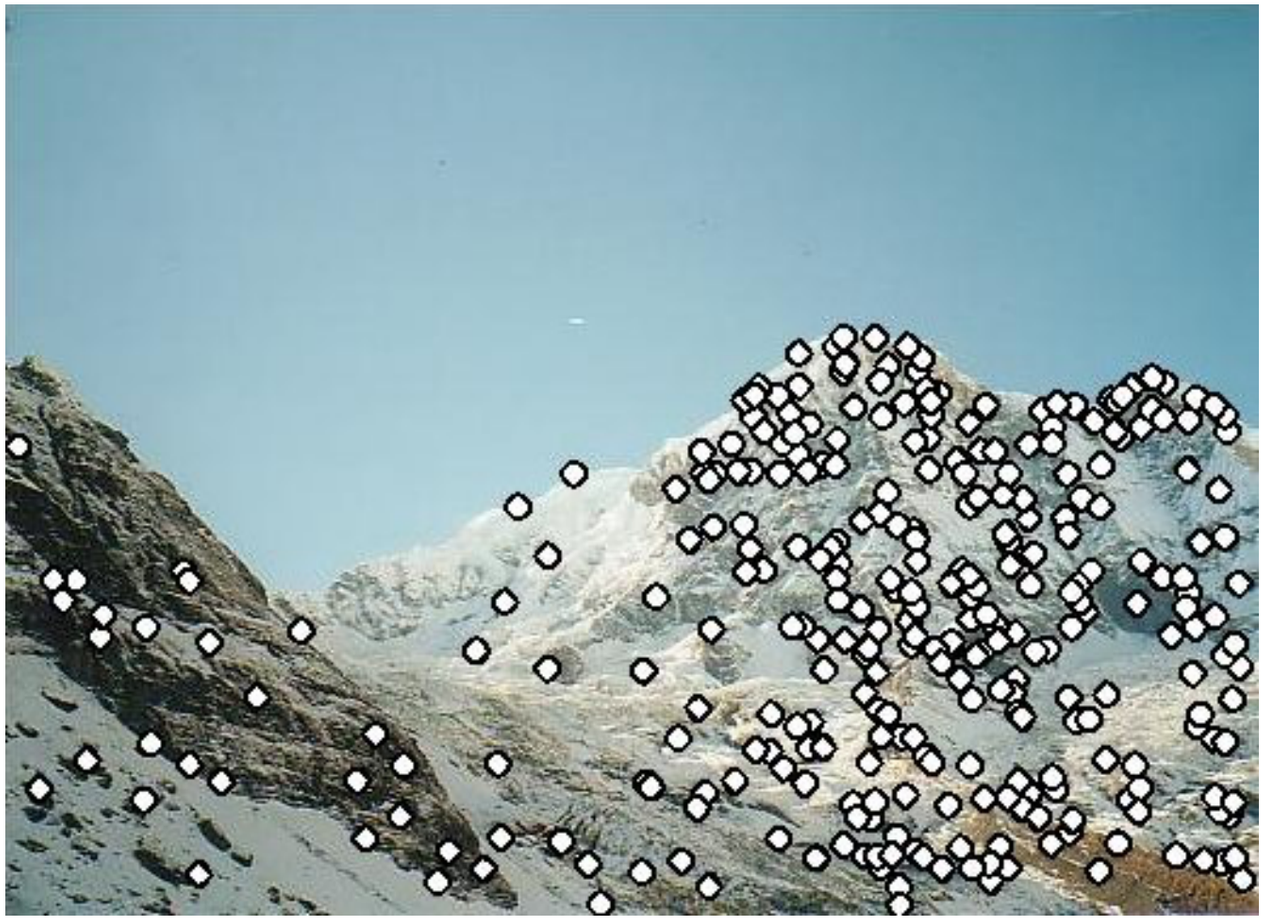
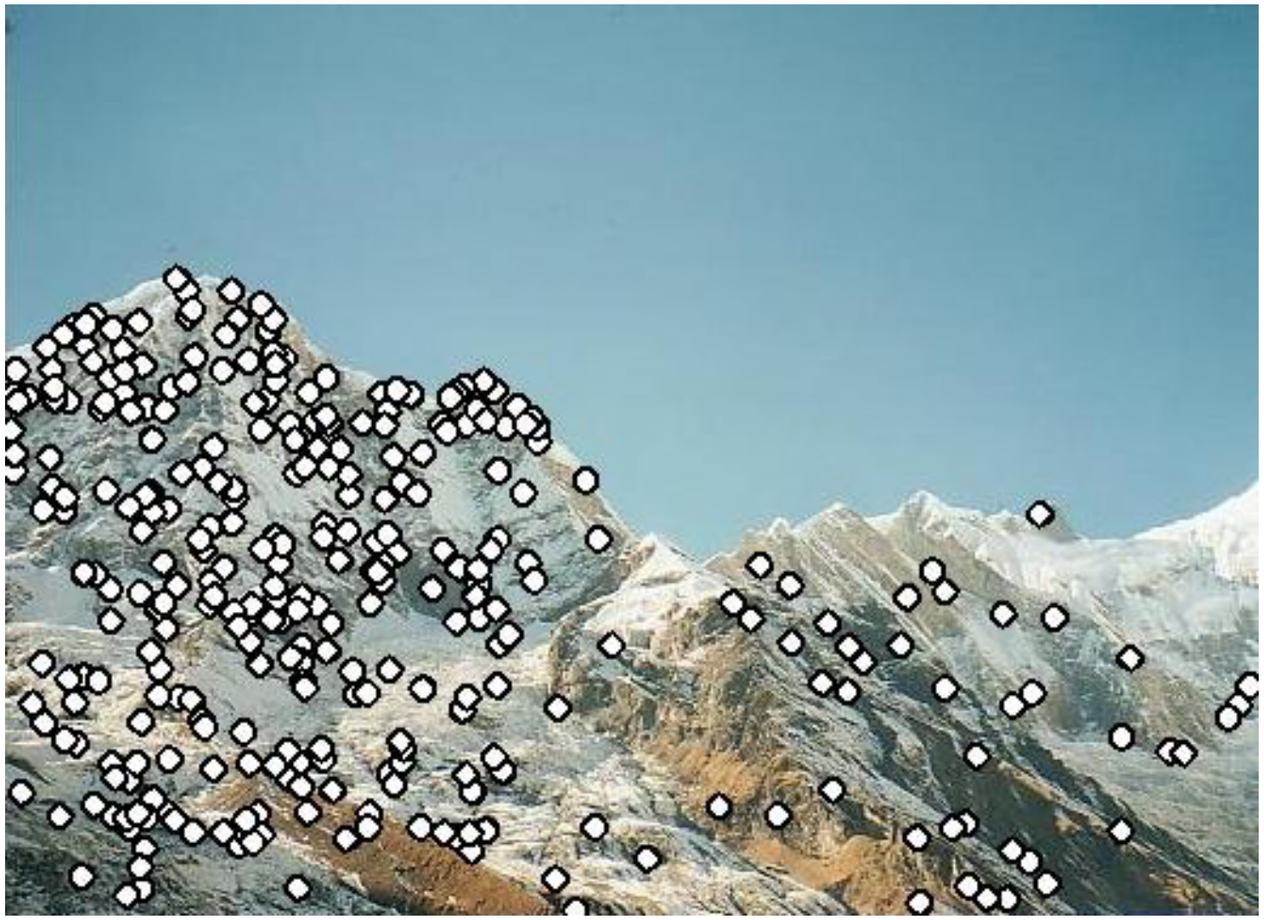




1. **Detect** corner features

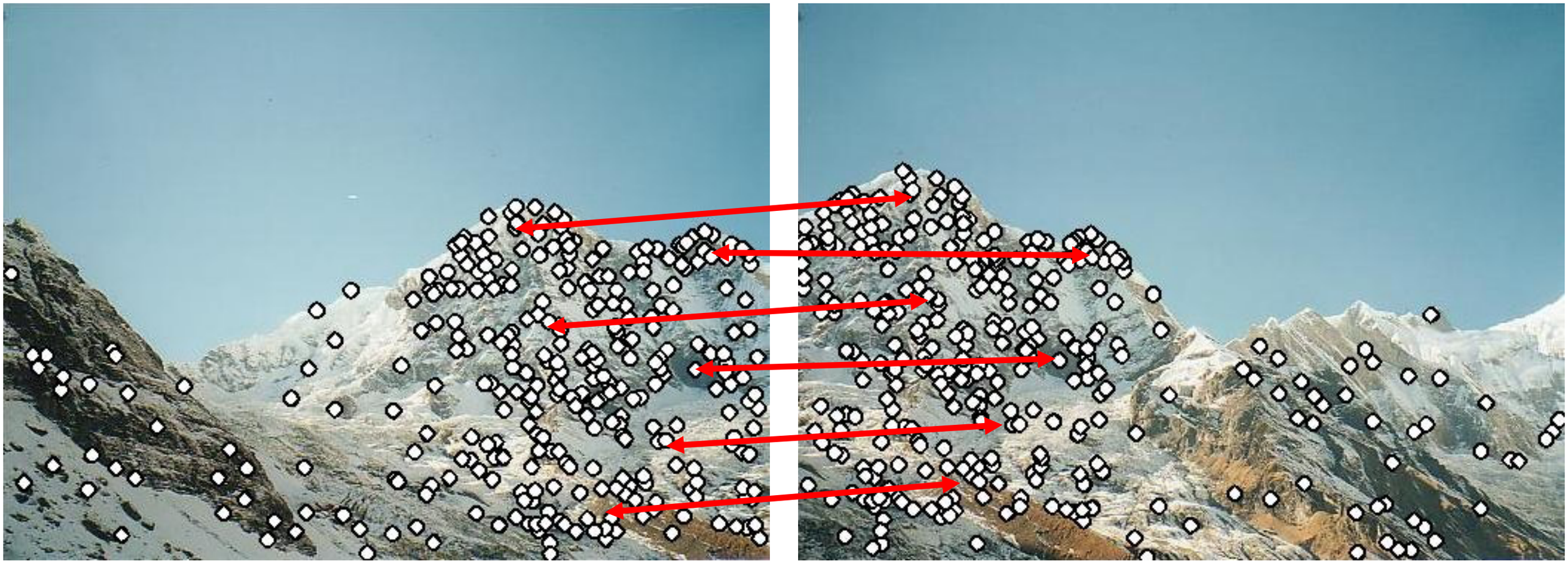
Running motivating example: Panorama Stitching





2. Compute feature **descriptors**

Running motivating example: Panorama Stitching



3. **Match** features based on their descriptors.

Running motivating example: Panorama Stitching

4. **Warp** images into alignment

Running motivating example: Panorama Stitching

5. **Blend** images to eliminate seams

Panorama Stitching: Steps

feature matching

1. **Detect** features
2. Compute feature **descriptors**
3. **Match** features based on their descriptors

geometric transformations

4. **Warp** images into alignment

photometric transformations

5. **Blend** images to eliminate seams

Image features

- Can be *global* or *local*
- Global features "distill" the whole image. examples:
  - average brightness
  - histogram of image intensity values
  - a tiny version of the image itself?
  - a vector ("embedding") produced by a neural network

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(our focus)

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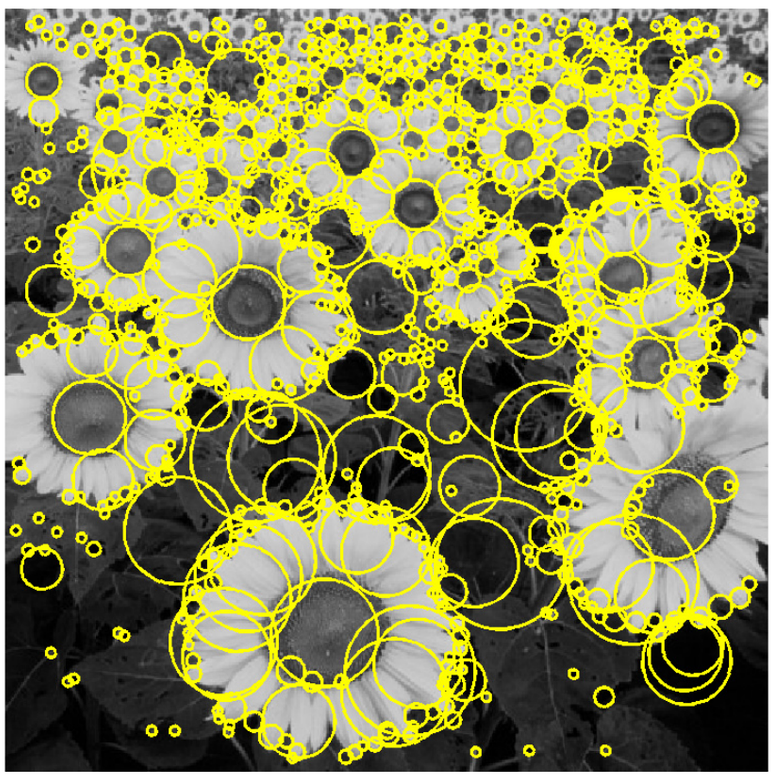
Image features

- Local features identify salient / distinctive / useful points in the image. Examples:

Edges

Blobs



Corners

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(our focus)

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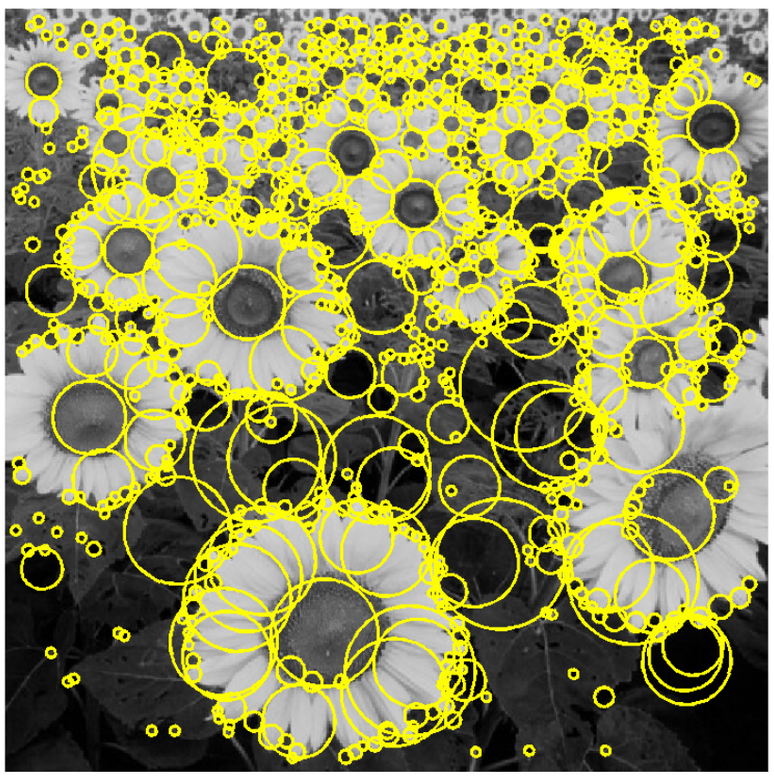
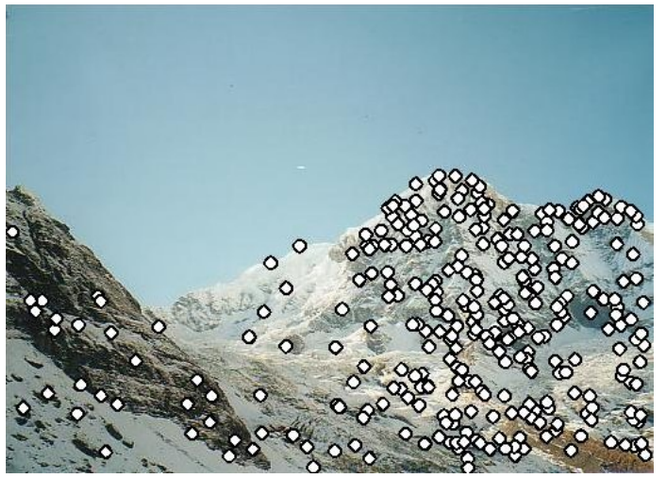


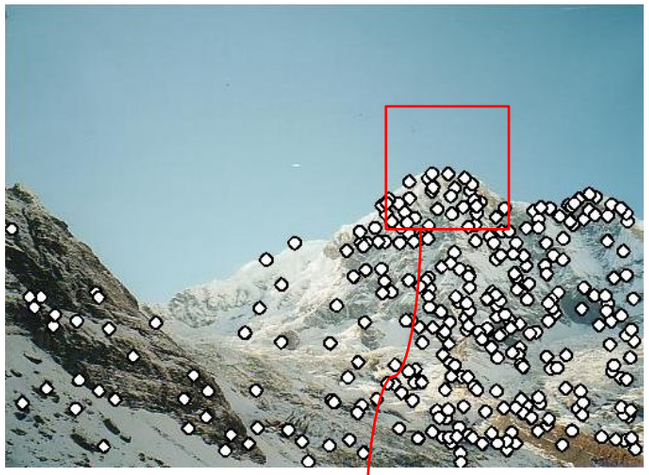
Corners

Features - Overview

1. Detect

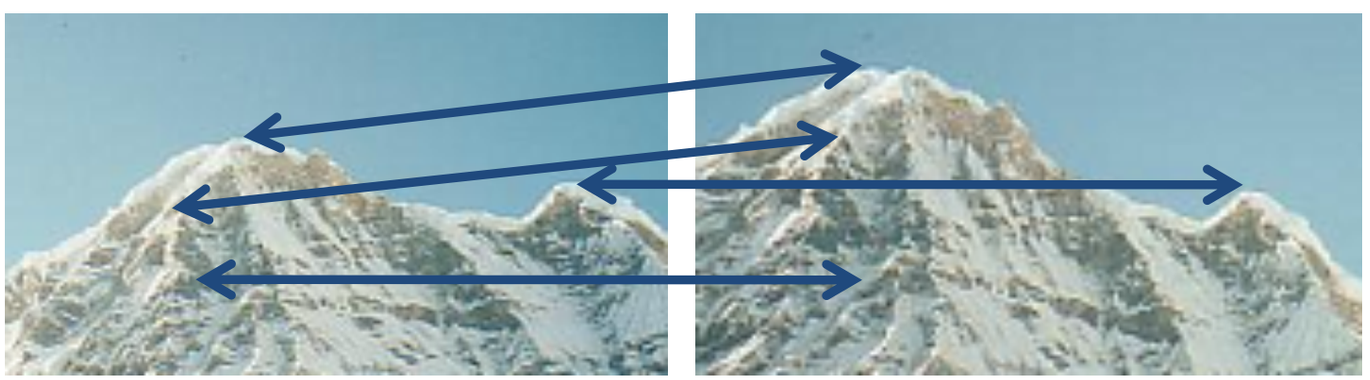


2. Describe



$$\mathbf{x}_2 = [x_1^{(2)}, \ldots, x_d^{(2)}]$$

3. Match



What makes a good feature?

Two desirable properties:

- Uniqueness: features **shouldn't** match if they're from different points in the scene.

- Invariance: features **should** match if they do come from the same point in the scene.