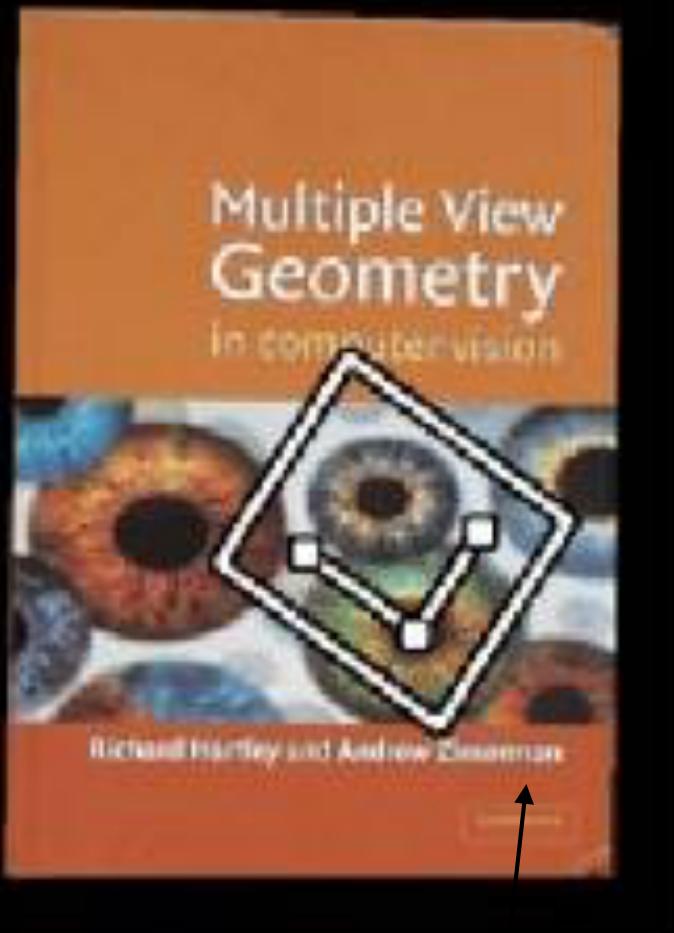


# Image Matching



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

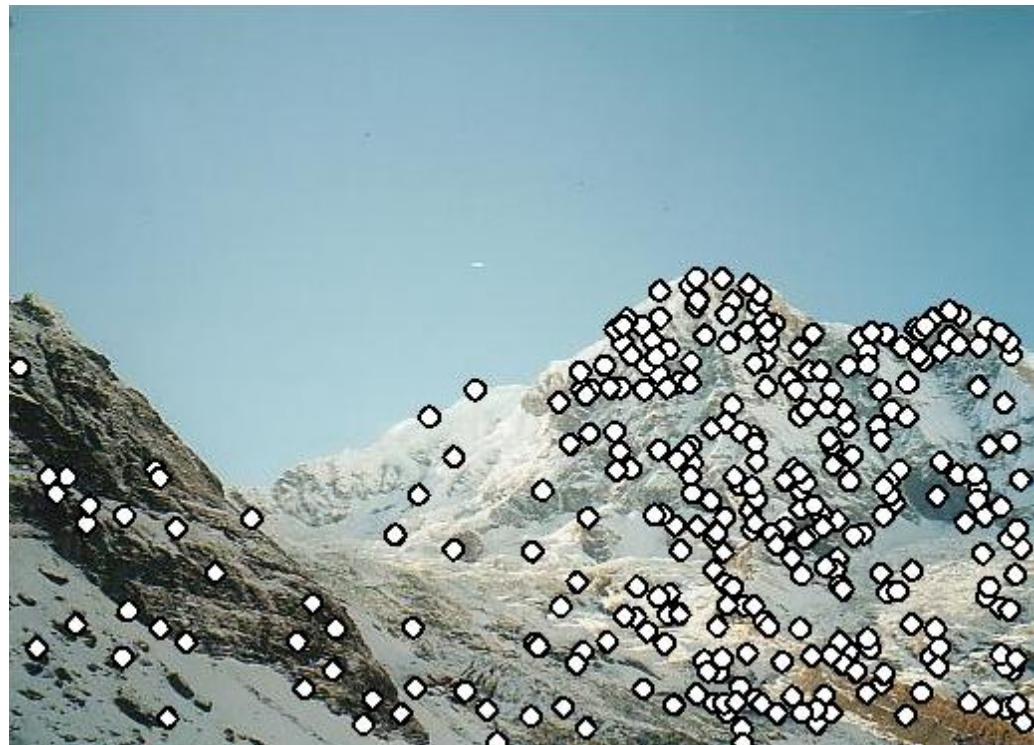


<https://youtu.be/5I5pbSs-yrU>

# Running motivating example: Panorama Stitching

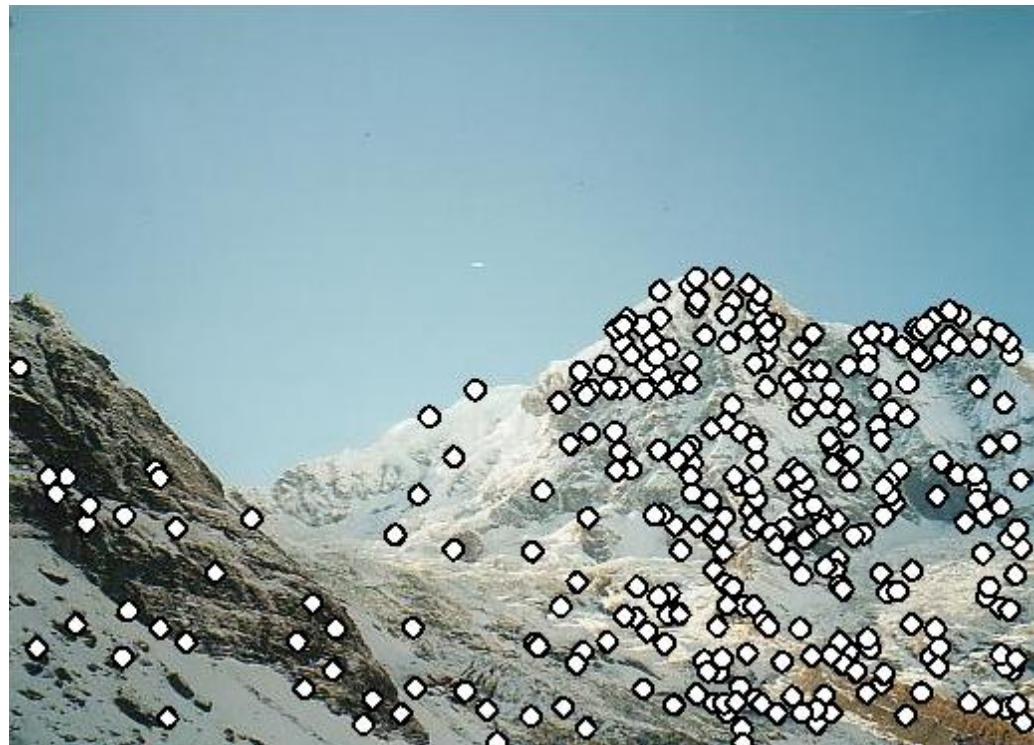


# Running motivating example: Panorama Stitching



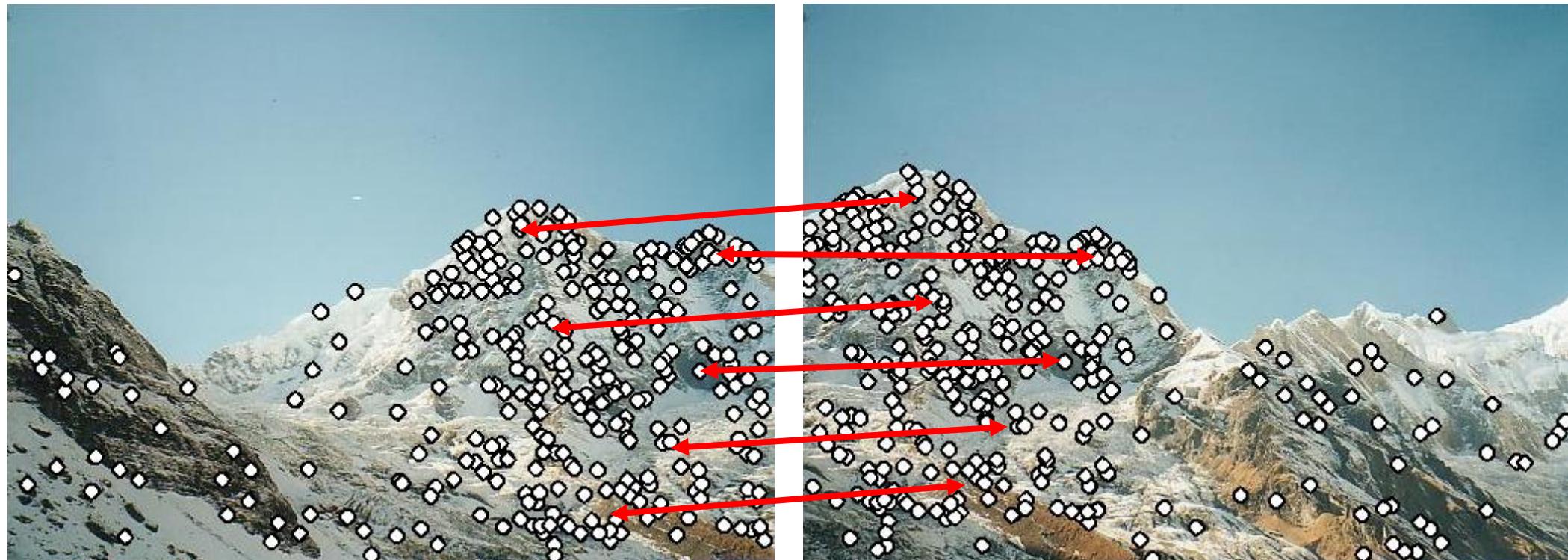
1. **Detect** corner features

# 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

- 1. **Detect** features
  - 2. Compute feature **descriptors**
  - 3. **Match** features based on their descriptors
  - 4. **Warp** images into alignment
  - 5. **Blend** images to eliminate seams
- feature matching
- geometric transformations
- photometric transformations

# 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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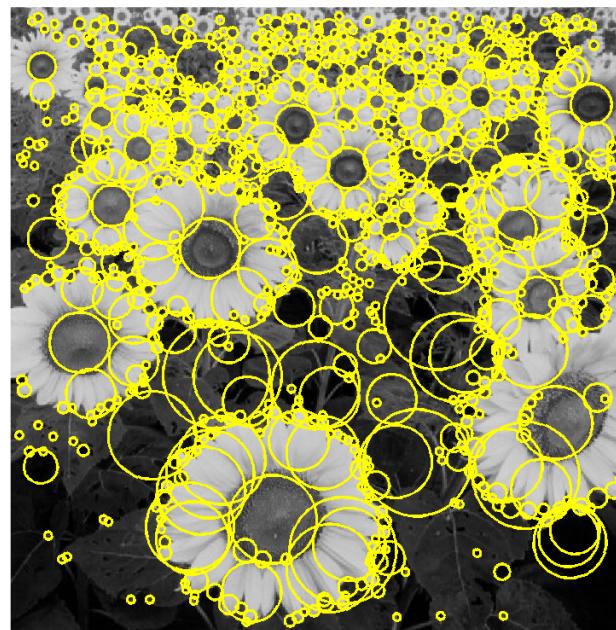
# Image features

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

Edges



Blobs



Corners



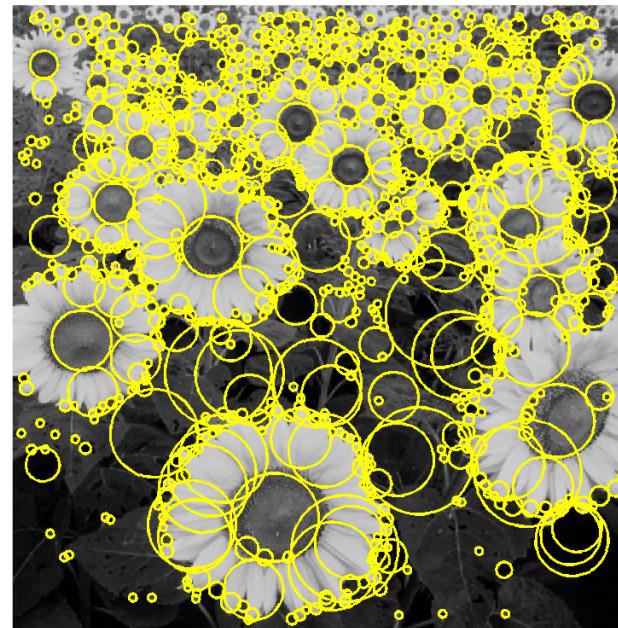
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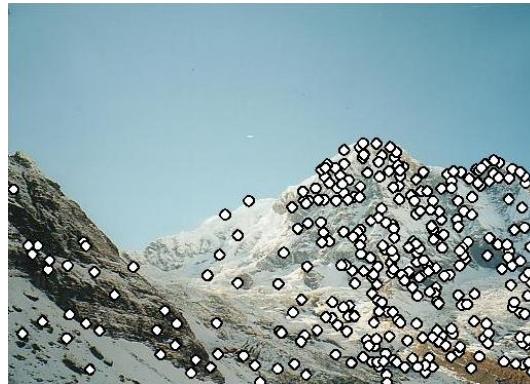
(our focus)

Corners

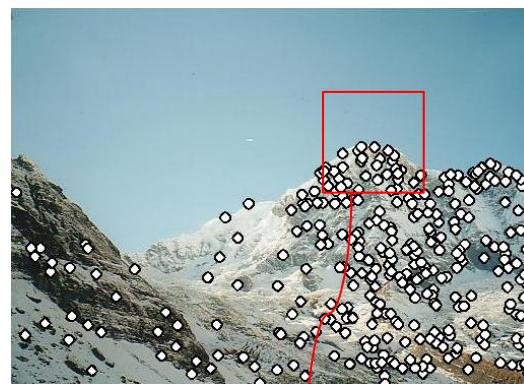


# Features - Overview

1. Detect

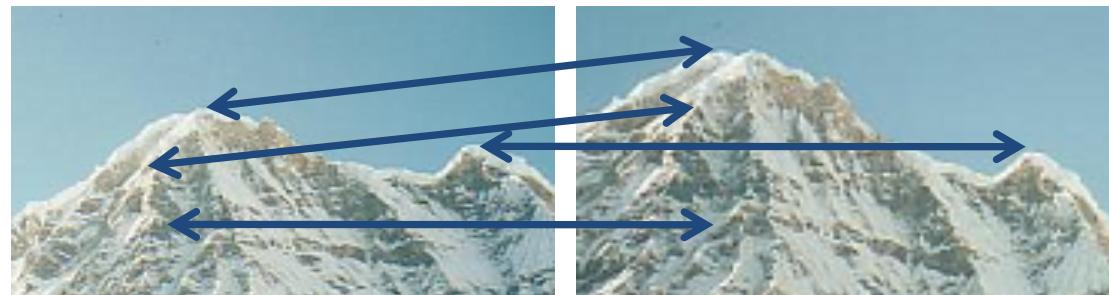


2. Describe



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

3. Match



# Next time: 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.