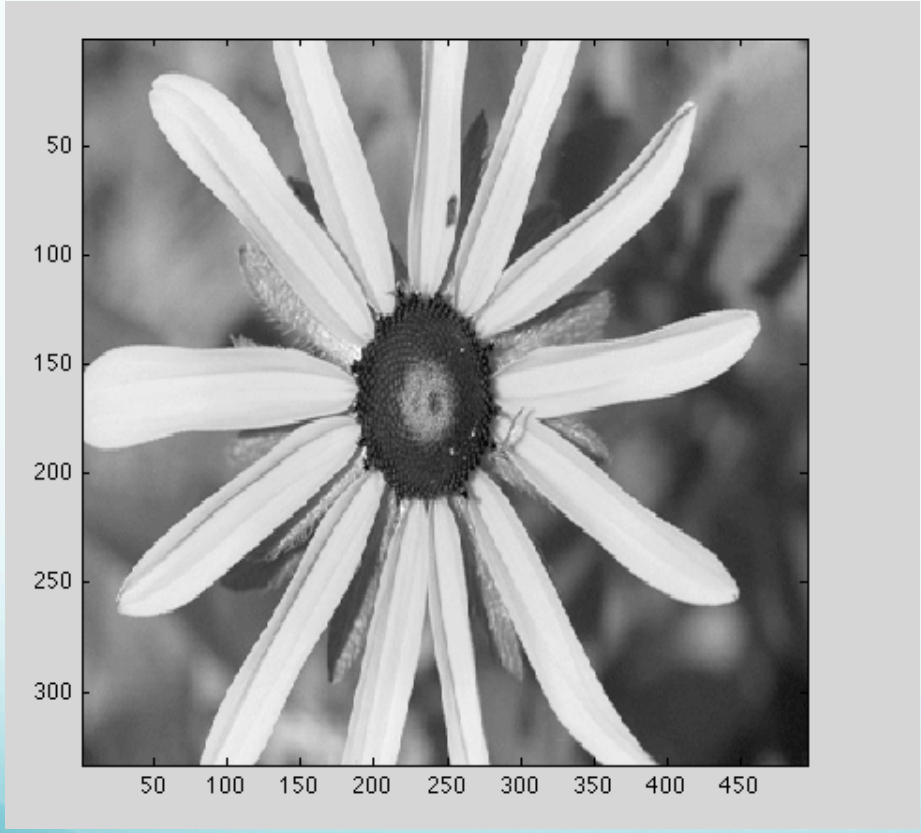
Graduate Computer Vision

CS691A (CS670)
Unit 3: Alignment
Erik Learned-Miller

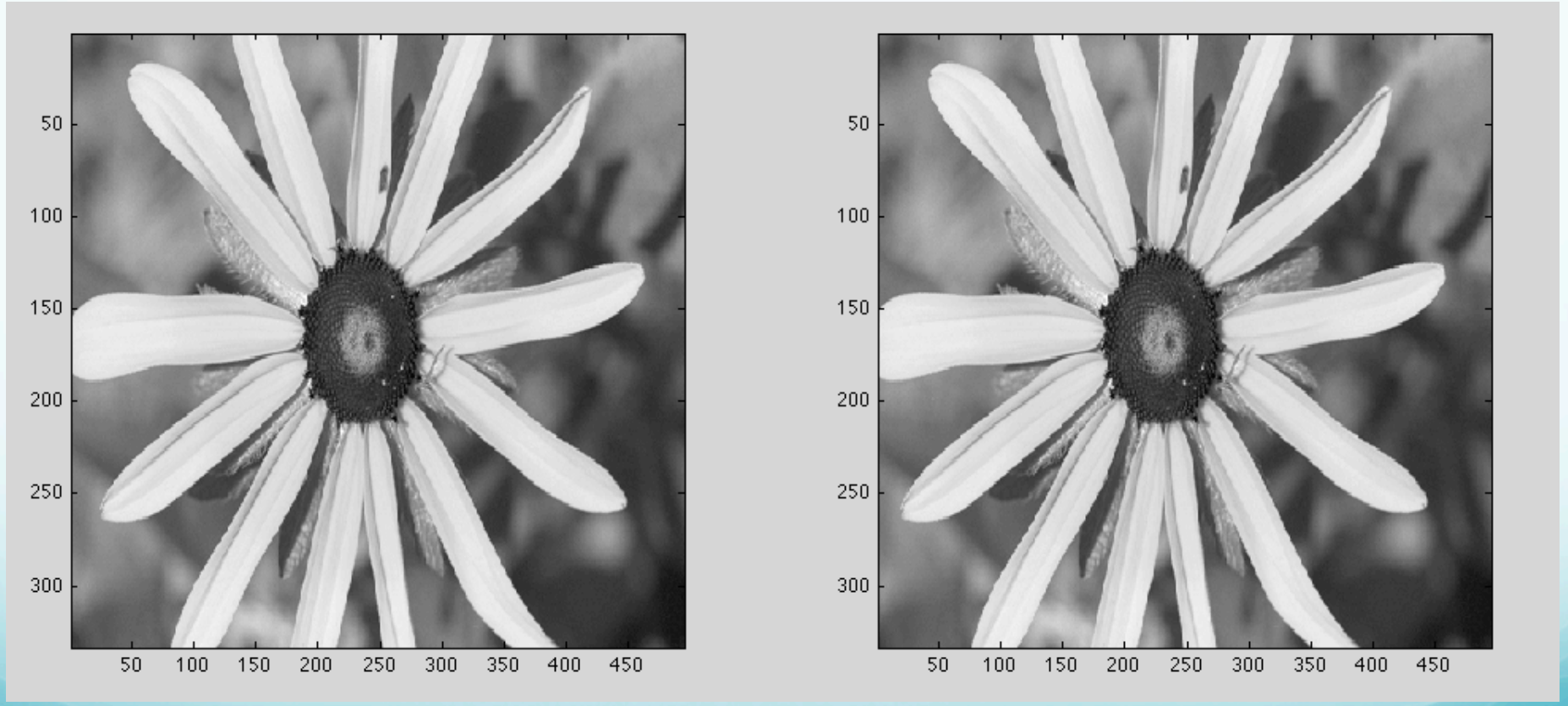
Today

- Why is alignment important

Alignment



How similar?


50
100
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50 100 150 200 250 300 350 400 450
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100
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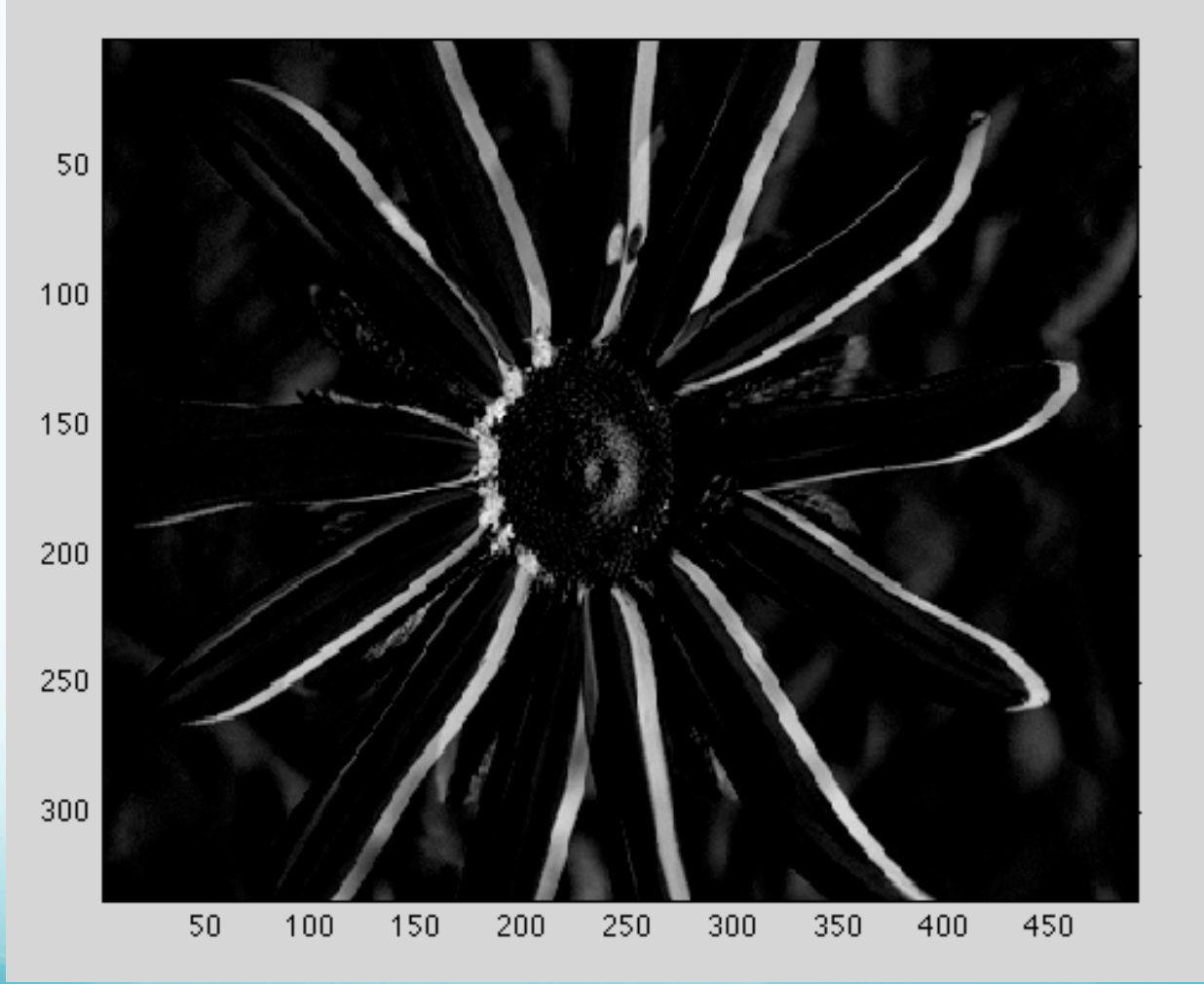
50 100 150 200 250 300 350 400 450

Difference Image



Two basic choices

- Use features that don't care about position at all...
- Try to align things before comparing

Two basic choices

- Use features that don't care about position at all...
  - Colors
  - "bags of features"

- Try to align things before comparing

Invariant Features

- Not very discriminative
- A good way to start looking for something, but not to confirm that you found it.
  - Apples are (or might be) red.
- For most recognition problems, some position information is critical.

Is there an apple here?

Face as a bag of features

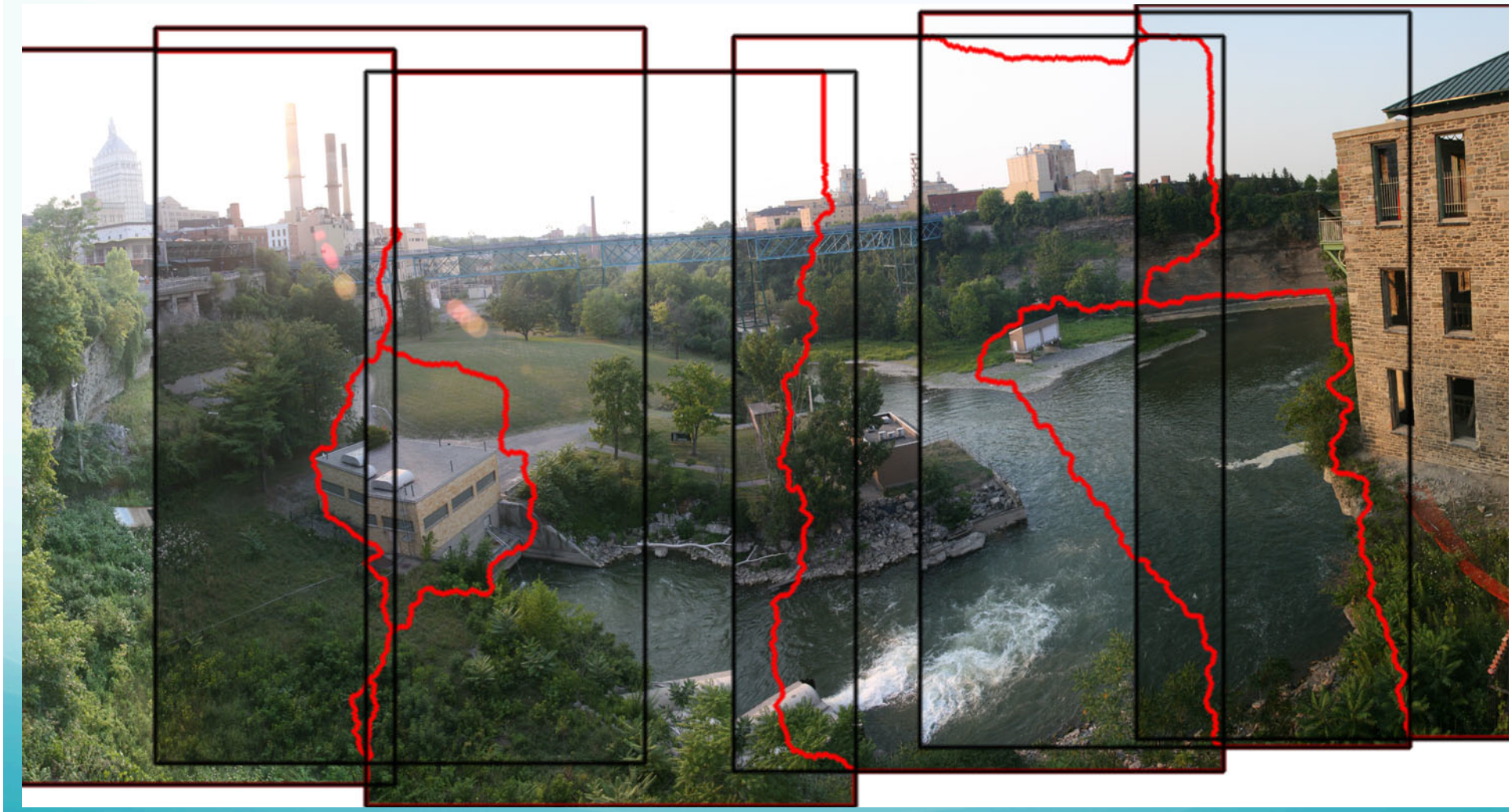
Many slides adapted from Fei-Fei Li, Rob Fergus, and Antonio Torralba

Sensitivity to Position and Relative Orientation of Features

Alignment methods

- **Alignment**
  - Finding exact correspondences
  - points in the world which represent the same thing
  - Applications:
    - Image stitching
    - Video stabilization
    - Rigid single object recognition
- **Generalized alignment**
  - Rough alignment of similar images
  - Examples:
    - Face alignment
    - Handwritten digit alignment

Image Stitching



Stabilization movies

Generalized Alignment

- For some matching function,
  for some set of transformations,
  find the best value of the matching function over all possible alignments.