

# CS354

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# A Brief History of Object Recognition/Detection

- Color indexing:
  - Swain, Michael J., and Dana H. Ballard. "Color indexing." *International journal of computer vision* 7.1 (1991): 11-32.
- Keypoint Feature Detection and Matching. E.g.:
  - Lowe, David G. "Distinctive image features from scale-invariant keypoints." *International journal of computer vision* 60.2 (2004): 91-110.
- Convolutional Neural Networks (ConvNets) Review:
  - LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "Deep learning." *Nature* 521.7553 (2015): 436-444.

# Feature Based Object Recognition

- Basic Steps:
  - Detect Keypoints
  - Calculate feature vectors
  - Look for matching features
  - Infer object location and pose from matches (generally not 3d)

# SIFT Based Object Detection

- Scale-invariant feature transform (SIFT)
- Detect Keypoints
  - Look for peaks in the difference of gaussian at multiple scales.
  - [Gaussian Pyramids Tutorial](#)
  - [SIFT Tutorial](#)
- Assign an orientation
  - Use a histogram of image gradients...
- Calculate feature vectors/descriptors
  - [Distinctive Image Features from Scale-Invariant Keypoints](#), David Lowe, 2004.
- [Full Example](#)