

## 381V Visual Recognition: Outline of lecture for Aug 31, 2016

- I. Basics in feature extraction: filtering
  - a. Digital images format
  - b. Linear filters
    - i. Smoothing: box filter, Gaussian filter
    - ii. Gradients: finite differences, derivative of Gaussian, Laplacian of Gaussian
    - iii. Template matching
  
- II. Invariant local features
  - a. Overview of local feature matching pipeline
  - b. Interest point operators
    - i. Harris corner detector
    - ii. Laplacian of Gaussian blob detector (~Difference of Gaussians)
  - c. SIFT descriptors
    - i. Definition
    - ii. Invariance properties
  - d. Feature matching
    - i. Finding neighbors
    - ii. Lowe's ratio test to eliminate ambiguous matches
  
- III. Specific object recognition with local feature matching
  - a. Target applications
  - b. Visual words for feature matching
    - i. Forming a visual vocabulary
    - ii. Inverted file index
    - iii. Bag-of-words representation for an image
    - iv. Vocabulary trees for large vocabularies
  - c. Spatial verification
    - i. RANSAC
      1. Line fitting
      2. Translation-only transformation
      3. Affine transformation
    - ii. Generalized Hough Transform
      1. Main idea of voting
      2. Line detection as an example
      3. Hough for SIFT matches, Lowe's approach