381V Visual Recognition: Outline of lecture for Feb 3, 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