Master in Computer Vision Barcelona

Project: A Hands-On Experience on Visual Object Recognition

Module 5: Visual Recognition – Week 1

Coordination: Ramon Baldrich

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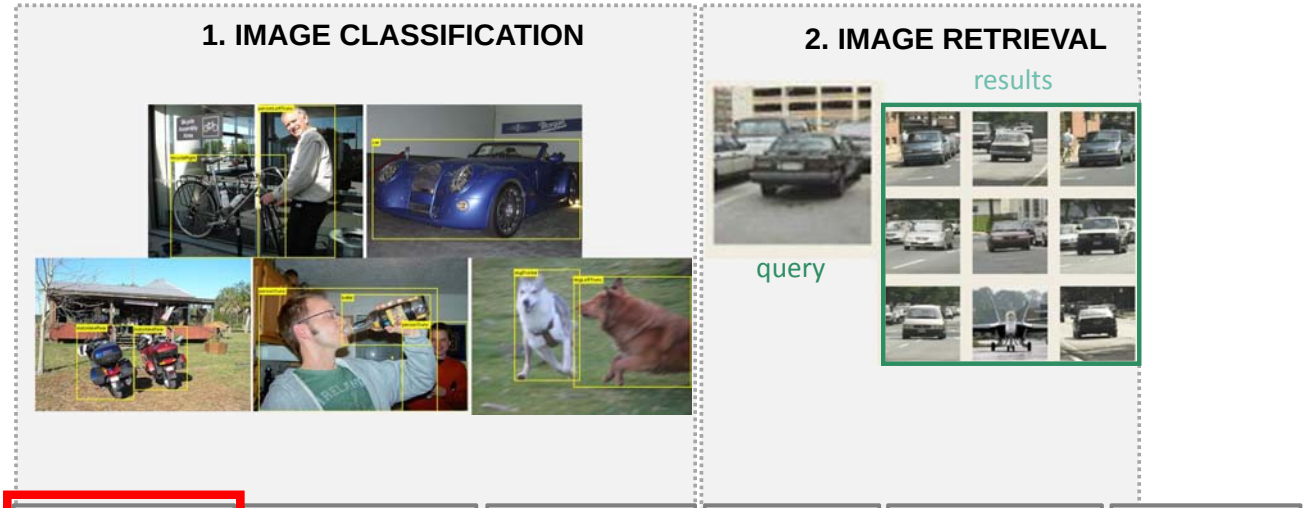
Project Schedule



Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
•BOW (SIFT) •K-Means, •SVM •SVM kernels •LBP / HOG	•Keypoints •Early fusion • Gist, Centrist •Color	• Spatial Pyr. •Late Fusion •LBPs •Color Constancy	•Fisher descriptor • Inverted file • VLAD • Fast NN	• Sparse coding • Product Quantization • Relevance feedback • LSH	**•Presentation**

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Assignments

- Groups of 2-3 students

- Week 1

  Basic pipeline for bag of words

  The goal of this week is
  - (i) to understand the basic principles underlying the pipeline of the Bag of Words approach and
  - (ii) tune the parameters of the vocabulary construction when applied in a Scene dataset.
  - Subsequently, a more complex classifier based on Support Vector Machine will be trained to learn to discriminate between different object categories.

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Assignments

Mandatory tasks:

- Consider different vocabulary sizes;
- Apply SVM with cross validation.

Optional tasks:

- Experiment with different features like HOG, LBP.
- Consider other kernels instead of linear SVM
- Substitute SVM by the nearest neighbor
  - Performance evaluation: Acc., confusion matrix, ROC curve
  - Deliverables (February 29th, 08:59): zip with code and 3 slides presentation (experiments, results, conclusions)

Upload the zip at the Moodle Master CV platform

http://cv.uab.cat/

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Datasets

Scene dataset (MIT http://cvcl.mit.edu/database.htm)

- 8 classes selected: coast, forest, highway, inside-city, mountain, open-country, street, tall-building

TRAINING/VALIDATION DATASET

- ~200 images x class

TEST DATASET

- ~100 images x class

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Programming Language

- Python python.org
- Suggested libraries (from linux repository)
  - python-opencv
  - python-imaging
  - python-matplotlib
  - python-numpy
  - python-scipy
  - python-libsvm
  - python-skimage
  - python-sklearn

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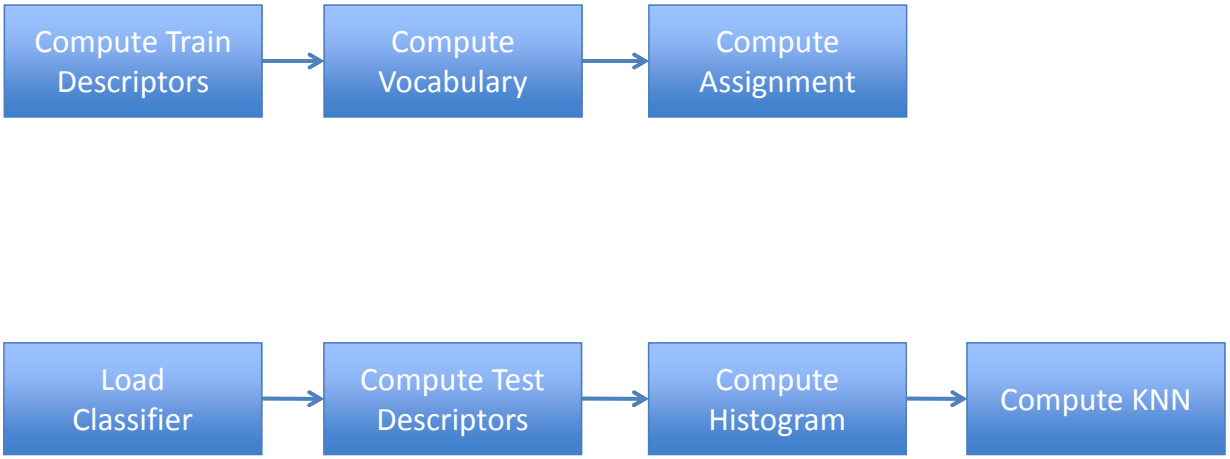
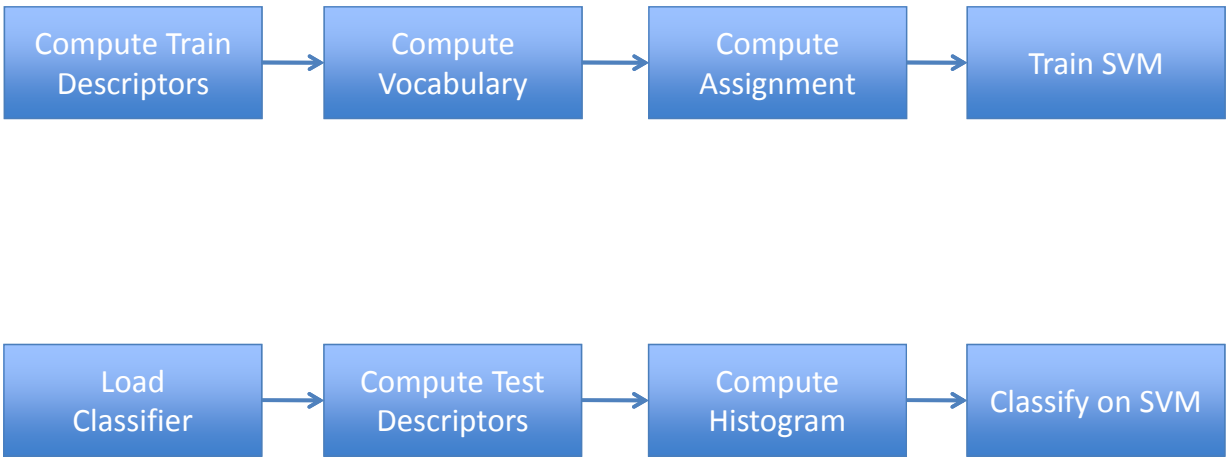
Code description



Code description



Code description

BOVW_functions.py

01_SIFT_visualization.py
02_Basic_BOVW.py

03_BOVW_CrossValidation.py

04_Early_Fusion.py
05_Late_Fusion.py
06_Spatial_Pyramids.py

BOVW_functions.py

```
def prepareFiles(rootpath):
def getKeypointsDescriptors(filenames,detector_type,descriptor_type):
def getAndSaveCodebook(descriptors,num_samples,k,filename):
def getAndSaveBoVWRepresentation(descriptors,k,codebook,filename):
def trainAndTestLinearSVM(train,test,GT_train,GT_test,c):
def trainAndTestLinearSVM_withfolds(train,test,GT_train,GT_test,folds,start,end,numpara):
```

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Code description: configuration parameters

Tasks to cover:

1. Introduce other descriptors
2. Nearest neighbor classifier
3. Data whitening
4. Confusion matrix
5. Roc curve
6. Work on cross-validation
7. Parallel processing (on images)

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Coordination: Ramon Baldrich
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