

# Machine Learning

## Assignment #4

SVM by LIMSVM Tools

# Requirement

1. Using LIBSVM tool for face recognition on YaleB dataset.
  - <https://www.csie.ntu.edu.tw/~cjlin/libsvm/>
  - Matlab version
2. Use **Principal Component Analysis** to reduce data dimension
3. Train your **Binary SVM for the first persons** by the following methods
  - Linear SVM
  - SVM with Polynomial Kernel
  - SVM with RBF Kernel

# Requirement

4. You need to understand the parameter settings and choose your own.
  - -d degree : set degree in kernel function (default 3)
  - -g gamma : set gamma in kernel function (default  $1/\text{num\_features}$ )
  - -r coef0 : set coef0 in kernel function (default 0)
  - -c cost : set the parameter C of C-SVC, epsilon-SVR, and nu-SVR (default 1)
  - -n nu : set the parameter nu of nu-SVC, one-class SVM, and nu-SVR (default 0.5)
  - -p epsilon : set the epsilon in loss function of epsilon-SVR (default 0.1)
  - -m cachesize : set cache memory size in MB (default 100)
  - -e epsilon : set tolerance of termination criterion (default 0.001)
  - -h shrinking: whether to use the shrinking heuristics, 0 or 1 (default 1)
  - -b probability\_estimates: whether to train a SVC or SVR model for probability estimates, 0 or 1 (default 0)
  - -wi weight: set the parameter C of class i to  $\text{weight} * C$ , for C-SVC (default 1)

# Requirement

5. Study the following document :

- A Practical Guide to Support Vector Classification
- <https://www.csie.ntu.edu.tw/~cjlin/papers/guide/guide.pdf>
- [http://ntu.csie.org/~piaip/svm/svm\\_tutorial.html](http://ntu.csie.org/~piaip/svm/svm_tutorial.html) (中文)
- Understand the concept of
  - Scaling
  - Cross-validation and Grid-search
  - When to Use Linear but not RBF Kernel

# Submit the following items...

- **Deadline : 6/7 (三) 11:59 p.m**
- Submit your input data, model and source code.
- Readme file – How to run your code.
- Report file
  1. 報告 – 你如何使用SVM工具
    - 包含作業用到的項目、每個項目的用法描述
  2. Experimental results
    - Report the accuracy of **5-fold Training Error** and **Test Error**
    - Compare your results to that of previous assignments (Nearest-Neighbor, CNN...)
  3. Problem or difficulty you encountered.
  4. Discussion.