National Chiao Tung University

**Machine Learning 2018 Fall
Homework #5**

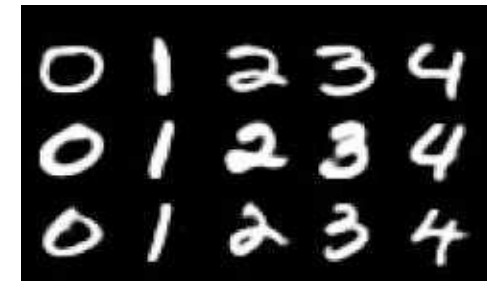Enriched Vision Applications
Laboratory

- ## **practice Support Vector Machine**

  ‣ Use SVM models to tackle classification on images of hand-written digits (digit class only ranges from 0 to 4, as figure shown on right).

  ‣ You should use <u>LIBSVM</u> library, with C++/Matlab/Python supports. There are fruitful official introductions or plenty materials you can find on internet, feel free to use them.

  ‣ Training data and testing data are both provided:

  ➡ training:

  - **X_train.csv** is a 5000x784 matrix. Every row corresponds to a 28x28 gray-scale image

  - **T_train.csv** is a 5000x1 matrix, which records the class of the training samples

  ➡ training:

  - **X_test.csv** is a 2500x784 matrix. Every row corresponds to a 28x28 gray-scale image

  - **T_test.csv** is a 2500x1 matrix, which records the class of the test samples

Homework# 5 - Due day 23:59PM 26th Nov

- **practice Support Vector Machine**

20 points ▸ Use different kernel functions (linear, polynomial, and RBF kernels) and have comparison between their performance.

30 points ▸ Please use C-SVC (you can choose by setting parameters in the function input, C-SVC is soft-margin SVM). Since there are some parameters you need to tune for, please do the grid search for finding parameters of best performing model. For instance, in C-SVC you have a parameter C, and if you use RBF kernel you have another parameter γ, you can search for a set of (C, γ) which gives you best performance in cross-validation. (lots of sources on internet, just google for it)

30 points ▸ Use linear kernel+RBF kernel together (therefore a new kernel function) and compare its performance with respect to others. You would need to find out how to use a user-defined kernel in libsvm.

20 points Submit a **report in pdf** format for showing your **code with detailed explanations**, giving **detailed discussion on experiments as well as your observations**.

Strict policy: you get nothing if you miss the deadline.