NYCU Pattern Recognition, Homework 4

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**Part. 1, Coding (50%)**:

1. (10%) Implement K-fold data partitioning.

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自動產生的描述

1. (10%) Set the kernel parameter to 'rbf' and do grid search on the hyperparameters **C** and. **gamma** to find the best values through cross-validation. Print the best hyperparameters you found. Note that we suggest using K=5 for the cross-validation.

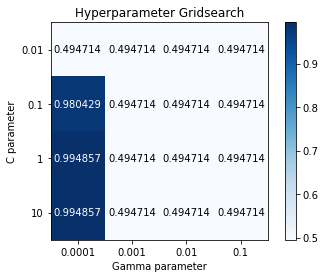
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自動產生的描述

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自動產生的描述

1. (10%) Plot the results of your SVM's grid search. Use "gamma" and "C" as the x and. y axes, respectively, and represent the average validation score with color. Below image is just for reference.



1. (20%) Train your SVM model using the best hyperparameters found in Q2 on the entire training dataset, then evaluate its performance on the test set. Print your testing accuracy.

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**Part. 2, Questions (50%):**

1. (10%) Show that the kernel matrix should be positive semidefinite is the necessary and sufficient condition for to be a valid kernel.

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自動產生的描述

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自動產生的描述

1. (10%) Given a valid kernel , explain that is also a valid kernel. (Hint: Your answer may mention some terms like \_\_\_\_ series or \_\_\_\_ expansion.)

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自動產生的描述

1. (20%) Given a valid kernel , prove that the following proposed functions are or are not valid kernels. If one is not a valid kernel, give an example of that the corresponding is not positive semidefinite and show its eigenvalues.

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自動產生的描述*

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自動產生的描述*

1. Consider the optimization problem

State the dual problem. (Full points by completing the following equations)

= \_\_\_ (x - 2)^2 + λ[(x + 4)(x - 1) – 3]\_\_\_\_\_\_\_\_\_\_\_\_\_

= \_\_\_\_\_ 2(x - 2) + λ(2x + 3)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

when ,

= \_\_\_\_\_ (4 - 3λ)/(2 + 2λ)\_\_\_\_\_\_\_\_\_\_\_

=

[(4 - 3λ) / (2 + 2λ) - 2]^2 + λ{[(4 - 3λ) / (2 + 2λ)) + 4][((4 - 3λ) / (2 + 2λ)) – 1]– 3}