Take-home Quiz 476/676

Due: end of the day April 13, 2021

15+5 (bonus).

Submission: Directly write in this word document. No code is required.

Basic machine learning quiz. The goal of the quiz is to push you read the assigned reading and slides.

You can find most of the answers in slides and readings.

1. (5pts) What are the objective function, hypothesis space, and optimizer in the least-square algorithm? You can write as much equation as you wish or describe with graphs. Mathematical equations are more preferred than words. What is the purpose of regularization in a least-square algorithm? Give an example if possible.
2. (5pts) True or False?
3. If X is a loss function, it should increase as our model get worse.

True

1. A model that is improving should assign higher and higher probability to the correct answer.

True

1. K in KNN model (K nearest Neighbor) is a hyper parameter that can be learned. True or False?

True

1. We choose hyperparameters using the validation set and run the test only one.

False

1. When we overfit a model, we tend to have lower training error and higher validation error.

True

(A model that is underfit will have high training and high testing error while an overfit model will have extremely low training error but a high testing error).

1. (5pts) We are performing a 3-way classification of images using linear classier with support vector machine loss (SVM loss). The following graph shows the scores for classification results and the equation of the loss function. Please compute the loss for each class and write down the results.

A picture containing graphical user interface

Description automatically generated

What happens to the loss if the score for car becomes larger or smaller?

What happens to the function if we use mean instead of sum?

Zhang et al What happens to the loss if it is changed from “1” to “10”? Write down the results

Describe in your own words, what is the objective function of the linear classifier? Write down a possible regularized loss for the linear classifier?

1. (5pts Bonus) In your own word, describe the objective function used in Zhang et al. “Colorful image colorization”( <https://arxiv.org/abs/1603.08511>) and explain the rationale of why it works.