1 point

1。 **Which of the following is NOT a valid measure of overfitting?**

- Sum of parameters ($w_1 + w_2 + \ldots + w_n$)
- Sum of squares of parameters ($w_1^2 + w_2^2 + \ldots + w_n^2$)
- **Range of parameters, i.e., difference between maximum and minimum parameters** ✓
- Sum of absolute values of parameters ($|w_1| + |w_2| + \ldots + |w_n|$)

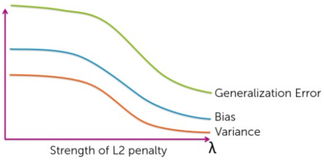
1 point

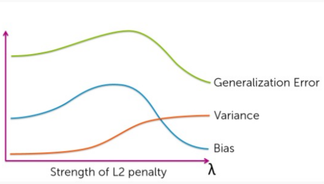
2。 **In ridge regression, choosing a large penalty strength λ tends to lead to a model with (choose all that apply):**

- [x] High bias
- [ ] Low bias
- [ ] High variance
- [x] Low variance

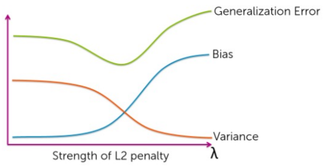
1 point

3。 **Which of the following plots best characterize the trend of bias, variance, and generalization error (all plotted over λ)?**





- **(selected)** ✓



1 point

4。 **In ridge regression using unnormalized features, if you double the value of a given feature (i.e., a specific column of the feature matrix), what happens to the estimated coefficients for every other feature? They:**

- Double
- Half
- **Stay the same** ✓
- Impossible to tell from the information provided

1 point

5。 **If we only have a small number of observations, K-fold cross validation provides a better estimate of the generalization error than the validation set method.**

- **True** ✓
- False

1 point

6。 **10-fold cross validation is more computationally intensive than leave-one-out (LOO) cross validation.**

- True
- **False** ✓

1 point

7。 **Assume you have a training dataset consisting of N observations and D features. You use the closed-form solution to fit a multiple linear regression model using ridge regression. To choose the penalty strength λ, you run leave-one-out (LOO) cross validation searching over L values of λ. Let $\text{Cost}(N, D)$ be the computational cost of running ridge regression with N data points and D features. Assume the prediction cost is negligible compared to the computational cost of training the model. Which of the following represents the computational cost of your LOO cross validation procedure?**

- $LN \cdot \text{Cost}(N, D)$
- **$LN \cdot \text{Cost}(N-1, D)$** ✓
- $LD \cdot \text{Cost}(N-1, D)$
- $LD \cdot \text{Cost}(N, D)$
- $L \cdot \text{Cost}(N-1, D)$
- $L \cdot \text{Cost}(N, D)$

1 point

8。 **Assume you have a training dataset consisting of 1 million observations. Suppose running the closed-form solution to fit a multiple linear regression model using ridge regression on this data takes 1 second. Suppose you want to choose the penalty strength λ by searching over 100 possible values. How long will it take to run leave-one-out (LOO) cross-validation for this selection task?**

- About 3 hours
- About 3 days
- **About 3 years** ✓
- About 3 decades

1 point

9。 **Assume you have a training dataset consisting of 1 million observations. Suppose running the closed-form solution to fit a multiple linear regression model using ridge regression on this data takes 1 second. Suppose you want to choose the penalty strength λ by searching over 100 possible values. If you only want to spend about 1 hour to select λ, what value of k should you use for k-fold cross-validation?**

- k=6
- k=36
- k=600
- **k=3600** ✓

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