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Week 7 : Assignment 7

The due date for submitting this assignment has passed.

Due on 2024-09-11, 23:59 IST.

Assignment submitted on 2024-09-11, 20:17 IST

Common Data Q1-Q2

Consider two models:

$\hat{f}_1(x) = w_0 + w_1 x$

$\hat{f}_2(x) = w_0 + w_1 x^2 + w_2 x^2 + w_4 x^4 + w_5 x^5$

1) Which of these models has higher complexity? ***1 point***

- $\hat{f}_1(x)$
- $\hat{f}_2(x)$
- It is not possible to decide without knowing the true distribution of data points in the dataset.

Yes, the answer is correct.
Score: 1
Accepted Answers:
$\hat{f}_2(x)$

2) We generate the data using the following model: ***1 point***

$y = 5x^3 + 2x + x + 3.$

We fit the two models $\hat{f}_1(x)$ and $\hat{f}_2(x)$ on this data and train them using a neural network.

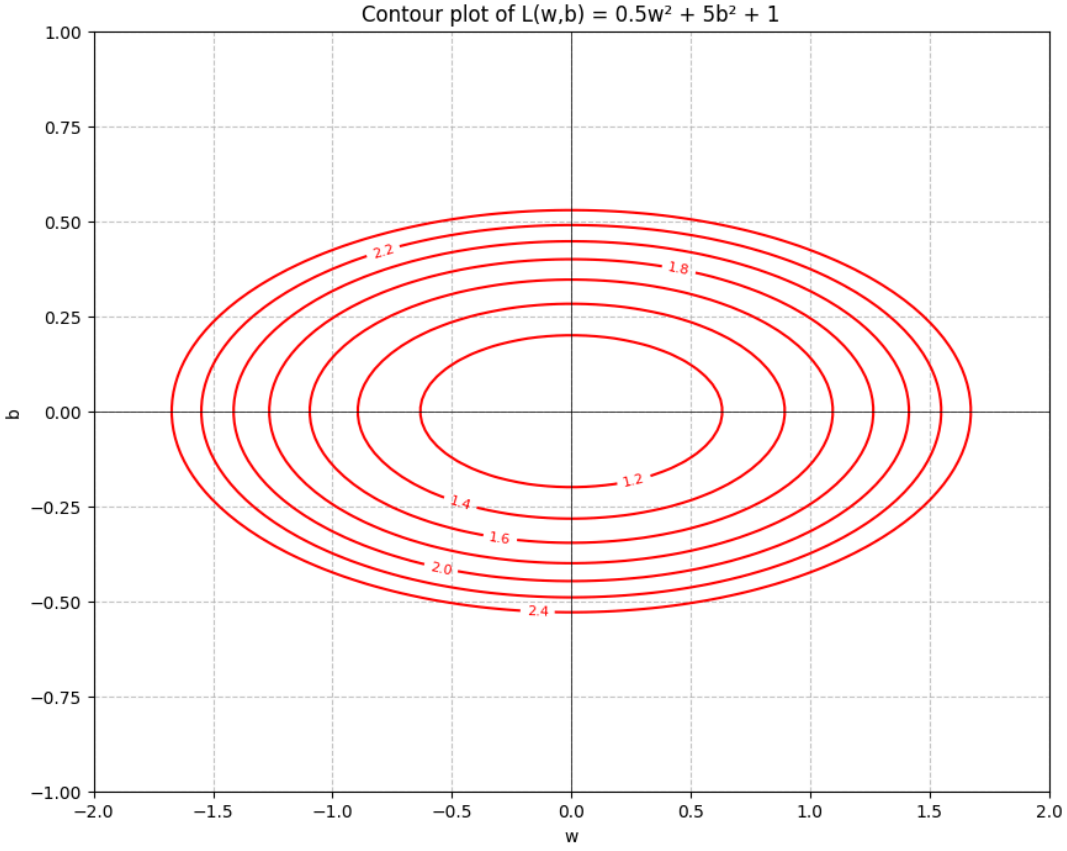
- [x] $\hat{f}_1(x)$ has a higher bias than $\hat{f}_2(x)$.
- [ ] $\hat{f}_1(x)$ has a higher variance than $\hat{f}_2(x)$.
- [ ] $\hat{f}_2(x)$ has a higher bias than $\hat{f}_1(x)$.
- [x] $\hat{f}_2(x)$ has a higher variance than $\hat{f}_1(x)$.

Yes, the answer is correct.
Score: 1

Accepted Answers:
$\hat{f}_1(x)$ has a higher bias than $\hat{f}_2(x)$.
$\hat{f}_2(x)$ has a higher variance than $\hat{f}_1(x)$.

Common Data Q3-Q6

Consider a function $L(w, b) = 0.5w^2 + 5b^2 + 1$ and its contour plot given below:



3) What is the value of $L(w^*, b^*)$ where w^* and b^* are the values that minimize the function.

1

Yes, the answer is correct.
Score: 1

Accepted Answers:
(Type: Range) 0.9,1.1

1 point

4) What is the sum of the elements of $\nabla L(w^*, b^*)$?

0

Yes, the answer is correct.
Score: 1

Accepted Answers:
(Type: Numeric) 0

1 point

5) What is the determinant of $H_L(w^*, b^*)$, where H is the Hessian of the function?

10

Yes, the answer is correct.
Score: 1

Accepted Answers:
(Type: Numeric) 10

1 point

6) Compute the Eigenvalues and Eigenvectors of the Hessian. According to the eigen-values of the Hessian, which parameter is the loss more sensitive to? ***1 point***

- b
- w

Yes, the answer is correct.
Score: 1

Accepted Answers:
b

7) Suppose that a model produces zero training error. What happens if we use L_2 regularization, in general? ***1 point***

- [x] It might increase training error
- [x] It might decrease test error
- [ ] It might decrease training error
- [x] Reduce the complexity of the model by driving less important weights to close to zero

Yes, the answer is correct.
Score: 1

Accepted Answers:
It might increase training error
It might decrease test error
Reduce the complexity of the model by driving less important weights to close to zero

8) Suppose that we apply Dropout regularization to a feed forward neural network. Suppose further that mini-batch gradient descent algorithm is used for updating the parameters of the network. Choose the correct statement(s) from the following statements. ***1 point***

- [x] The dropout probability p can be different for each hidden layer
- [ ] Batch gradient descent cannot be used to update the parameters of the network
- [x] Dropout with $p = 0.5$ acts as a ensemble regularize
- [ ] The weights of the neurons which were dropped during the forward propagation at t^{th}

iteration will not get updated during $t + 1^{th}$ iteration

Yes, the answer is correct.
Score: 1

Accepted Answers:
The dropout probability p can be different for each hidden layer
Dropout with $p = 0.5$ acts as a ensemble regularize

9) We have trained four different models on the same dataset using various hyperparameters. The training and validation errors for each model are provided below. Based on this information, which model is likely to perform best on the test dataset? ***1 point***

Model	Training error	Validation error
1	0.9	1.2
2	0.3	0.6
3	1.5	0.5
4	1.2	1.2

- Model 1
- Model 2
- Model 3
- Model 4

Yes, the answer is correct.
Score: 1

Accepted Answers:
Model 2

10) Consider the problem of recognizing an alphabet (in upper case or lower case) of English language in an image. There are 26 alphabets in the language. Therefore, a team decided to use CNN network to solve this problem. Suppose that data augmentation technique is being used for regularization. Then which of the following transformation(s) on all the training images is (are) appropriate to the problem ***1 point***

- [x] Rotating the images by $\pm 10^{\circ}$
- [ ] Rotating the images by $\pm 180^{\circ}$
- [x] Translating image by 1 pixel in all direction
- [x] Cropping

Yes, the answer is correct.
Score: 1

Accepted Answers:
Rotating the images by $\pm 10^{\circ}$
Translating image by 1 pixel in all direction
Cropping