

Course: Machine Learning - Foundations
Week 1 (Test questions)

1. (1 point)

Answer: $[2, 4, -5] \in R^3$

2. (1 point)

Answer: C

It may be appropriate for classification but not for regression as it uses a fixed penalty of 1 if the output does not match with the target value, which may not be a useful loss calculation.

3. (1 point)

Answer: C

Target variable is discrete

4. (1 point)

Answer: C

remainder is 1

5. (1 point)

Answer: C

labels are absent for unsupervised learning

6. (1 point)

Answer: C

7. (1 point)

Answer: B,D

8. (1 point)

Answer: B

9. (1 point)

Answer: C

Training set is used to fit the model validation set is used for model selection and test set is used for evaluating the final model

10. (1 point)

Answer: C

$\frac{1}{n} \sum_{i=1}^n -\log(P(X^i))$ is used for density estimation, $\frac{1}{n} \sum_{i=1}^n \|g(f(X^i)) - X^i\|^2$ is used for dimensionality reduction, $\frac{1}{n} \sum_{i=1}^n \|f(X^i) - Y^i\|^2$ is used for regression and $\frac{1}{n} \sum_{i=1}^n \mathbf{1}(f(X^i) \neq Y^i)$ is used for classification

11. (1 point)

Answer: Pair 1: 15.225 [Range could be 15 to 16]Pair 2: 3.8 [Range could be 3 to 4] Pair 1: $Loss = \frac{0.625+10.625+19.225+30.425}{4} = 15.225$

x_1	x_2	$f(\mathbf{x})$	$g(f(x^i)) - x^i$	$ g(f(x^i)) - x^i ^2$
1	0.5	0.5	[-0.75, -0.25]	0.625
2	2.3	-0.3	[-2.15, -2.45]	10.625
3	3.1	-0.1	[-3.05, -3.15]	19.225
4	3.9	0.1	[-3.95, -3.85]	30.425

Pair 2: $Loss = \frac{0.406+2.356+4.656+7.80}{4} = 3.8$

x_1	x_2	$f(\mathbf{x})$	$g(f(x^i)) - x^i$	$ g(f(x^i)) - x^i ^2$
1	0.5	0.75	[-0.625, -0.125]	0.406
2	2.3	2.15	[-0.925, -1.225]	2.356
3	3.1	3.05	[-1.475, -1.575]	4.656
4	3.9	3.95	[-2.025, -1.925]	7.8

12. (1 point)

Answer: A

For (a,b)=(1,1)

 $Loss = \frac{0.0010+0.0171+0.0018+0.0017}{4} = 0.0054$

x	y	x+1	x+1-y	(x+y-1) ²
-1	0.0319	0	-0.0319	0.0010
0	0.8692	1	0.1308	0.0171
1	1.9566	2	0.0434	0.0018
2	3.0343	3	-0.0343	0.0017

Similarly,

for (a,b)=(1,2)

Loss= 1.0592

for (a,b)=(2,1)

Loss=1.5086

for (a,b)=(2,2)

Loss=3.562

13. (1 point)

Answer: g: 2.964 [Range could be 2 to 4]

h: 11.924 [Range could be 11 to 13]

 $Loss_g = \frac{1.44+2.89+0.49+1+9}{5} = 2.964$ $Loss_h = \frac{0.04+0.09+18.49+25+16}{5} = 11.924$

\mathbf{X}	y	$g(\mathbf{X})$	$h(\mathbf{X})$	$y - g(\mathbf{X})$	$y - h(\mathbf{X})$	$(y - g(\mathbf{X}))^2$	$(y - h(\mathbf{X}))^2$
[2]	5.8	7	6	-1.2	-0.2	1.44	0.04
[3]	8.3	10	8	-1.7	0.3	2.89	0.09
[6]	18.3	19	14	-0.7	4.3	0.49	18.49
[7]	21	22	16	-1	5	1	25
[8]	22	25	18	-3	4	9	16

14. (2 points)

Answer: g: 1/6

h: 1/2

\mathbf{X}	y	$g(\mathbf{X})$	$h(\mathbf{X})$
[4, 2]	+1	1	-1
[8, 4]	+1	1	1
[2, 6]	-1	-1	-1
[4, 10]	-1	-1	1
[10, 2]	+1	1	1
[12, 8]	-1	1	1

15. (1 point)

Answer: Loss=34.5

\mathbf{X}	$f(\mathbf{X})$	$g(f(\mathbf{X}))$	$g(f(\mathbf{X})) - \mathbf{X}$	$(\ g(f(\mathbf{X})) - \mathbf{X}\)^2$
[1,2,3]	2.5	[2.5,5,7.5]	[1.5,3,4.5]	31.5
[2,3,4]	4	[4,8,12]	[2,5,8]	93
[-1,0,1]	-0.5	[-0.5,-1,-1.5]	[0.5, -1, -2.5]	7.5
[0,1,1]	1	[1,2,3]	[1,1,2]	6

$$Loss = \frac{31.5+93+7.5+6}{4} = 34.5$$