MLA Theory Assignment 2

Q.1. Consider following data where X = Rating for movie "Bahubali-part !" by: the person. Y; = Rating for movie "Bahubali-part 2" by the person. where rating is to done on the scale of 1 to 5 & 1 is lowest rating & 5 is highest rating.

i. Find values of Bo & B, wint. linear regression model which best fits given data.

ii. Interpret & explain equation of regression line. iii. If new person votes "Bahubali part-1" as 3 then

predict the rating of same person for "Bahubali part-

Person		Yi = Rating for movie "Bahubali - part 2" by ith the person
1	4-	3 1
2	2	4
3	3	2
4	.5	5
5	<u> </u>	3
6	3	

$$X = \frac{4}{12} + \frac{3}{12} + \frac{5}{12} + \frac{18}{12} = \frac{1$$

×;	Y;	X;-X	(x;-x)2	(Y:-F)	(x;-x)*(Y;-y)
4	3		1-1-1-1	0	0
2	.+	1-1-1-2		1.6	-1
3	2	0	0		0
5	5	2	4	2	4
	3	-2	4	0	0
3		0	0	-2	0
			Σ=10		٤=3

$$B_1 = \frac{\sum (x_1 - \overline{x})(y_1 - \overline{y})}{\sum (x_1 - \overline{x})^2} = \frac{3}{10} = 0.3$$

$$\beta_0 = Y - \beta_1 X$$
= 3-0.3 X 3
= 3-0.9
 $\beta_0 = 2.1$

jalo i	Interpretations:-
	O For increase in value of x by 1 unit there is
	increase in value of y in 0.3 units.
Contract for	the similar in the second of t
	② Even if x = 0 value of independent valiable, it is
	expected that value of Y is 2.1.
	W. Ma know as a Character of the Control of the Con
	iii. We know, eq of regression line is $Y = 2.1 + 0.3 \times$.
	Using this we can predict rating ofor "Bahubali-part?" if we know rating for "Bahubali-part!".
	The Know stacing too Banaball-part !
	Here, X = 3
Marie Nation	and the second s
Strage ari	Y=2.1+0.3 x3
San Company	=2.1+0.9
	Y = 3
0	
	Thus, the rating prediction of same person for
	"Bahubali-part 2" is 3.
Q. 2.	Define Regularized regression. Explain Lasso & Ridge
	regression.
· in	nt continue delicalitati describitati
\rightarrow	• The least-squares regression can turn out to be unstable
	as it is highly reliant on the training data. Instability
	is a pointer of a tendency to over fit. Regularization
	is a broad-spectrum method to avoid such over filling

by applying supplementary constraints to the weight vector.

• A general approach is to construct sure the weights are on average, small in magnitude: this is referred to as shrinkage. This regularized problem still has a closed-form solution:

W = (XTX + \(\lambda\) - 1 XTY
Where I stands for the identity matrix with 1's
on the diagonal & o's everywhere else.

Lasso :-

- The is substitute from of regularized regression which means least absolute shrinkage & selection operator. It replaces the ridge regularization term II wi?

 With the sum of absolute weights I wil.
- · It uses II regularization technique.
- The season that it automatically does features, selection.
- . It does not work well when Features are highly correlated.

	Ridge Regression:-
	The regularization amounts to adding λ to the diagonal of XTX, a renowned trick to get better the numerical stability of matrix inversion. This form of least-squares regression is known as ridge regression.
•	The shrinks the parameters, so it is normally used to prevent multicollinearity.
	The reduces the model complexity by coefficient shrinkage.
	• It uses 12 regularization technique.
	The is majorly used to prevent overfitting.
0	• It is not useful in case of high no of features.
	• It works well when Features are highly correlated.
Q.3.	Consider the following dataset consisting of the scores of two variables on each of seven individuals:
	, a (q. pil
	The state of the s

		Subject	A	В	Mary Control
		K. Jasto	1.0	1.0	
-	det	2	1.5	2.0	e horast
-	10,1	3	3.0	4.0	om 1 sip
-	Ser Figure	4	5.0	7.0	
-		5	3.5	5.0	, ms 25 6 1 8 7
-		6	4.5	5.0	
-	Won	7	3.5	4.5	Value of the control

Consider subject 1 & subject 4 as initial centroids.

Apply k-means algorithm & show step-by-step

generation of clusters. Write the centroids final

clusters.

M. =	(1.0, 1.0)	H2= (5.0,7.0)	
Step 1:	13400	Subject	Mean Vector
	Group 1		(1.0,1.0)
	Group 2	4	(5.0,7.0)

Euclidian distance =
$$\sqrt{|H_{1x}-x_1|^2 + |H_{2y}-y_1|^2}$$

 $d(H_{11}) = \sqrt{|I_{10}-I_{10}|^2 + |I_{10}-I_{10}|^2} = 0$

The same of the sa	
****	$d(H_{2},2) = \sqrt{ 5.0 - 1.5 ^2 + 7.0 - 2.0 ^2} = 6.10$
	$d(H_{11}3) = \sqrt{ 1.0 - 3.0 ^2 + 1.0 - 4.0 ^2} = 3.61$
	$d(H_{2},3) = \sqrt{ 5.0-3.0 ^2 + 7.0-1.0 ^2} = 3.61$
	$d(H_{2},3) = \sqrt{15.0 - 3.0} + 17.0 - 7.0 = 3.61$
	d(Hen+)=V11.0-5.012+11.0-7.012 = 7.21
	$d(H_{0},4) = \sqrt{ 5.0-5.0 ^2 + 7.0-7.0 ^2} = 0$
0	$a(H_{21}+) = V[5.0-5.0] + [7.0-7.0] = 0$
	d(H,25)-V11.0-3.512+11.0-5.012 - 4.72
	12
	$d(H_{27}S) = \sqrt{ 5.0 - 3.5 ^2 + 7.0 - 5.0 ^2} = 2.50$
	d(H,16)=V11.0-4.5 2+ 1.0-5.0 2 = 5.32
	$d(H_2, 6) = \sqrt{ 5.0 - t.5 ^2 + 7.0 - 5.0 ^2} = 2.06$
	$d(H_{11}7) = \sqrt{ 1.0 - 3.5 ^2 + 1.0 - 4.5 ^2} = 4.30$
	BELLEVILLE IN THE REPORT OF THE PARTY OF THE
	d(H27)=V15.0-3.512+17.0-4.512=2.92
	Step 2: Thus, we obtain 2 clusters containing
-	1123 & (4,5,6,7) as d(H1,i) < d(H2,i)
	For subjects {1,2,3}.

Their new centroids are:

$$H_{1} = \left(\frac{1}{3}\left(1.0 + 1.5 + 3.0\right), \frac{1}{3}\left(1.0 + 2.0 + 4.0\right)\right) = \left(1.83, 2.33\right)$$

$$H_{2} = \left(\frac{1}{4}\left(5.0 + 3.5 + 4.5 + 3.5\right), \frac{1}{4}\left(7.0 + 5.0 + 5.0 + 4.5\right)\right)$$

$$H_{2} = \left(\frac{1}{4}\left(1.0 + 1.5 + 3.0\right), \frac{1}{3}\left(1.0 + 2.0 + 4.0\right)\right)$$

Subject	A	В	d(M1,Si)	d (425i)	
2	1.0	1.0	0.47	5.38 4.28	
3	3.0	1. 0	2.04	1.78	
5	3.5 4.5	5·0 5·0	3.15	0.73	
7	3.5	4,5	2.74	1.08	

Step 3: We obtain 2 new clusters (1,23 & (3,15,6,7) as d(H1,i) < d(H2,i) for subjects

New centroids are:

$$H_{1} = \left(\frac{1}{2}\left(1.0 + 1.5\right), \frac{1}{2}\left(1.0 + 2.0\right)\right) = \left(1.25, 1.5\right)$$

$$H_{2} = \left(\frac{1}{5}\left(3.0 + 5.0 + 3.5 + 4.5 + 3.5\right), \frac{1}{5}\left(4.0 + 7.0 + 5.0 + 5.0 + 3.5\right)\right)$$

$$S.0 + 4.5$$

H2 = (3.9,5.1)

Subject	Α	В	d(Hnsi)	d(42,5;)
1	1.0	. 1.0	0.56	5.02
2	1.5	2.0	0.17	3.92
3	3.0	4.0	2.04	1.42
4	5.0	7.0	564	2.20
5	3.5	5.0	3.15	0.41
6	4.5	5.0	3.78	0.61
7	3.5	1.5	2.74	0.72

Step t: Since, there is no change in the cluster,
the K-means algorithm comes to a halt here
& final result consists of 2 clusters (1,2)
& \$3, 1,5,6,7}.

Q.t. For the following transactions data set generate association rules using Apriori algorithm. Consider minimum support as 50% & confidence as 75%.

Transaction ID	Items
	Bready, Cheese, Eggs, Juice
2	Bread, Cheese, Juice
3	Bread, Milk, Yogurt
4	Bread, Juice, Milk
5	Cheese, Juice, Milk

Step 1:

Support (item) = Frequency of item / Number of transactions

7-tem	Frequency	Support (in %)
Bread Cheese Eggs Juice Milk Yogurt	4 3 1 4 3	4 5 = 80% 3 5 = 60% 1 5 = 20% 4 5 = 80% 3 5 = 60% 1 5 = 20%

Step 2: Remove all the items whose support is below given minimum support i.e. 50%.

	7-tem	Frequency	Suppost (in %)
	Bread	4	80'/.
	Bread Cheese Juice Milk	3	60%
	Juice	4-	80%
and:	Milk .	3	60%
	a Language for		

Step 3: Now, Form the 2 items candidate set & their Frequencies.

Thems Pair Frequency Support (in %) Bread, Cheese 2 215 - to% Bread, Juice 3 315 - 60% Cheese, Juice 3 315 - 60% Cheese, Milk 2 215 - to% Cheese, Milk 1 1/5 - 20% Tuice, Milk 2 215 - to% Step t: Remove all the items whose support is below given minimum support i.e. 50%. Thems Pair Frequency Support (in %) Bread, Juice 3 60% Cheese, Juice 3 60% Step 5: Now, Form 3 items candiate set & Frequency Thems Pair Frequency Support (in %) Bread, Juice, Cheese 2 215 - to% The 2 item subsets are & Bread, Juice & Thice, Cheese? & Bread, Cheese & But & Bread, Cheese is not a member of table in step the hence it is not Frequent & it is violating Apripri						
Thems Pair Frequency Support (in %) Bread, Cheese 2 2/5 = 40% Bread, Tuice 3 3/5 = 60% Bread, Milk 2 2/5 = 40% Cheese, Tuice 3 3/5 = 60% Cheese, Milk 1 1/5 = 20% Tuice, Milk 2 2/5 = 40% Step +: Remove all the items whose support is below given minimum support i.e. 50%. Thems Pair Frequency Support (in 1/2) Bread, Tuice 3 60% Cheese, Tuice 3 60% Cheese, Tuice 3 60% Thens Pair Frequency Support (in 1/2) Bread, Tuice 3 60% Thens Pair Frequency Support (in 1/2) Thens Pair Frequency Support (in 1/2) Thens Pair Frequency Support (in 1/2) Bread, Tuice, Cheese 2 2/5 = 40% The 2 item subsets are Bread, Tuice 3, Thirce, Cheese? & Bread, Cheese? But Bread, Cheese	d-1	A Paper	Transfer hours	zudl .uls moz		
Bread, Juice 3 3 s = 60% Bread, Milk 2 2/s = 40% Cheese, Juice 3 3 s = 60% Cheese, Milk 1 1/s = 20% Juice, Milk 2 2/s = 40% Step t: Remove all the items whose support is below given minimum support i.e. 50%. Thems Pair Frequency Support (in 1/o) Bread, Juice 3 60% Cheese, Juice 3 60% Cheese, Juice 3 60% Then Spair Frequency Support (in 1/o) Bread, Juice 3 60% Then Spair Frequency Support (in 1/o) Bread, Juice, Cheese 2 2/s = 40% The 2 item subsets are Bread, Juice 3, Juice 3, Juice, Cheese & Bread, Cheese & But Bread, Cheese & Juice, Cheese & Bread, Juice 3, Juice, Cheese & Bread, Cheese & But Bread, Cheese & Juice, Cheese & Bread, Line & Bread, Cheese & But Bread, Cheese & Juice, Cheese & Bread, Cheese & But Bread, Cheese						
Bread, Milk 2 2/5 = to 1/6 Cheese, Juice 3 3/5 = 60 1/6 Cheese, Milk 1 1/5 = 20 1/6 Juice, Milk 2 2/5 = to 1/6 Tuice, Milk 2 2/5 = to 1/6 Step t: Remove all the items whose support is below given minimum support i.e. 50 1/6. Thems Pair Frequency Support (in 1/6) Bread, Juice 3 60 1/6 Cheese, Juice 3 60 1/6 Step 5: Now, Form 3 items candiate set & Frequency Thems Pair Frequency Support (in 1/6) Bread, Juice, Cheese 2 2/5 = to 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 2 item subsets are Bread, Juice 3/6 1/6 The 3/6 1/6 1/6 The 3/6 1/6 1/6 The 4/6 1/6 1/6 The 4/6 1/6 1/6 1/6 The 4/6 1/6 1/6 1/6 The 5/6				salago Imaga	2/5 - 40%	
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Juice, Milk 2 2/5 = to/6 Step t: Remove all the items whose support is below given minimum support i.e. 50%. Thems Pair Frequency Support (in 1/6) Bread, Juice 3 60%. Cheese, Juice 3 60%. Step 5: Now, Form 3 items candiate set & Frequency. Thems Pair Frequency Support (in 1/6) Bread, Juice, Cheese 2 2/5 = 40% The 2 item subsets are (Bread, Juice), The 3 item subsets are (Bread, Juice), The 4 i				3	3/5 = 60%	
Step t: Remove all the items whose support is below given minimum support i.e. 50%. Thems Pair Frequency Support (in 1.0) Bread, Juice 3 60%. Cheese, Juice 3 60%. Step 5: Now, Form 3 items candiate set & Frequency. Thems Pair Frequency Support (in 1/0) Bread, Juice, Cheese 2 2/s = 40% The 2 item subsets are & Bread, Juice & Truice, Cheese & & Bread, Cheese & Bread, Cheese & & Bread, Cheese & & Bread, Cheese & & & Bread, Cheese & & & & & & & & & & & & & & & & & &	beari -	- action 2	Cheese, Milk	Proof Third	1/5 = 20%	
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The 2 item subsets are & Bread, Juice & (Tuice, Cheese) & & Bread, Cheese). But & Bread, Chees (Tuice, Cheese) & & Bread, Cheese). But & Bread, Cheese			Items Pair	Frequenc	Support (in 1/0)	
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and a member of table in step too hence		The 2 item subsets are & Bread, Juice }				
is not a member of table in step the hence it is not Frequent & it is violating Apripri		(Trice, Cheese) & & Bread, Cheeses, But & Bread, Cheese				
it is not Frequent & it is violating hipother			is not a member of table in Step 120 hence			
			it is not fre	quest & it is	110/agald ubalba	

Property: Thus [Bread, Juice, Cheese] is not considered. Step 6: Generate Rules. For oules, We consider item pairs: ① [Bread, Juice] Bread > Juice & Juice > Bread ② [Cheese, Juice] Cheese > Juice & Juice > Cheese Confidence (A > B) = Support (AUB) / Support (A) Thus, ① Confidence (Bread > Juice) = Support (Bread U Juice) / Support (Bread) = \$60 80 = 75 ° / 6 ② Confidence (Juice > Bread) = Support (Juice U Bread) / Support (Tuice) Support (Tuice) = 60 / 80 = 75 ° / 6 ③ Confidence (Cheese > Juice) = Support (Cheese U Juice) / Support (Cheese) = 60 / 60		
Considered. Step 6: Generate Rules. For order, We consider item pairs: ① {Bread, Tuice} Bread > Tuice & Juice > Bread ② {Cheese, Tuice} Cheese > Juice & Juice > Cheese Confidence (A > B) = Support (AUB) / Support (A) Thus, ① Confidence (Bread > Juice) = Support (Bread U Juice)/ Support (Bread) = \$60/80 = 75'/6 ② Confidence (Tuice > Bread) = Support (Tuice U Bread)/ Support (Tuice) = \$60/80 = 75'/6 ③ Confidence (Cheese > Juice) = Support (Cheese U Juice)/ Support (Cheese)		Property. Thus & Bread, Juice, Cheese? is not
Step 6: Generate Rules. For rules, we consider item pairs: ① (Bread, Juice) Bread > Juice & Juice > Bread ② (Cheese, Juice) Cheese > Juice & Juice > Cheese Confidence (A > B) = Support (AUB) / Support (A) Thus, ① Confidence (Bread > Juice) = Support (Bread U Juice) / Support (Bread) = \$60/80 = 75'/ ② Confidence (Juice > Bread) = Support (Juice U Bread) / Support (Juice) Support (Juice) = 60/80 = 75'/ ③ Confidence (Cheese > Juice) = Support (Cheese U Juice) / Support (Cheese)	C. C.	
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① (Cheese, Juice) Bread -> Juice & Juice -> Bread ② (Cheese, Juice) Cheese -> Juice & Juice -> Cheese Confidence (A->B) = Support (AUB) / Support (A) Thus, ① Confidence (Bread -> Juice) - Support (Bread U Juice) / Support (Bread) = \$60 80 = 75 % ② Confidence (Juice -> Bread) = Support (Juice U Bread) / Support (Juice) -= 60/80 = 75 % ③ Confidence (Cheese -> Juice) - Support (Cheese U Juice) / Support (Cheese)	1	For rules we consider Hom pains:
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Thus, ① Confidence (Bread > Juice) = Support (Bread V Juice)/ Support (Bread) = \$60/80 = 75°/6 ② Confidence (Juice -> Bread) = Support (Juice V Broad)/ Support (Juice) = 60/80 = 75°/6 ③ Confidence (Cheese -> Juice) = Support (Cheese V Juice)/ Support (Cheese)		
Thus, ① Confidence (Bread > Juice) = Support (Bread V Juice)/ Support (Bread) = \$60/80 = 75°/6 ② Confidence (Juice -> Bread) = Support (Juice V Broad)/ Support (Juice) = 60/80 = 75°/6 ③ Confidence (Cheese -> Juice) = Support (Cheese V Juice)/ Support (Cheese)	<u> Nalal</u>	Confidence (A -> B) = Support (AUB) / Support (A)
(1) Confidence (Bread -) Juice) - Support (Bread V Juice) Support (Bread) Support (Bread) To only on the support (Juice V Bread) Support (Juice) 60/80 -15'/6 (2) Confidence (Cheese -> Juice) - Support (Cheese V Juice) Support (Cheese)		and the second s
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2 Confidence (Tuice -> Bread) - Support (Juice U Bread)/ Support (Juice) - 60/80 -75% 3 Confidence (Cheese -> Juice) - Support (Cheese U Juice)/ Support (Cheese)	(it	(1) Confidence (Bread -> Juice) - Support (Bread V Juice)
=75% (2) Confidence (Tuice -> Bread) = Support (Tuice U Bread)/ Support (Tuice) = 60/80 =75% (3) Confidence (Cheese -> Tuice) = Support (Cheese U Juice)/ Support (Cheese)		Support (Bread)
② Confidence (Juice → Bread) = Support (Juice U Bread)/ Support (Juice) = 60/80 = 75'/o ③ Confidence (Cheese → Juice) = Support (Cheese U Juice)/ Support (Cheese)		
Support (Juice) = 60/80 =75'/o 3 Confidence (Cheese -> Juice) - Support (Cheese U Juice)/ Support (Cheese)		=75%
Support (Juice) = 60/80 =75'/o 3 Confidence (Cheese -> Juice) - Support (Cheese U Juice)/ Support (Cheese)		
= 60/80 =75% 3 Confidence (Cheese → Juice) - Support (Cheese U Juice)/- Support (Cheese)	- Consum	(2) Confidence (Tuice -> Bread) - Support (Juice U Broad)/
3 Confidence (Cheese > Juice) = Support (Cheese U Juice) - Support (Cheese)		
3 Confidence (Cheese → Juice) - Support (Cheese U Juice) - Support (Cheese)	(8)	
3 Confidence (Cheese → Juice) - Support (Cheese U Juice) - Support (Cheese)		
Support (cheese)		
Support (cheese) = 60/60		
= 60/60	1-1	Support (cheese)
in a district of the second of		
	7	

	DATE / /
	① Confidence (Juice → Cheese) - Support (Juice Ucheese)
	Support (Juice) = 60/80
	= 75%
	All the above rules are well I will
	All the above rules are valid because the confidence of each rule is greater than or equal
	to the confidence given i.e. 75%.
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