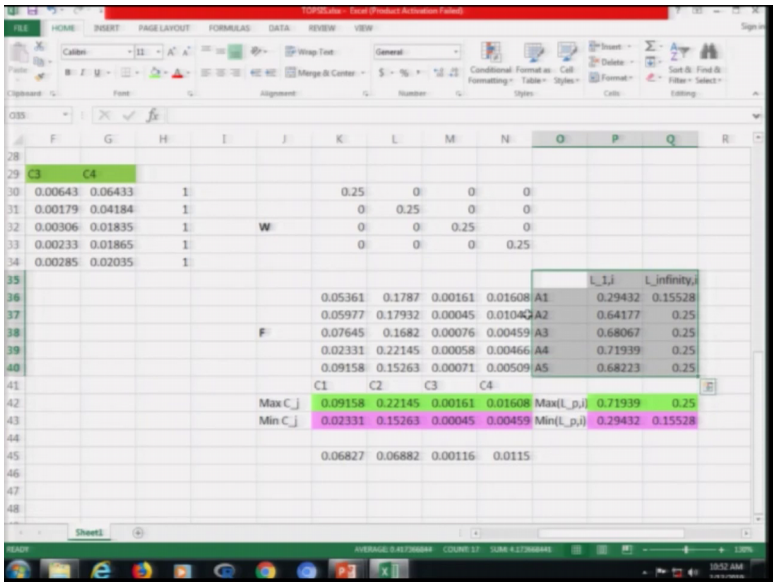
Data Analysis and Decision Making – II
Prof. Raghu Nandan Sengupta
Department of Industrial & Management Engineering
Indian Institute of Technology, Kanpur

Lecture – 40
VIKOR

Welcome back my dear friends, a very good morning good afternoon good evening to all of you wherever you are. And this is the DADM II course which is Data Analysis and Decision Making II under the NPTEL MOOC series and as you know this course is for 12 weeks spread over 12 weeks, each week we have 5 lectures each being for half an hour and the total duration for the course is in hours it will be 30 and in number of lectures it will be 60.

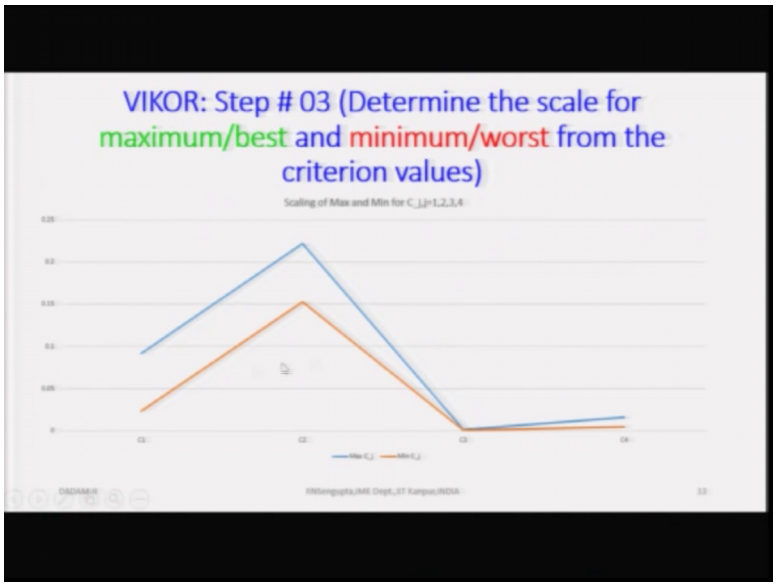
And after each week you have assignments. So, you have already come completed the 7 assignments after 7 weeks and today is the last class for the eighth week hopefully we will wrap up the VIKOR method you with the example which you are discussing and you will be able to solve problems in the VIKOR area. And now in the last class which is the 30 last class which is this one burst one left before that one once we were when we have process of wrapping up the 8th week, which is the 39th class. If you remember we are discussing about the maxima and the minima and based on the maximum minima we had these values.

(Refer Slide Time: 10:31)



So, the maxima was there for each criteria this was the max. So, let me make a simple colour. So, a light blue something sort of non-similarly it will be something sort of like pink a very light one. So, these are positive and negative in as simple sense. Let me make it green. So, it will give the concept of positive value a very light green.

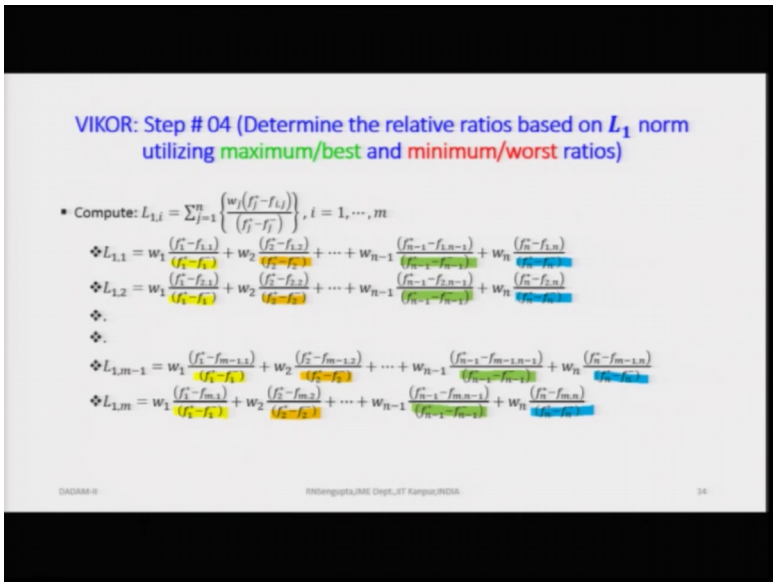
(Refer Slide Time: 02:14)



So, these are the maxima minima and I have basically drawn them in the in the chart where for each criteria if I go along this vertical this means the overall scaling based on which I will try to compare. Now it also means that if I consider a c 1 only the criteria; that means, the maximum liking on the disliking I may get I will not use the word disliking liking in the positive side liking the less positive sense, is given by this length.

Similarly, for c two, but if you c for c three; that means, in c 3 level we are undecided try of trying to basically fathom the liking and not that liking 1 for c 3 based on the fact that we are taking any 2 alternatives at a time while for c 4 the liking disliking distance is less. So, this is the scaled max minus min levels and we will use that in the denominator for trying to find out for each and every c 1 c 2 c 3 c 4. So, we have already have these values.

(Refer Slide Time: 03:22)



Now, we will do the further calculation now we will find out the norms based on L 1 norm and the L infinity norm these are the 2 ends of the norms of the distance measure if you remember I have been mentioning the distance measure time and again. And this I will find out based on the fact that I am going to find it for each and every alternative combining the criteria.

So, let me come to the fact that I will take the alternatives; that means. So, it will be the weights are basically the weights which I have w 1 to w n. So, they were w 1 w 2 w 3 w 4. So, I will find out the weights in such a way. So, I will divide by the max on the min which is there in the lets highlight this fact max min for the first civilian max min for the first max min for the first match min for the first.

So, then I will try to find used lies in the ratio of the maximum second second second second; similarly I have a third third third third depending on the numbers. So, I have just mark this last, but one n minus 1 n minus 1 n minus 1 n minus 1 when in this case is 3 and finally, I do for n which is the fourth fourth means j is equal to 4 fourth fourth fourth. So, the ratios are always are the same which are what I have already found out the difference here.

So, let me write down the difference. So, these are the difference which I have and this 0.6827 is the distance which I have along the c in the vertical axis in the graph, c 2 is

0.068. So, 0.06827, for the first one and 0.06882 for the second one, almost the same and second third one is 00116 which is almost 0.

So, if you see the graph it will become more readable that the distance between the max and the min for the third criteria is almost 0. Now we go to the normalization one. So, what is the normalization one? So, the max minus the corresponding value; that means, we go f 11 f 12; that means, I am following the row wise difference. So, it will be the and write down I will write down the values and calculate it. So, multiply it by max minus this divided by I will use the max minus this. So, it will be easier max minus the min.

So, here what values become fixed this these values are for the corresponding cells are fixed. So, I will basically find out then I do go to the second value, which is this multiplied by max, max minus F 1 2 divided by max, max I am taking force now force the second j j is equal 2 minus min of j 2 plus 0.25 into maximum for the c 3 1 minus f 1 3 divided by maximum for third third means third criteria minus the minimum of that criteria finally, ok.

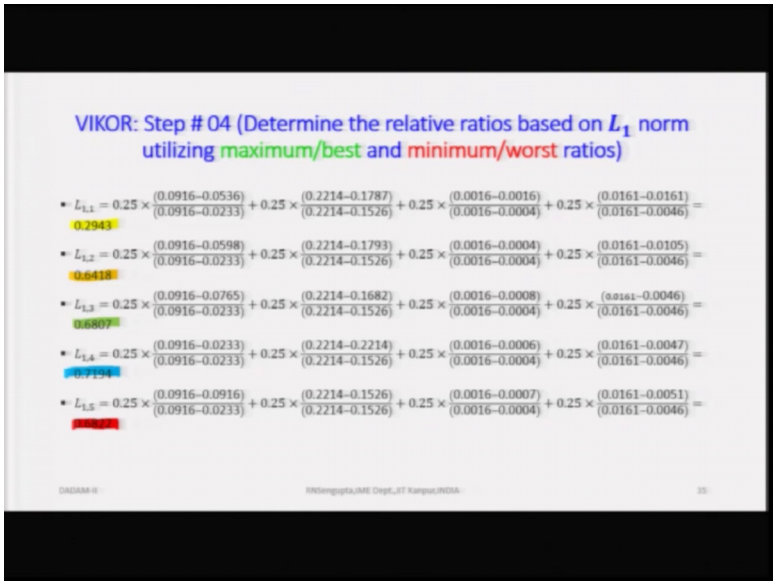
This should be this m 32 say let I have to put it m 32 or else I would not be doing just this n 32 the last value is n 33 multiplied by fourth criteria maximum value minus f 13 the whole thing divided by maximum for fourth criteria minus the minimum 1. So, this is done. So, this is done. So, I have for the first one.

So, if I want to do it for the second one for the L 1 norm. So, let me write it L 1. So, it would be comma L 1 norm and these basically be the ith one for the ith alternative and we will find out similarly L infinity comma i th norm. So, we will find it out. So, now, what do we need to fix here? Here this will be fixed fixed. So, first let us fix the values of the weights.

So, it will be easy for us to calculate. So, weights are fixed now we also need to finalize and fix the maximum value I am only fixing the maximum value for the time being. So, this I missed. So, this maximum value also I fixed that makes them very are fixed maximum values are fixed then now I need to fix the minimum values also. So, minimum values are in the denominator, we will copy it and double check we need to move in minimize the this one be there and the last is and so, this is done. So, I need to copy. So, let me copy it. So, let us check by the cells whether they are right it is right this

is right this is right this is right. So, let us check the values calculated here are matching with the x in the ppt.

(Refer Slide Time: 11:13)

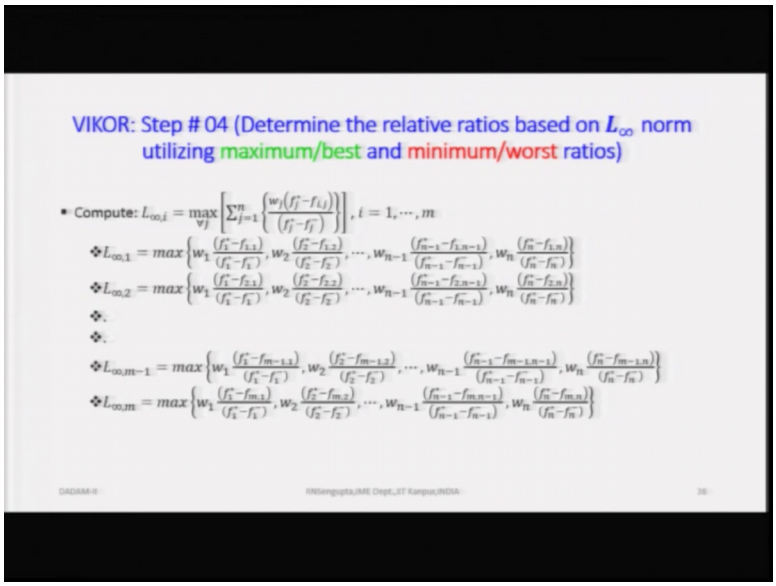


So, the L 1 1 value for the for the norm 1 alternative 1 is 0.2943. So, this is 0.2943 second is 0.6164 17 which is 6418 which is fine 0.68 1.68 1. So, I am calling these values c remember sorry I should highlight it. This is the first this is for the second this is for the third this is for the fourth this is for the. So, all these values are marked definitely.

So, let us go again 0.29432 which is yellow color which means matching L 1 1 first L is the norm, second L is the alternative. Second one is orange color 0.6418 which is matching. So, 0.64177 for the L 1 second alternative L 1 third alternative is 0.68067 which is the green colors matching, the L 1 fourth norm of fourth alternative is 0.7194 which is matching here and the last one for the L 1 norm fourth fifth alternative is 0.6822 which is matching here.

Now, once done I have found out all the L 1 norm values and I go to the what is basically.

(Refer Slide Time: 12:42)



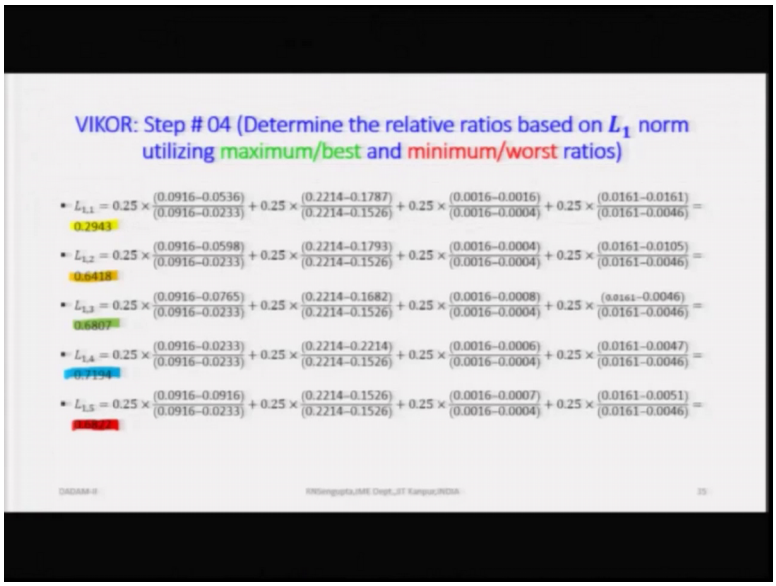
For the L infinity norm; that means, I have to find out the maximum. So, I find out I copy it accordingly and then I am basically change it I will tell you what I am doing let me copy it and then make it. So, these values only K l m. So, these are the values which are fixed.

So, I go here let me change it accordingly, I think I can shift it here this goes you know you have to do it simply. So, this becomes K then becomes l then comes m and the last one comes and so, this is matching. So, I go to it becomes k becomes l just check the how the cells are moving and that will create a thing disk this becomes m and this becomes n.

So, last, but 1 alternative which is the fourth one, this becomes k this becomes l this becomes m this becomes and similarly the last row how can you calculating a L infinity for the each and every alternative 1 to 5. This becomes k, this becomes L now I should change L m should be there m yes this would be done here k l. So, kl then I go to m the network.

So, these are done. So, let me check.

(Refer Slide Time: 16:07)



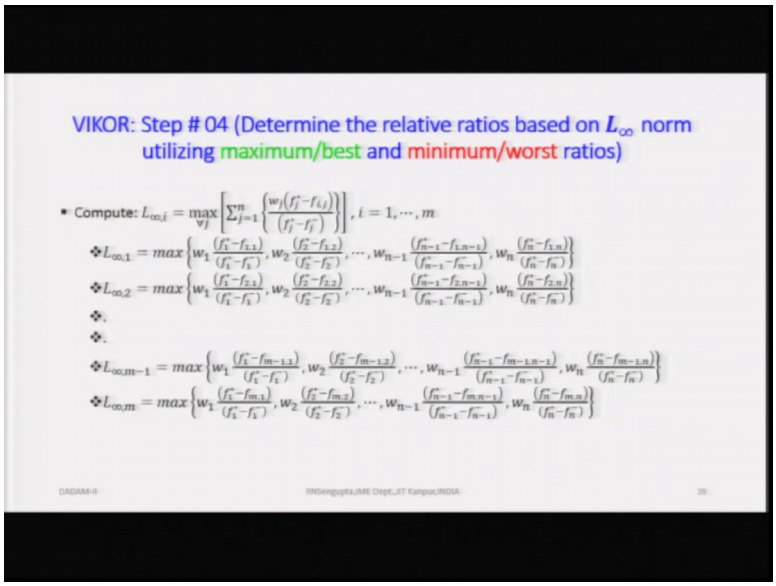
The values 0.1 I am only check let me make the colour. So, it will be easy for you to. So, it would be first will be orange, then say for example, green then say for example, blue, example is come later orange, green, blue let me make. So, these are the colors which are made let me check. So, these values are if I calculate here 1 2 9 4 3 2 1 6 4 6 8 7 1 and alpha 950 values are given. So, this will be double check I find out the maxima.

So, I have to find out the maxima. So, I put max and for the last cell also I put a I put a maxima I have to basically find out the maxima of all the values. So, it will be for the plus it becomes comma, it becomes a comma, it becomes a comma, let me put a comma in place of my with this plus sign that will solve all the problem.

So, I should take a max also max done comma I am going slowly. So, please bear with me and the last one is comma. So, here also I put the max, this is for the L infinity norm. So, these are comma. So, closing bracket for the maximum and similarly we need to put a maxima here.

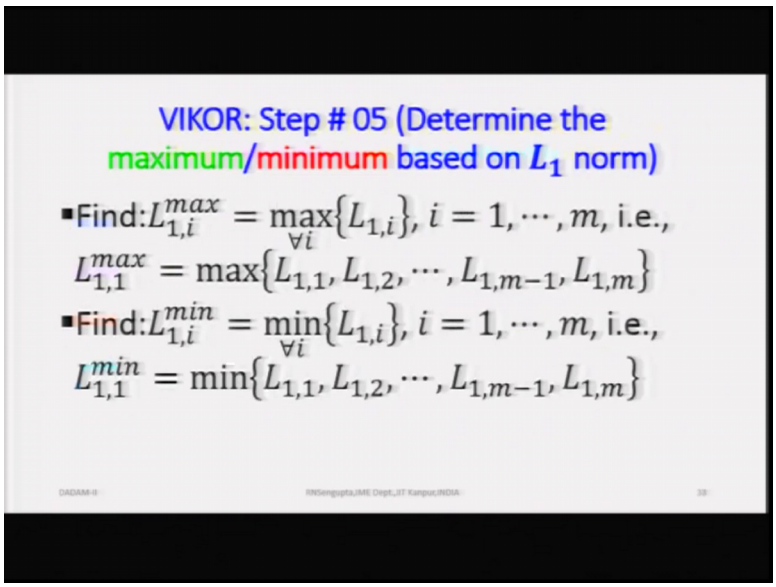
Then we move the plus because we will compare them. So, the values are I L infinity for the ith alternative 1 2 3 4 I given as 0.155 then all values are 0.2 let us check whether they are there. So, if you see.

(Refer Slide Time: 19:34)



So, the first one is 0.1553 and the rest are all 0.25 as it is. The green color the light blue color the red color and the dark blue color. So, the values are maximum.

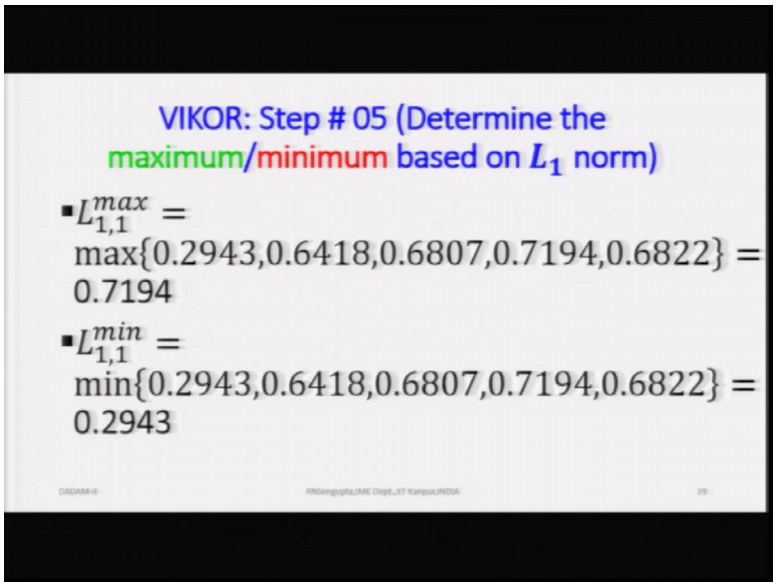
(Refer Slide Time: 19:54)



Now, once I have that I would try to basically find out the maximum the minimum this and I would and then tell you why. So, I will try to find out the max. So, let me write down max of L 1 comma i enter it and I would write it max value. So, it will be easy I will put it as p and put it as min as 40 and then I find out the max. So, I will find out the max for this, this means L 1 i and I find out the min.

Similarly, find out the. So, these are the values. So, let me first plot it.

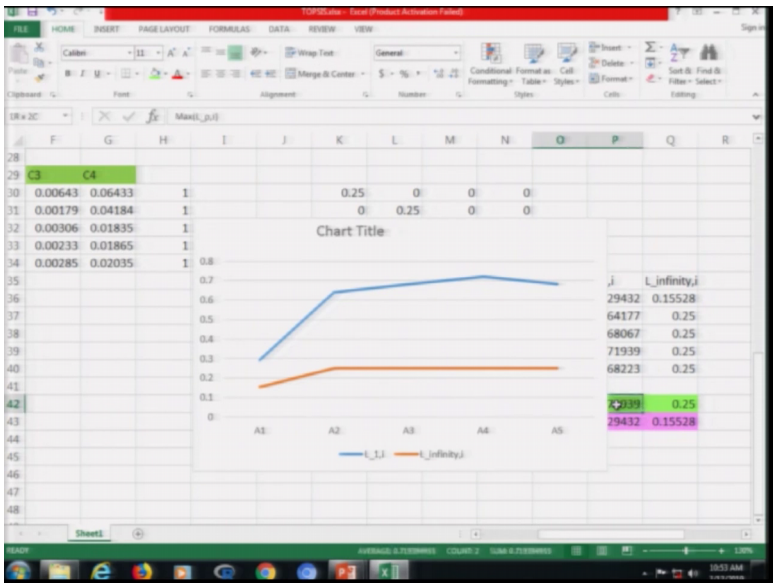
(Refer Slide Time: 21:06)



So, all whether the min and max are coming out to be same or let me 0.7194 which is 0.17194 which is the green one then I have the min is 0.2943 0.2943 similarly for L infinity u max, L infinity min the values of 0.25 0.1533 which is fine.

So, now let us plot these if I have the n infinity this is for A 1 A 2 A 3 A 4 A 5; this is the maximum distances which I can have.

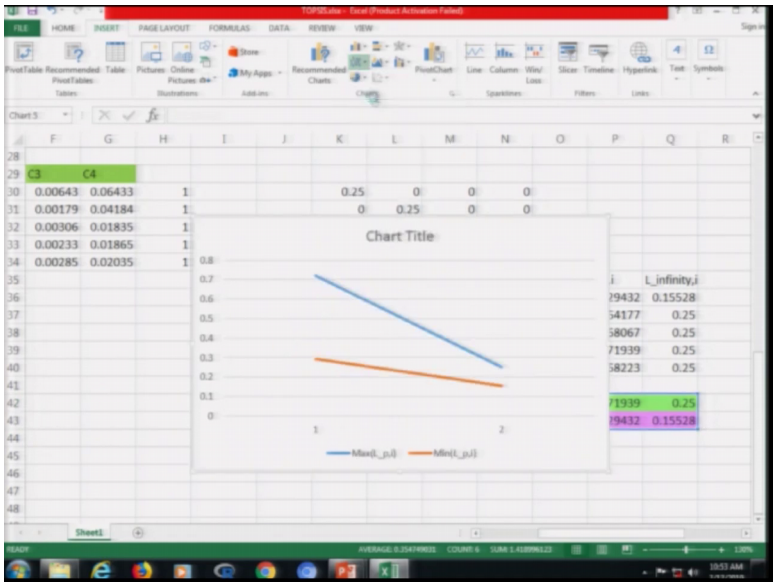
(Refer Slide Time: 21:57)



Now if you find out for all the combination of the alternatives you will find out for A 1, the difference between the maximum and the minimum of the least while it is maximum for A 4.

So, when you are trying to compare the combination of all the alternatives for each combination of the criteria is based on alternatives, the ranking changes and when I see. So, this is 1 graph and when I basically plot the max and min 1.

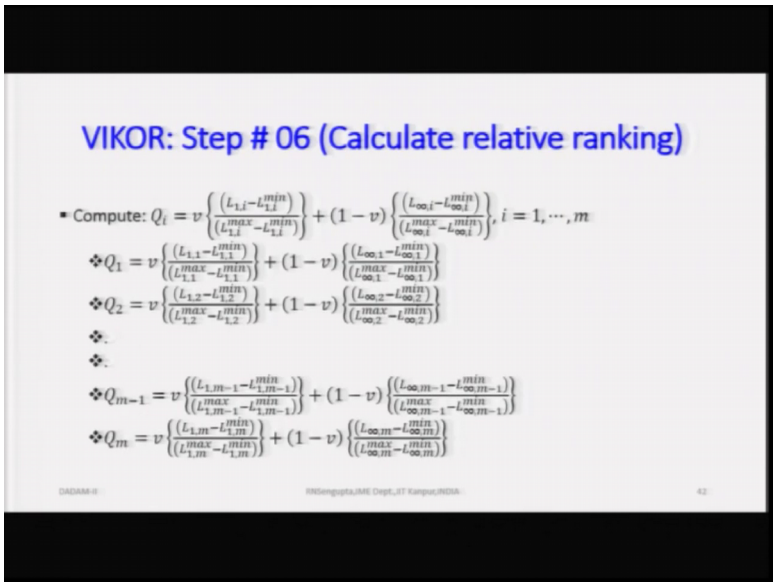
(Refer Slide Time: 22:39)



So, it will be basically maximum is also decreasing, but decreasing for these values of all the combinations such a way that for the min 1 max min for the levels of 2

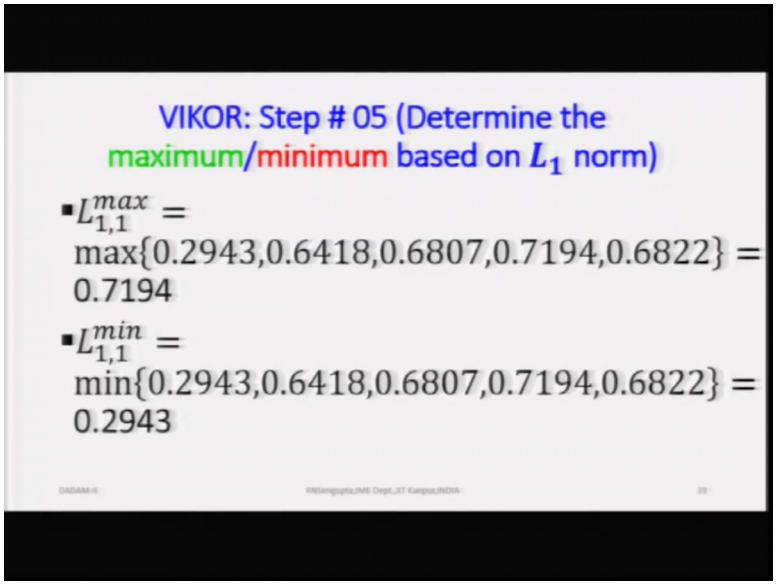
So, the blue, blue and the orange one are basically for the L 1 L 1 L p. So, what you are checking is that if you check along where the pointer is being hovered, this is the maximum distance we can have for the L 1 norm and this is what L infinity norm depending on the zone you can choose that how good the bad the criteria decisions are. And then you can basically rank it accordingly to find out how the ranking is done.

(Refer Slide Time: 23:32)



So, finally, I will take this combination of the weights of the L 1 norm and the L input which according to where you want to put. So, v is the weights which is basically 30 percent and 1 minus v will be 70 percent based on that you prove the ranking and find out the overall score.

(Refer Slide Time: 23:57)



So, you will basically to we will be doing the ranking based on the fact that you have l 1 1 L 1 1; that means, for each and every things you have the max and the min

corresponding to the case where you find out the maximum min various 0.71 and 0.94 and 0.29 and the max value of being 0.25 and 0.15.

So, you make a define of the differences put the weightages of v and 1 minus v find out the ranking. With this I will end the 40th lecture for this which is basically complete the 8 week for the VIKOR and for any queries please write on the forum and we will definitely be able to answer that. So, the eighth assignment would be only related to the VIKOR have a nice day and.

Thank you very much.