Fuzzy Sets, Logic and Systems and Applications
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Lecture – 45
Some Examples on Composite Linguistic Terms

So, welcome to lecture number 45 of Fuzzy Sets, Logic and Systems and Applications, here in this lecture we will discuss Some Examples on Composite Linguistic Terms.

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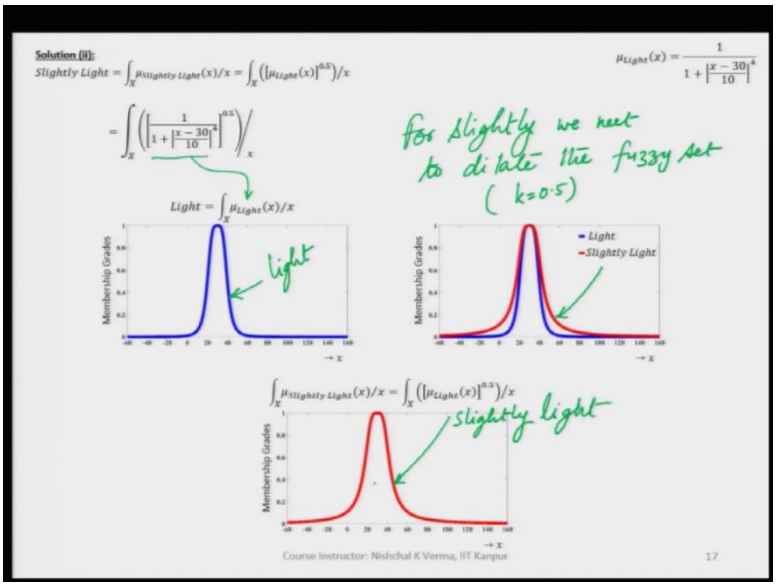

Now, let us take an example here where we have to find a composite linguistic term for slightly light. So, for light linguistic term we have a fuzzy set here which you can see is for light which is represented by a continuous membership function μ_{light} by bell shaped members function here.

And now, since we are interested in $slightly\ light$, so slightly, so I will write here for slightly we need to dilate the fuzzy set. So, this way when we dilate the fuzzy set we get a new fuzzy set which is here, here this is slightly for slightly the value of k because we are dilating. So, the value of k here I am writing k is equal to 0.5 for slightly. Similarly, if we have more or less this is same as $slightly$. So, either we say $slightly$ or we say more or less we need to dilate the fuzzy set.

So, here in our case if we say *light* and then we say *slightly light*. So, then for *slightly light* we have to dilate the original fuzzy set *light* to get *slightly light* which is mentioned here which is the composite fuzzy set for *slightly light* is shown here by the red color.

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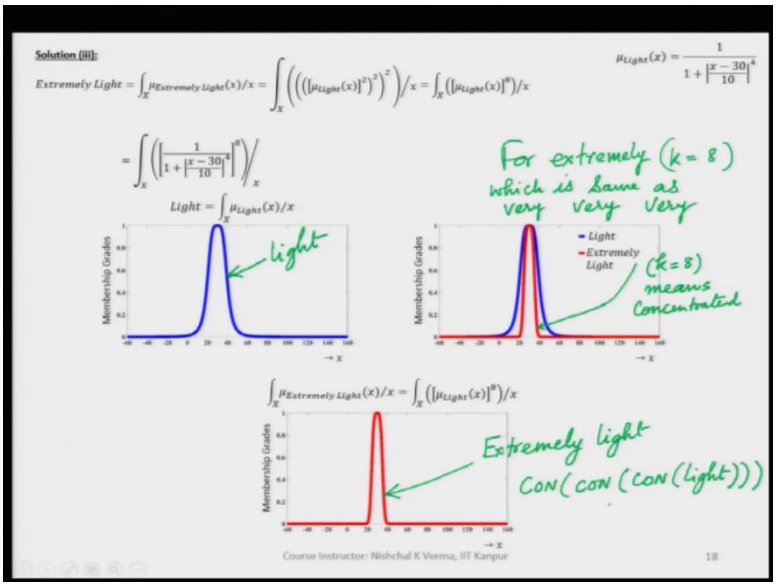

Now, in case we are interested in *extremely light*. So, for *extremely light* the value of k becomes 8. So, the value of k for *extremely* this for *extremely*, for *extremely* and this *extremely* is same as which is which is same as very very very, 3 times very.

So, we have already have the fuzzy set for *light* which is here we have fuzzy set for *light* and then if we are interested in *extremely light* it means we have to concentrate the *light* fuzzy set 3 times. So, this we have we this fuzzy set which is represented by blue color is for *light* fuzzy set and here you see the red fuzzy set the red color fuzzy set is for *extremely light*. And here this *extremely light* is basically we have got by taking k is equal to 8 means we have, means this has been concentrated, means the fuzzy set has been concentrated.

So, this way the composite fuzzy sets can be obtained here this is called the hedge *extremely light* means we are obtaining the linguistic hedge and thereby we are finding the resulting fuzzy set. So, we see that this red color fuzzy set is for the *extremely light* fuzzy set. And, this we have found as the concentration of, concentration of *light*. So, *extremely light* we have got out of concentrating the fuzzy set thrice.

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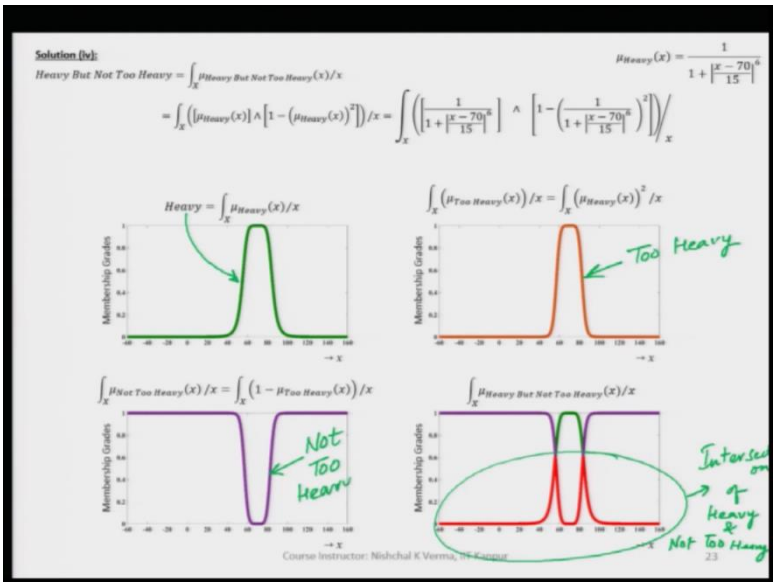

Now, let us take another example another composite fuzzy set where we need to find a *heavy but not too heavy*. So, we have the fuzzy set here, fuzzy set representation for the linguistic term *heavy* and here also the μ_{heavy} is nothing, but bell shaped membership function.

And, if a *heavy* fuzzy set and I mean the fuzzy set for *heavy* linguistic term is shown here. And, then let us first find the fuzzy set for *too heavy* and then *not too heavy* and then let us connect *heavy and not too heavy* together to get the composite fuzzy set. So, this fuzzy set is for *heavy*, then this fuzzy set is for *too heavy*, this is for *too heavy*, this is for *too heavy*; *too heavy* you know how did we get we simply concentrated this and we have got the fuzzy set for *too heavy*.

Now, let us quickly find the *not too heavy*. So, the fuzzy set for *heavy* is here *too heavy* is here and *not too heavy* is here, *not too heavy*. Now since we have *heavy and not too heavy* fuzzy sets let us now use the connective but in between and get the modified fuzzy set for, *heavy but not too heavy*.

So, when we do this we see that since we have *heavy* here and then we have *too heavy* here, we have *not too heavy* here. So, now, for finding *heavy but not too heavy* we have to use the connective, but and we have to use and for but, means we are taking the intersection. So, we will take the intersection of these two. So, here we this is *not too heavy*, this is *not too heavy* and this fuzzy set is for, this fuzzy set is for. So,

means we have two fuzzy sets: one is for *heavy* and other one is for *not too heavy* and when we super impose both the fuzzy sets on each other and when we take the intersection of this we are getting the resultant as *heavy but not too heavy*.

So, let us now look at this. So, this portion is giving us the intersection the intersection here of *heavy*, but *heavy and not too heavy*, intersection of *heavy* and *not too heavy*. And we already know that this is for *heavy*, this fuzzy set is for *heavy* this for *too heavy* and this is for *not too heavy*.

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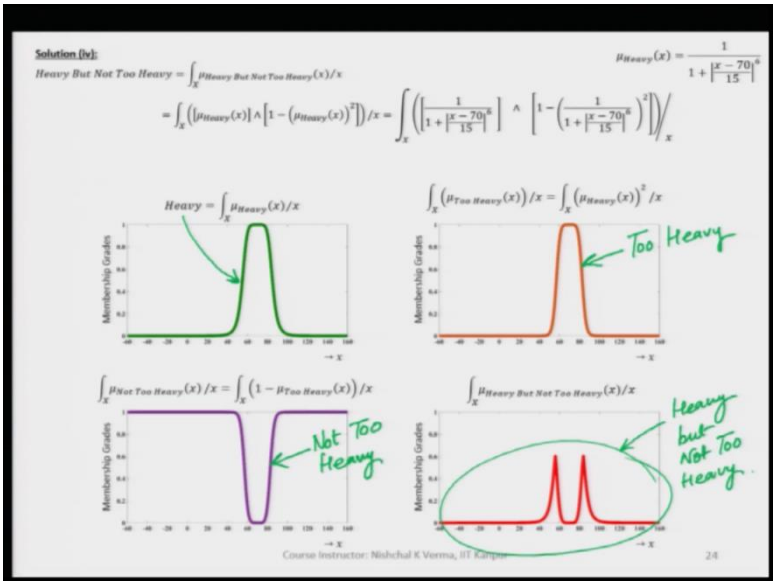

So, this way we have found this outcome after taking the intersection of the *heavy and not too heavy* and this is what is the fuzzy representation of the linguistic term *heavy but not heavy*. And we already know that this is for *heavy* this fuzzy set is for *too heavy* and this fuzzy set is for *not too heavy*. So, this way we have seen that we have found the new composite fuzzy set which is the outcome of *heavy but not too heavy*.

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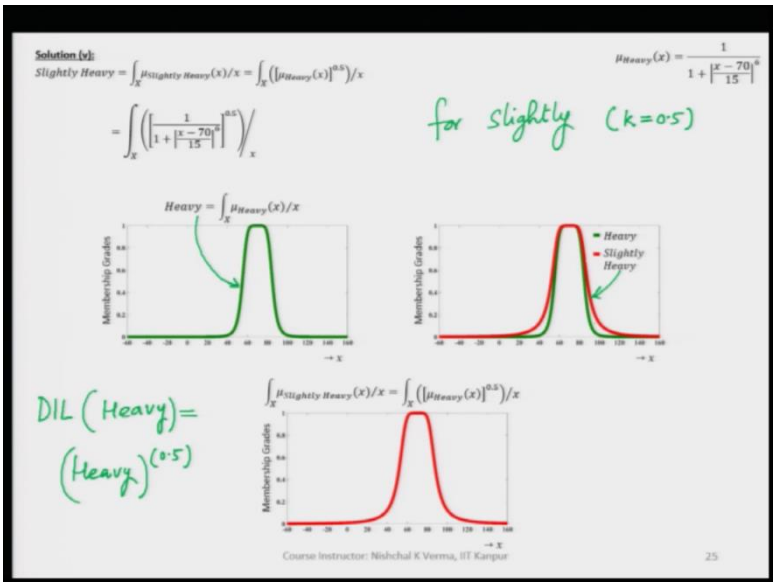

Let us quickly go ahead and find the fuzzy set for slightly *heavy* here this *slightly* is a hedge and for *slightly* for getting the *slightly heavy* from *heavy* we need to dilate. So, for slightly k is going to be equal 0.5. So, for *slightly heavy* what we have to do is we need to dilate the primary fuzzy set that is the heavy fuzzy set the fuzzy set for *heavy*.

So, we have here the fuzzy set for *heavy* and this red color fuzzy set is the fuzzy set which is represented by red color is basically the basically for this *slightly heavy* here. So, how did we get this *slightly heavy* is just fine in just dilating the *heavy* fuzzy set. So, this is very simple. So, when we have any primary fuzzy set and we are interested in the *slightly* of this fuzzy set this primary fuzzy set we dilate.

So, this is going to give us the fuzzy set like this. So, *slightly*, so dilation is going to give us the *slightly heavy*. So, dilation of *heavy* is going to give us the *slightly heavy*.

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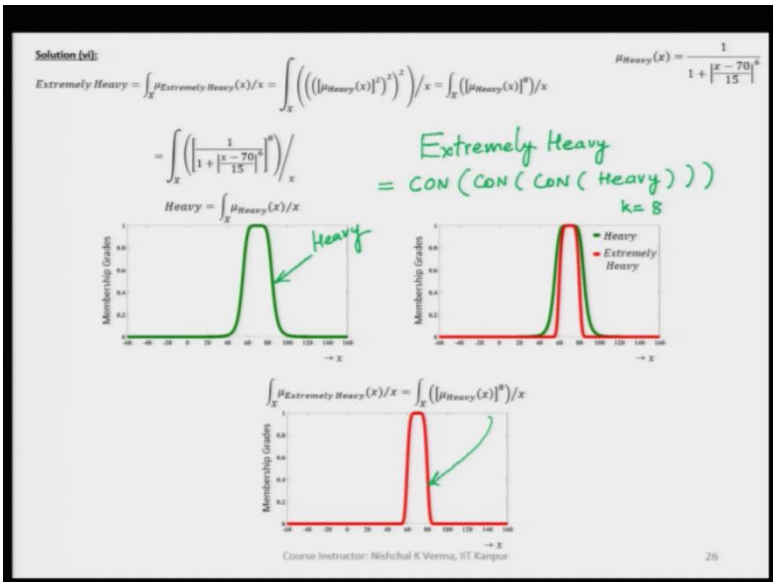

Now, this way on the same lines we can find *extremely heavy*. So, for *extremely* as I have already mentioned this *extremely* word this *extremely* we can get by concentrating the primary term thrice. So, the *extremely* can be obtained like *extremely heavy* , *extremely heavy, extremely heavy* can be simply the concentration and then concentration and then concentration of *heavy*. So, this means that 3 times concentration of heavy and is a normal concentration it means the final value of k is going to be 8.

So, in this case when we are *extreme* when we are finding the fuzzy set for *extremely*, *extremely heavy*. So, *extremely heavy* basically is the concentration with k is equal to 8 and when we do that we are going to get this fuzzy set which is represented by a red color and this is the original the primary term for *heavy*. This is how we can find the composite linguistic terms the fuzzy sets for composite linguistic terms

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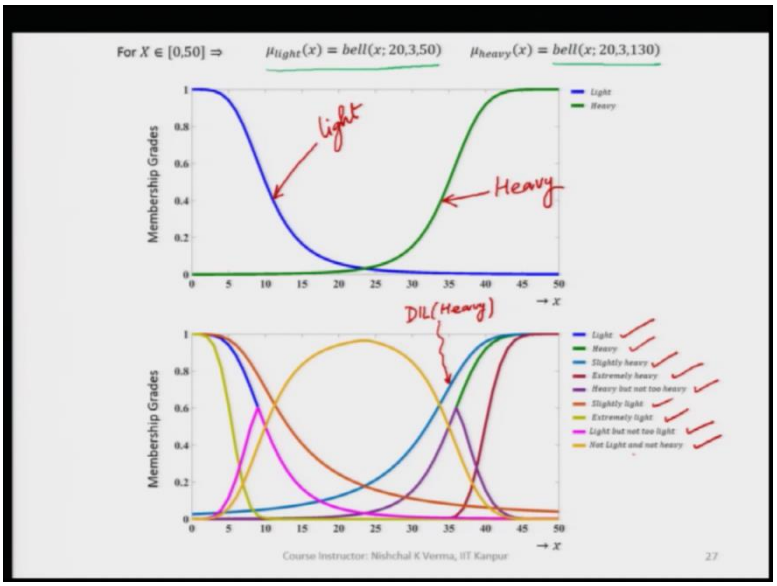

Now, here the same can be represented on the represented together. So, we see that when we have a bell shaped membership function for light linguistic value and a bell shaped membership function for *heavy* linguistic value. But, here the parameters of this bell shaped function membership function are different for *light* and *heavy*, you can see here in case of *light* we have 20, 3, 50, in case of *heavy* we have 20, 3, 130.

So, this membership this fuzzy set is for heavy this for *heavy* and this fuzzy set is for *light*. So, when we have these two primary terms and now you can see when we obtain the linguistic hedges and thereby the composite linguistic terms and representation as fuzzy sets, we see that here when we had *light* fuzzy set this blue color is for *light* I can just tick here.

So, you can see blue color for the set is for *light* and then here we have green colored fuzzy set for *heavy* and when we are interested in *slightly heavy* which we have obtained by dilating *heavy*. So, this we have obtained by dilating *heavy* means we have simply taken k is equal to 0.5. So, this you can see here this is the dilation of *heavy* and you see the *extremely heavy* here which is here.

So, *extremely heavy* which is which we can simply we can concentrate thrice a *heavy* membership heavy fuzzy set and so we basically concentrate here thrice for getting the *extremely heavy* this is *extremely heavy*. And, similarly when we are interested in *heavy but not too heavy*.

So, we use the connective, but and this we are getting by simply getting the intersection of $heavy$ and $not\ too\ heavy$ and then we when we are interested in $slightly\ light$, we take the value of k is equal to 0.5 as I mentioned is here we dilate and similarly for $extremely\ light$ we are taking the concentration three times means k is equal to 8 similarly here we use $light\ but\ not\ too\ light$, similarly we have $light$ and then we take the intersection of $light\ with\ not\ to\ light$, means we get first the complement of $too\ light$ which becomes $not\ too\ light$ and then we take the intersection of this with $light$. Similarly, $not\ light\ and\ not\ heavy$ we take the complement of $light$ and not we take the complement of $light$ and $heavy$ and then we take the intersection of these two to get the composite terms.

So, this way we see that when we have primary terms primary fuzzy sets, then we can obtain suitable composite linguistic terms and thereby you know its representations as fuzzy sets very easily. So, $light$, $heavy$ in this case in our case our primary terms and then we have found the $slightly\ heavy$, $extremely\ heavy$, $heavy\ but\ not\ too\ heavy$, $slightly\ light$, $extremely\ light$, $light\ but\ not\ too\ light$, $not\ light\ and\ not\ heavy$.

So, like that we can find any suitable composite linguistic terms by using the primary terms hedges and connectives and this way we can manage to get lot many composite linguistic terms and that's understand as to how we get all these composite linguistic terms using the primary linguistic terms hedges and connectives.

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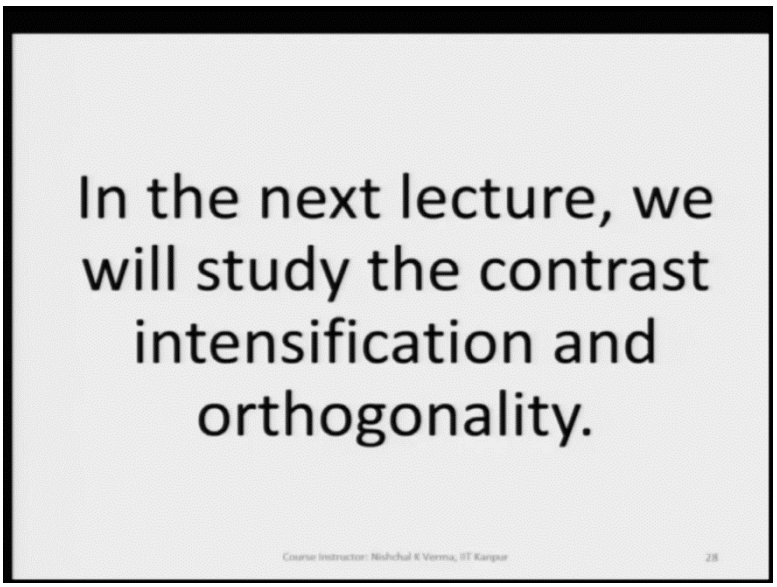

So, with this I would like to stop here and in the next lecture we will study the contrast intensification and orthogonality of fuzzy sets.

Thank you.