Deep Learning
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Module 2.4
Lecture - 02
Errors and Error Surfaces

Before we go to the next section which is on learning, I just want to introduce the concept of Errors and Error Surfaces and tell you how it relates to these multiple solutions that we were talking about.

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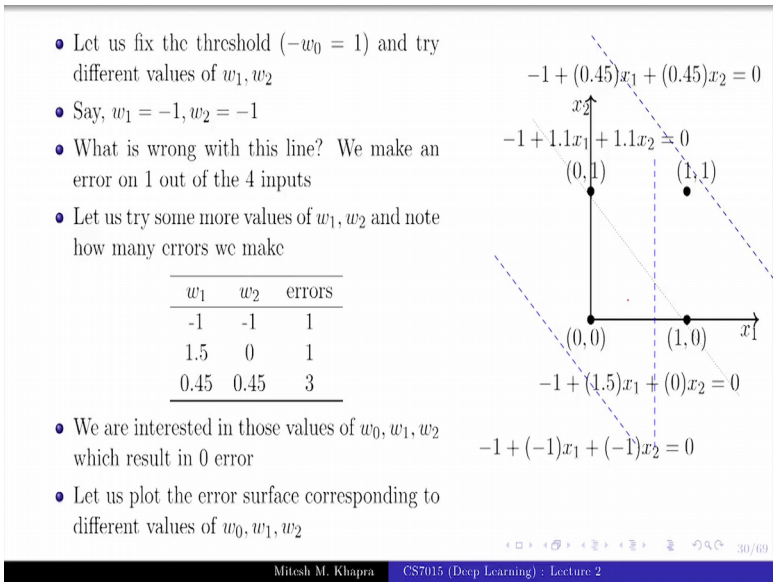

So, for simplicity what we will do is, we will just set the threshold to minus or minus w to 1 which is setting the threshold to minus 1 and now, I will try different values of w 1 and w 2 ok. So, I was saying that there are multiple values of w 1 and w 2 possible and these are all real numbers, right. We are not constrained by having them as Boolean values. So, now this is one solution which I tried. I tried setting w 1 to minus 1 and w 2 to minus 1. What is wrong with this line? Does it lead to any errors? How many?

Just one error, right; So, this makes an error of 1 out of the 4 inputs. Now, let me just try some other values of w 1 and w 2, this line; Again one error, ok. What about this line? Not 4, 3 because 0, 0 is anyways on this side of a line.

So, now given this now tell me that my question is to find these w. So, I would want to find w 1 w 2 and so on. Given this discussion on errors, can you tell me a condition that I am looking for. I want to find w 1 w 2 or up to w n such that errors are minimized and in the best case errors are 0, right. So, that is what I want, right. So, this just I want to make a case that these search for w's is driven by certain objective and this objective is to minimize the error, fine.

So, now since we are doing this, let us plot the error surface corresponding to different values of w naught w 1 and w 2.

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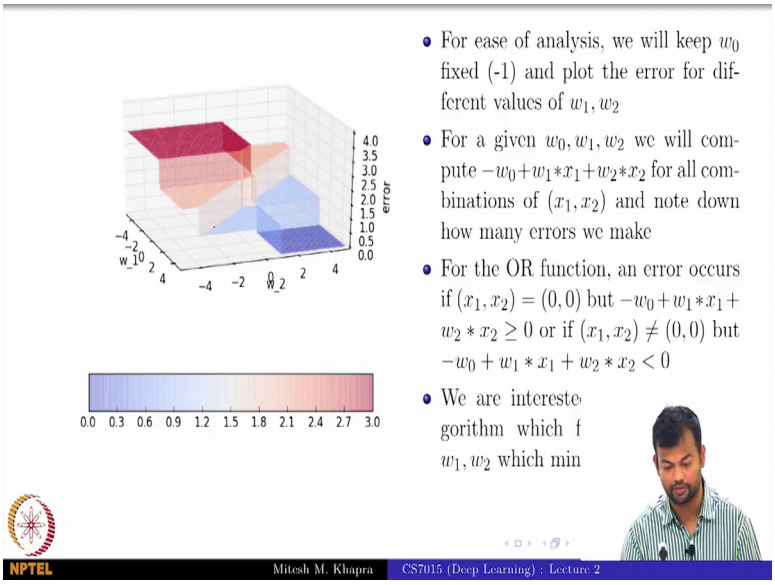

Once again for simpler analysis we will just keep w naught to be fixed at minus 1 and now what I have; so, just do not read this bullet as of now, even this one. So, I have this w 2 here. So, that is my one axis and I have w 1 here which is my another axis. Now, what I am going to do is I am going to try different values of w 1 and w 2. So, this axis can go from minus infinity to plus infinity. Of course, for showing the sake of showing, here I have just had it from minus 4 to 4.

So, now what I am going to do is I am searching for some values of w's w 1 and w 2. So, that my errors is 0 and let us do a brute force and I will just try every value between minus 4 to 4, ok. In fact, one of the solutions which I proposed actually was this 1.1, 1.1 right. That is the line which we saw on the previous slide and which led to 0 errors and that is the dark blue surface here. So, how did I compute this error? Actually I just

substituted minus, sorry 1.1, 1.1 here and then, I put in all the four values combinations for x1, x 2, right and I realized that I am able to satisfy all of them. So, I do not get any error, right. Now, instead of that if I had put something different?

So, let me just go back to the previous slide which was see minus 1, minus 1 right which is I think yeah somewhere around here right minus 1, minus 1 I guess. So, for that I am in this light blue region where the error was once. I make errors for one of the inputs, right. So, it is a very brute force way of finding this and this is not going to work, right because we have lots of inputs to check, but this is just to give you an intuition that we are looking at errors and we are trying to find a value of w 1, w 2 which minimize this error. So, that is the idea behind errors and error surfaces.