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Basics of Neural Network Programming

Computation Graph

Computation graph



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Interactive Transcript

English

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0:00

You've heard me say that the computations of a neural network are organized in terms of a forward pass or a forward propagation step, in which we compute the output of the neural network, followed by a backward pass or back propagation step, which we use to compute gradients or compute derivatives. The computation graph explains why it is organized this way. In this video, we'll go through an example. In order to illustrate the computation graph, let's use a simpler example than logistic regression or a full blown neural network. Let's say that we're trying to compute a function, J , which is a function of three variables a , b , and c and let's say that function is $3(a+bc)$. Computing this function actually has three distinct steps. The first is you need to compute what is bc and let's say we store that in the variable call u . So $u=bc$ and then you my compute $V=a * u$. So let's say this is V . And then finally, your output J is $3V$. So this is your final function J that you're trying to compute. We can take these three steps and draw them in a computation graph as follows. Let's say, I draw your three variables a , b , and c here. So the first thing we did was compute $u=bc$. So I'm going to put a rectangular box around that. And so the input to that are b and c . And then, you might have $V=a+u$. So the inputs to that are V . So the inputs to that are u with just computed together with a . And then finally, we have $J=3V$. So as a concrete example, if $a=5$, $b=3$ and $c=2$ then $u=bc$ would be six because $a+u$ would be $5+6$ is 11 , J is three times that, so $J=33$. And indeed, hopefully you can verify that this is three times five plus three times two. And if you expand that out, you actually get 33 as the value of J . So, the computation graph comes in handy when there is some distinguished or some special output variable, such as J in this case, that you want to optimize. And in the case of a logistic regression, J is of course the cos function that we're trying to minimize. And what we're seeing in this little example is that, through a left-to-right pass, you can compute the value of J . And what we'll see in the next couple of slides is that in order to compute derivatives, there'll be a right-to-left pass like this, kind of going in the opposite direction as the blue arrows. That would be most natural for computing the derivatives. So to recap, the computation graph organizes a computation with this

blue arrow, left-to-right computation. Let's refer to the next video how you can do the backward red arrow right-to-left computation of the derivatives. Let's go on to the next video.

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