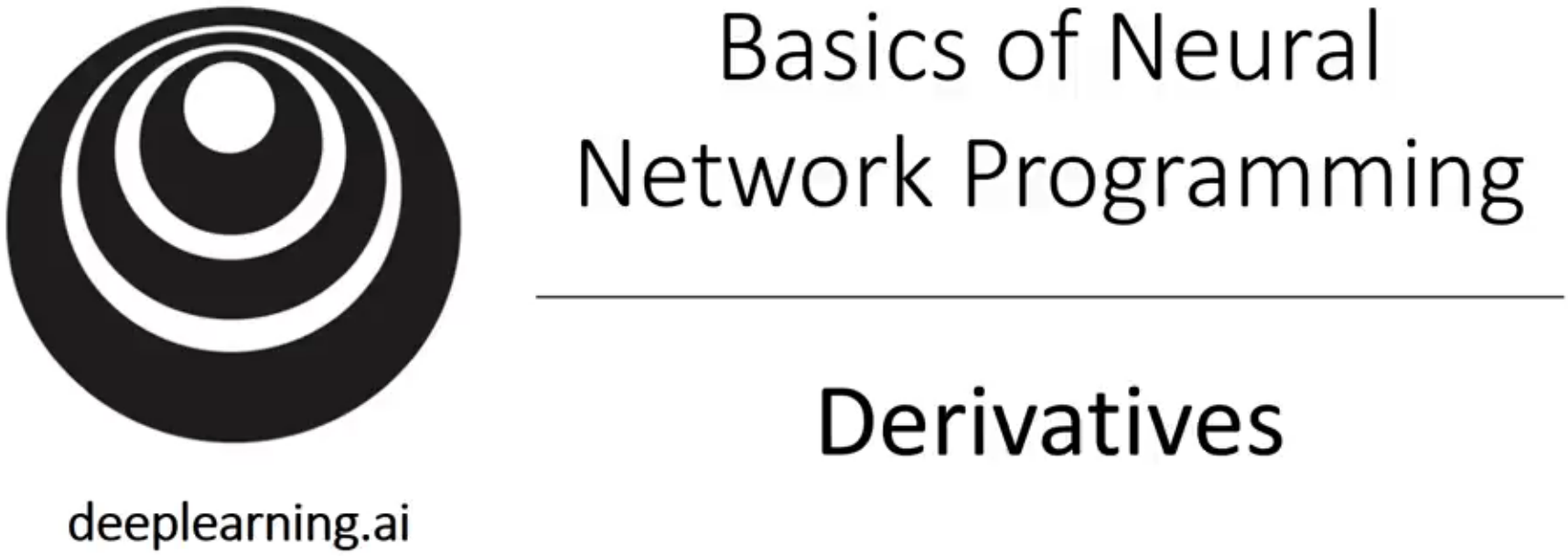

Derivatives

Have a question? Discuss this lecture in the week forums. >

Interactive Transcript

English

Help us translate!

0:00
in this video I want to help you gain an intuitive understanding of calculus and the derivatives now maybe you're thinking that you haven't seen calculus since your college days and depending on when you graduate maybe that was quite some time back now if that's what you're thinking don't worry you don't need a deep understanding of calculus in order to apply new networks and deep learning very effectively so if you're watching this video or some of the later videos be wondering wow this stuff really for me this calculus looks really complicated my advice to you is the following which is that watch the videos and then if you could do the homework and complete the programming homework successfully then you can apply deep learning in fact what you see later is that in week 4 will define a couple of types of functions that will enable you to encapsulate everything that needs to be done with respect to calculus that these functions call forward functions and backward functions that you learn about the less you put everything you need to know about counselors into these functions so that you don't need to worry about them anymore beyond that but I thought that in this foray into deep learning that this week we should open up the box and peer a little bit further into the details of calculus but really all you need is an intuitive understanding of this in order to build and successfully apply these algorithms oh and finally if you are among that maybe smaller group of people that are expert in calculus if you're very familiar with calculus observe this it's probably okay for you to skip this video but for everyone else let's dive in and try to get an intuitive understanding of derivatives I've plotted here the function f of a equals 3/8 so it's just a straight line to gain intuition about derivatives let's look at a few points on this function let's say that a is equal to 2 in that case f of a which is equal to 3 times 8 is equal to 6 so if a is equal to 2 then you know F of a will be equal to 6 let's say we give the value of a you know just a little bit of a nudge I'm going to just bump up me a little bit so there is now 2.00 1 right so I'm going to get a like a tiny little nudge to the right so now is let's say 2 oh one this plug this is to scale 2.01 the 0.001 difference is too small to show on this plot this give them a little nudge to the right now f of a is equal to three times at so six point zero zero three Simplot this over here this is not the scale this is six point zero zero three

so if you look at this low triangle here some highlighting in green what we see is that if I match a 0.001 to the right then F of a goes up by 0.03 the amount that F of a went up is three times as big as the amount that I judged a to the right so we're going to say that the slope of the derivative of the function f of a at a equals two or when a is equal to 2 the slope this reading and you know the term derivative basically means slope is just that derivative sound like a scary a more intimidating word whereas slope is a friendlier way to describe the concept of derivative so one of these year derivative just think slope of the function and more formally the slope is defined as the height divided by the width of this little triangle that we have in green so this is you know 0.03 over 0.01 and the fact that the slope is equal to 3 or the derivative is equal 3 just represents the fact that when you watch a to the right by 0.01 by tiny amount the amount that F of a goes up is three times as big as the amount that United the inertial a in the horizontal direction so that's all that the slope of a line is now let's look at this function at a different point let's say that a is now equal to five in that case f of a three times a is equal to 15 so let's say I again give a and notch to the right a tiny longnecks is now bumped up to five point over one F of a is three times that so f of a is equal to fifteen point zero three and so once again when I bump into the right not a to the right by 0.001 F of a goes up three times as much so the slope again at a equals five is also three so the way we write is that the slope of the function f is equal to three we say D F of a da and this just means the slope of the function f of a when you nudge the variable a a tiny little amount um this is equal to three and an alternative way to write this derivative formula is as follows you can also write this as d da of f of a so whether you put the f of a on top of whether you write it you know down here it doesn't matter but all those equation means is that if I nudge a to the right a little bit I expect F of a to go up by three times as much as I not just the value of little a now for this video I explained derivatives talking about what happens we nudge the variable a by 0.001 um if you want the formal mathematical definition of the derivatives derivatives are defined with an even smaller value of how much energy a to the right so it's not open over 1 is not 0.001 is not 0.0 and so on 1 is sort of even smaller than that and the formal definition of derivative says what have you nudge a to the right by an info testable amount basically an infinite infinitely tiny tiny amount if you do that does f of a go up three times as much as whatever was a tiny tiny tiny amount that you now stay to the right so that's actually the formal definition of a derivative but for the purposes of our intuitive understanding we're going to talk about nudging a to the right by this small amount 0.001 even if it's 0.001 isn't exactly you know tiny tiny insa testable now one property of the derivative is that no matter where you take the slope of this function it is equal to 3 whether a is equal to 2 or a is equal to 5 the slope of this function is equal to 3 meaning that whatever is the value of a if you increase it by 0.001 that value of f of a goes up by three times as much so this function has the same slope everywhere and one way to see that is that wherever you draw this your little triangle right the height divided by the width always has a ratio of three to one so I hope this gives you a sense of what the slope what the derivative of the function means for a straight line where in this

example the slope of the function was three everywhere in the next video let's take a look at a slightly more complex example where the slopes of the function can be different at different points on the function

Downloads

Lecture Video	mp4
Subtitles (English)	WebVTT
Transcript (English)	txt
Lecture Slides	pptx

Would you like to help us translate the transcript and subtitles into additional languages?