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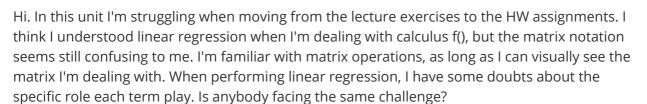
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Need help

discussion posted 5 days ago by love-yourself



What may we do to better seize this concept?

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younhun (Staff)

4 days ago

I used to struggle with the same thing, so I can sympathize. The single best way is to actually understand what the derivative is doing in smaller-dimensional cases, say in 2 dimensions.

HOWEVER, there's kind of a "cheat" way of doing matrix calculus. When multi-dimensional things seem foreign, you should always appeal to the single-variable case for guidance.

For example, when you have a function like $f\left(x
ight)=x^{T}Ax$, you should notice that this is a quadratic function in x. Think of something like $h(x) = cx^2$, and take the derivative. You should get h'(x) = 2cx. So ∇f , which is the multi-dimensional analogue of the derivative, should resemble 2Ax. But there are a few different candidates, like $2A^Tx$, $2x^TA$, $2x^TA^T$, etc. Only one of them makes sense (depending on whether you think of gradients as column or row vectors. In this class, we've often thought of them as column vectors) so we get 2Ax.

In fact, if you write it out the long way, then you'll see that this "cheat" actually gave the right answer, since

$$f\left(x
ight)=\sum_{i,j}A_{i,j}x_{i}x_{j}$$
 which gives $rac{\partial}{\partial x_{i}}f\left(x
ight)=2A_{i,i}x_{i}+2\sum_{j
eq i}A_{i,j}x_{j}=2(Ax)_{i}.$