How do I learn mathematics for machine learning?

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Updated Dec 14, 2013 · Upvoted by Tudor Achim, phd student working on machine learning andNikhil Garg, I lead a team of Quora engineers working on ML/NLP problems

When going through my Machine Learning course last semester, I felt like I had the most catching up to do with Linear Algebra. I felt key ideas from LinAlg are harder to remember over time than Probability. I found myself to be mostly working with probability distributions, Bayes' rule, MLEs and MAPs, while the algebra side of it was mostly optimization in higher dimensions, was mostly Matrix calculus.

I discovered that the Matrix Cookbook was popular with most students for working with Matrix Calculus as it seems to have a never-ending list of matrix derivatives:

http://www2.imm.dtu.dk/pubdb/vie...

As far as brushing up on the rest of your Linear Algebra knowledge is concerned, I highly recommend Strang's lectures/book:

http://ocw.mit.edu/courses/mathe...

Highly relevant topics include knowing about rank and inversion, SVD, and also make sure you're very comfortable with eigenvalues and eigenvectors, amongst other things.

Finally, with Analysis, I don't think ML requires a formal introduction to Analysis at all. Its important to know higher dimensional calculus well, especially parts related to optimization, such as Lagrange multipliers, the primal-dual form, and in general, the calculus of Matrices, and you should be good to go.

Overall, I think the case with Linear Algebra and Calculus is to work your way through an ML book/course, and stop and look at the relevant math when necessary, whereas you need a strong foundation in Probability right from the beginning, and most textbooks on ML tend to talk a lot about probability while skimming over the mathematical details of LinAlg and Calculus.