Teach yourself Machine Learning the hard way !

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It has been 3 years since I have steered my interests towards Machine Learning. I had just graduated from college with a Bachelor of Engineering in Electronics and Communication Engineering. Which is, other way of saying that I was:

- a toddler in programming.
- little / no knowledge of algorithms.
- studied engineering math, but it was rusty.
- no knowledge of modern optimization.
- zero knowledge of statistical inference.

I think, most of it is true for many engineering graduates (especially, in India !). Unless, you studied mathematics and computing for undergrad.

Lucky for me, I had a great mentor and lot of online materials on these topics. This post will list many such materials I found useful, while I was learning it the hard way !

All the courses that I'm listing below have homework assignments. Make sure you work through each one of them.

1. Learn Python

If you are new to programming, I recommend that you learn python. It's an easy language to learn and lot of courses that I'll suggest in this post use python in their assignments. You need to be able to get things done, not just learn the syntax .

Here are few excellent resources to learn python:

- Google's Python Class – This is a short course. But teaches you all you need to know to code up something quick.
- Introduction to Computer Science – This is a 3 week long course. If you have never coded in any language before, you may want to take this course instead.

2. Learn / Brush up your Multivariate Calculus

Every Machine Learning algorithm requires optimization. Foundation for which is a solid knowledge of Multivariate Calculus and Linear Algebra. I love this course, if you like Math, I'm sure you will too !

- Multivariate Calculus

If you have not taken any calculus before, then you may want to consider taking Calculus One.

3. Learn / Brush up Linear Algebra

We all know how to multiply matrices, take inverses and calculate determinants. To understand Machine Learning algorithms, that's not enough ! You need sound understanding of geometric interpretations of these operations. Prof. Gilbert Strang lectures are an excellent resource to learn Linear Algebra the right way.

- Linear Algebra

4. Take a course in probability theory and statistical inference

It is vital to understand probability theory well, to understand why any machine learning algorithms work ! I haven't taken this version of the course. But the contents of the course below look very relevant.

- Introduction to Probability

5. Take a basic course in Algorithms

Solid understanding of algorithms is essential to any computational discipline. Prof. Tim Roughgarden has an excellent introductory course on the topic.

- Algorithms: Design and Analysis 1
- Algorithms: Design and Analysis 2

6. Take basic machine learning course

Now, you are ready to tackle 2 most basic machine learning courses available online.

- Introduction to Artificial Intelligence – Gives a broader view of the field of artificial intelligence.
- Machine Learning – An excellent course, thought by Prof. Andrew Ng. You need to learn MATLAB / Octave for programming assignments.

Now, you can participate on Kaggle after learning scikits-learn.

Just with the skills you have learnt so far, you may be able to land a handsome paying job with the sexy title "Data Scientist" ! You can impress your cocktail party friends!

But, you have a long way to go ! You are nowhere near calling yourself **"an expert"** in Machine Learning. You won't be able to pick a paper from ICML / NIPS conference and understand it !

If you want to separate yourself from the crowd ! If you want to be able to understand, implement and may be some day suggest an improvement to advances in Machine Learning read my 2nd post on the same topic !

Like Prof. Peter Norvig says "Teach yourself programming in 10 years", if you want to be a world class expert, you need to learn more than syntax !