

CPSC 540: Machine Learning: Prerequisite Form

Machine learning is a popular topic, and it is increasingly being used in a huge variety of applications. However, the advanced material is very challenging because it brings together a larger number of ideas from computer science, mathematics, and statistics. Unfortunately, due to the popularity of the topic we typically have a few students register for the course who do **not yet** have the appropriate background. These students not only hurt themselves because they struggle with the high workload in the course, but they also hurt the experience of the other students since significant class time ends up being spent on material that should be specified as prerequisites.

While it is hard to add formal prerequisites to graduate courses because people come from such different backgrounds, we need to establish that everyone in the class has a common background. Below I give a list of courses (and important related topics) that I would ideally like a CPSC 540 student to take either before or simultaneously with CPSC 540:

- A linear algebra course like Math 221 (linear systems, eigenvalues).
- A probability course like Math 302 (conditional probability, expectations).
- A multivariate calculus course like Math 200 (gradients, optima).
- A scientific computing course like CPSC 302 (numerical solution of linear systems, condition number).
- An algorithms and complexity course like CPSC 320 (big-O notation, NP-hard problems).
- A statistical inference course like STAT 305 (linear regression, maximum likelihood estimation).
- A machine learning course like CPSC 340 (classification trees, nearest-neighbour methods).

I understand that some highly-motivated students will be able to succeed in the course while missing one of these prerequisites. However, if you are missing multiple prerequisites or haven't obtained strong grades in multiple of the classes above, it's better for to fill in your background on these subjects rather than take CPSC 540.

As a check that all students registered in the class have a background that is reasonably close to the above, all students registered in the course must fill out the next two pages of this document describing how they fulfill the prerequisites. You should list the relevant courses as well as the grades obtained in them, and for non-UBC courses I also want to see the list of topics from the courses. This form should be e-mailed to me along with relevant transcripts (unofficial copies are ok). If you are a CPSC or EECE or STAT student, this can be done in the first week of classes. For students in other departments, this needs to be done before you can register for the course.

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1 Linear algebra

Took a course, did a separate study, and gave a talk at a Regional conference on Linear algebra.

2 Probability

My current research is on Stochastic Dynamical Systems, I've had numerous courses on Probability, both classically and measure theoretically.

3 Multivariate calculus

Gave a lecture on multivariate last term and have been tutoring it for 4+ years

4 Scientific computing

I've had several numerical analysis courses, worked with Mathematica, Matlab, Julia and R, my current research requires some heavy computing.

5 Algorithms and complexity

From a numerical analysis perspective, I've learned the differences between $O(1)$ and $O(n \log n)$ for example. No official CS course on algorithms.

6 Statistical inference

I've had a course on Statistical Theory where we developed hypothesis tests and used MLE methods, was on a research team for creating a spatio-temporal model to discuss water contamination.

7 Machine learning

went through Andrew Ng's Coursera on the applications of machine learning and have read a few other papers on multi-level Perceptrons. I ~~also~~ believe I am at least capable in the subject unofficially, aware of K-means and backpropagation etc.