**Template for a Better Methods Curriculum**

By: Tiago Ventura

Instead of discussing options of summer programs, I will focus on what I did, or what I wish I had done considering the methods options we have in our department and in the university, broadly speaking. The views reflected below are stictly my own.

**My overall and controversial message**: *invest in your technical training and learn as many methods as you can during your PhD*. Those are hard to learn later, way harder than the topics you learn in your substantive seminars, and you can always work through seminar syllabi later. Use seminars to generate research ideas.

Below is my proposed plan for optimizing your methodological training.

**First Year**

**Mathematics:**

The most important thing is to build solid math intuition during your first year. I would suggest you focus as much as you can on working through your previous courses in Calculus and Probability Theory, and maybe Linear Algebra. The first two are fundamental for you to effectively learn maximum likelihood estimation, machine learning, and Bayesian statistics.

If you know what a likelihood function is, how to maximize it, and how to combine distinct probability distributions, you can skip these courses. If you have no idea about these concepts—as was my case upon enterting the program--I would advise you to invest in your mathematics training in your first year. I would work through these two courses and the book below:

Calculus (MIT):

<https://ocw.mit.edu/courses/mathematics/18-01sc-single-variable-calculus-fall-2010/>

Probability Theory:

<https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041-probabilistic-systems-analysis-and-applied-probability-fall-2010/>

David Siegels’ Youtube Channel and Book:

<https://www.youtube.com/c/DavidSiegelmath/playlists>

Other than that, if you have time, it is also a good use of your time to register for upper-level undergraduate courses in the Mathematics Department. I am currently auditing one in Probability Theory (STAT410) and I am loving it.

**Second Year**

There are three courses our department does not offer as graduate seminars that I believe are fundamental to your training: Causal Inference, Machine Learning (or Natural Language Processing), and Bayesian Statistics. Most of our students take these courses at ICPSR or in other departments on campus. I would strongly encourage you to take it on campus during your second year – ICPSR is great but not as good as a full semester. I have a few suggestions of departments you can look at to take these courses.

My philosophy for graduate school was always to learn as many methods as possible. So, the list is long, and you can always try new things.

**Causal Inference:**

* ECON756: Empirical Political Economics.
* EDMS647: Causal Inference and Evaluation Methods.
* EDMS769G: Introduction to Graphical Models for Causal Inference.

**Machine Learning**

A lot of options in the CS and INST departments. I would say auditing any undergraduate advanced (400s) on Machine Learning, Natural Language Processing, or Artificial Intelligence will give you an interesting survey of the area. One crucial challenge is that all the courses are in Python, not R.

Beyond CS, this one below is an interesting option:

* SURV699U: Special Topics in Survey Methodology; Machine Learning for Social Science

**Bayesian Statistics**

Here, honestly, we don’t have a lot of options on campus. Bayesian can be extremely technical, and the courses in the statistics department might be too much. I believe that Multilevel Modeling with Ernesto covers some intuition behind Bayesian, and the ICPSR Intro to Bayes with Johannes Garreth is an interesting option. In any case, EDMS offers a Bayesian seminar that considering your interest in the field can be useful to take.

* EDMS787: Bayesian Inference and Analysis

All in all, if I could go back, I would have followed the template below in organizing my second year in the program:

**Template**

*Fall Year II*

* MLE (GVPT)
* Causal Inference (one of the above)
* Substantive Seminar on your field

*Spring Year II*

* Multilevel (GVPT with Ernesto)
* Machine Learning/Natural Language Processing
* Substantive Seminar on your Field

*Summer II*

* ICPSR.

*Beyond Year 2:*

Consider applying for the summer schools below.

1. **Summer Institute in Computational Social Science.**

Organized by Matthew Salganik and Chris Bail. The program consists of two weeks of training with advanced Ph.D. students, postdocs and assistant professors. The first week consists of a series of lectures and exercises in computational social science, while the second is more research-oriented. It is great for students to network with colleagues from other universities and fields, and it provides funding for the research project you started with other participants in the second week of the school.

Link Here: <https://compsocialscience.github.io/summer-institute/>

1. **Empirical Implications of Theoretical Models.**

Three-weeks summer program on formal modeling. Although I do not do formal models a lot, the EITM is great to get feedback on your research and to build a larger professional network with colleagues from other universities. I went on my third summer. If I could change, I would go on my 4th year, after having my prospectus defended, and at least one paper of my dissertation done.

Link Here: <http://eitm.princeton.edu/>