

# STAT 991: TOPICS IN DEEP LEARNING

Department of Statistics, The Wharton School, University of Pennsylvania, Fall 2019

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**Time:** Thursdays 12:00pm-1:20pm

**Place:** Huntsman Hall F36

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**Objectives:** This advanced seminar course will explore several topics in deep learning. We will discuss both theory and applications.

Students will present topics over one or more lectures. The presentations will summarize either the basic foundations of the area or the work of several research papers on a topic. They will include necessary background, algorithms, in-class code demonstrations, as well as results and proofs (in case of theory). Finally, the goal of the course will also be to identify new research directions.

I am hoping that this course will provide a venue for discussion for students interested in deep learning and related areas at Penn.

## Course Pages:

1. Canvas for announcements and private materials: <https://canvas.upenn.edu/courses/1475847>
2. Public class page: <https://github.com/dobriban/topics-in-deep-learning>

**Prerequisites:** You are expected to have some basic familiarity with deep learning. In particular, you should know what the following terms mean: deep net, hidden layer, activation, weight, bias, ReLU, backpropagation, SGD, dropout, batchnorm, CNN, RNN, Keras. In addition, you are expected to have a basic familiarity with statistics and machine learning (e.g., at the level of CIS 520 and STAT 430).

**Topics:** A list of possible topics are discussed on the Github page.

**Computation:** There is no formal computational component of the course. However, it can be extremely helpful to build experience doing deep learning yourself. For this, if you are coming from a statistics background, the easiest route is to use Keras in R. If you have experience using other computational frameworks, you may use those in your presentation.

In the Fall 2018 edition of the class, we have some small deep learning experiments in class. Some code for these is provided on Github under the folder /Code/ for your convenience. To set up your environment, follow the following steps:

1. To prepare, you need to install the Python distribution Anaconda on your laptop. For this there are several tutorials online.
2. You also need to install Keras: <https://github.com/keras-team/keras>. The code to do this is included in the R scripts posted on Canvas.

3. We use material from the book Deep Learning in R, by Chollet and Allaire. See <https://github.com/jjallaire/deep-learning-with-r-notebooks>.

**Instructor:** Edgar Dobriban, [dobriban@wharton.upenn.edu](mailto:dobriban@wharton.upenn.edu), Office: 465 JMHH. Office Hours: by appointment

**Feedback:** I am interested to hear about your experience and suggestions for the class.

**Grading Policy:** The course grade will be driven by two factors: presentation (80%), and class participation (20%). The components of each are

- Presentation: Clarity (ability of others to follow). Correctness. Coverage (did you cover the important parts). Insight.

Think of the presentation as a course project. You will need to prepare the presentation (slides to be presented in class, or cca 6 pages of lecture notes) and provide it to the class 24 hours in advance. These will be posted on Canvas or Github. You may reuse presentation materials from other sources.

We are aiming that the first student presentations be in the second week. There is a Google Sheet where you can sign up. I can guide with choosing topics, literature search, and structuring the presentation.

- Class participation: Attendance, asking questions.