STAT4402/7503 Tutorial Paper

2020 Semester 2, due 5pm 9 Oct

Key dates

- (2%) Submit your tutorial paper topic and with references (one per line) at `http://tinyurl.com/y3j9geqp` before 5pm, 25 Sep.
- (18%) Submit your tutorial paper before 5pm, 9 Oct on Blackboard.

Task

You are required to perform in-depth self-study of a machine learning or deep learning topic of your own choice, and showcase your learning outcome as a tutorial paper.

If you are not sure what you want to write about, you may find potential topics by reading "More about ..." slides or optional slides in the lecture slides. For example, slide 22 in Lecture 4 mentions a few dimension reduction methods not covered in the lectures, such as LASSO, LARS, kernel PCA, Isomap... In case you want to look at what are covered in the last offering of STAT4402/7503, the slides are available at `https://www.nan-ye.com/teach/stat4402/`).

Once you have chosen your topic, the best way to prepare your tutorial paper is probably to first search for some reference resources and read them — you should be able to find plenty of good resources using a search engine. Take notes as you study the reference resources. In particular, note down questions that come to you. Some questions may be about points that are difficult to understand, and you can work out a better explanation for these points. Some questions may be about things that are not explained in the reference materials, and may require additional research. Some questions may be about how to implement the ideas or algorithms... Once you go through these, you should have enough materials to write about.

The tutorial paper should be written at a level accessible for an audience with solid background in linear algebra, calculus, statistics and programming (that is, a typical STAT4402/7503 student). Your tutorial paper may include the following components

- A discussion on why the topic is interesting/significant.
- If you are writing about an algorithm, include enough detail so that readers can implement the algorithm by following your tutorial paper. If you are writing about a theory topic, include necessary definitions and present proofs if possible.
- A discussion on the strengths/limitations of the methods/models/analyses.
- Examples or code snippets or demos. The code should be complete and runnable. Your report only need to include the most relevant code snippets, and the complete code can be included as an appendix or a supplementary file. However, note that the purpose of your tutorial paper is not about listing facts or procedures, but about making things understandable.

- Exercises and solutions. The exercises can be based on the questions that you encounter while self-studying.
- References for further study (such as links to implementations, related papers), and a description for them.

Make sure you cite resources that you refer to. If you include examples or code snippets or demos written by you, you would like to highlight these.

N.B. Don't write a literature review. A literature review surveys what is in the literature – it is broad, but often does not include much technical details. A tutorial paper provides indepth technical explanation on a topic – it is detailed and more or less self-contained, but does not need to be broad.

Deliverable

The first deliverable is your proposed topic and an initial list of references that you plan to use.

The final deliverable, your tutorial paper, should be a single PDF file, possibly with supplementary files (e.g. your complete code).

There is no page limit on the tutorial paper, but you are encouraged to be concise. Your tutorial paper will be graded based on clarity, completeness, correctness, significance, and novelty.

- Clarity: no spelling, grammar, and punctuation mistakes; content is well-organized; notations and technical statements are clear.
- Completeness: the paper should provide a self-contained coverage on the topic.
- Correctness: the arguments and technical details should be sound and correct.
- Significance: justification for why the topic is significant.
- Novelty: creative ways to explain the topic; anything that you believe that you have done it in a different way. Highlight things that showcase your creativity in your tutorial paper.

On a blank page immediately after the title page, indicate whether your consent for your tutorial paper to be used as a teaching resource by including one of the statements below.

I give consent for this to be used as a teaching resource.
I DO NOT give consent for this to be used as a teaching resource.

Examples

Below are some excellent examples of tutorial papers written by professional machine learning researchers. While they may not cover topics that you want to write about, you may find it helpful to see what are the elements that make them good tutorial papers. Of course, these papers are usually long, and you are not expected to write such a long tutorial paper for this course.

- Graham Neubig. Neural Machine Translation and Sequence-to-sequence Models: A Tutorial. 2017. https://arxiv.org/pdf/1703.01619.pdf.
- Carl Doersch. Tutorial on Variational Autoencoders. https://arxiv.org/pdf/1606.05908.pdf
- Eric Brochu, Vlad M. Cora, Nando de Freitas. A Tutorial on Bayesian Optimization of Expensive Cost Functions, with Application to Active User Modeling and Hierarchical Reinforcement Learning. 2010. https://arxiv.org/pdf/1012.2599.pdf.
- Lawrence Rabiner. A tutorial on hidden Markov models and selected applications in speech recognition. 1989. https://web.ece.ucsb.edu/Faculty/Rabiner/ece259/Reprints/tutorial%20on%20hmm%20and%20applications.pdf.

There are a lot of tutorial blogs online, and some are very well-written, such as https://colah.github.io/posts/2015-08-Understanding-LSTMs/. However, in general, you need to be more discerning with the quality of blog posts.

You can also find two example tutorial papers on Blackboard. They are written by students taking the course last year.