Deep Learning

Spring 2019

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LIÈGE université

Logistics

This course is given by:

- Theory: Prof. Gilles Louppe (g.louppe@uliege.be)
- Projects and guidance:
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Feel free to contact any of us for help!




Lectures

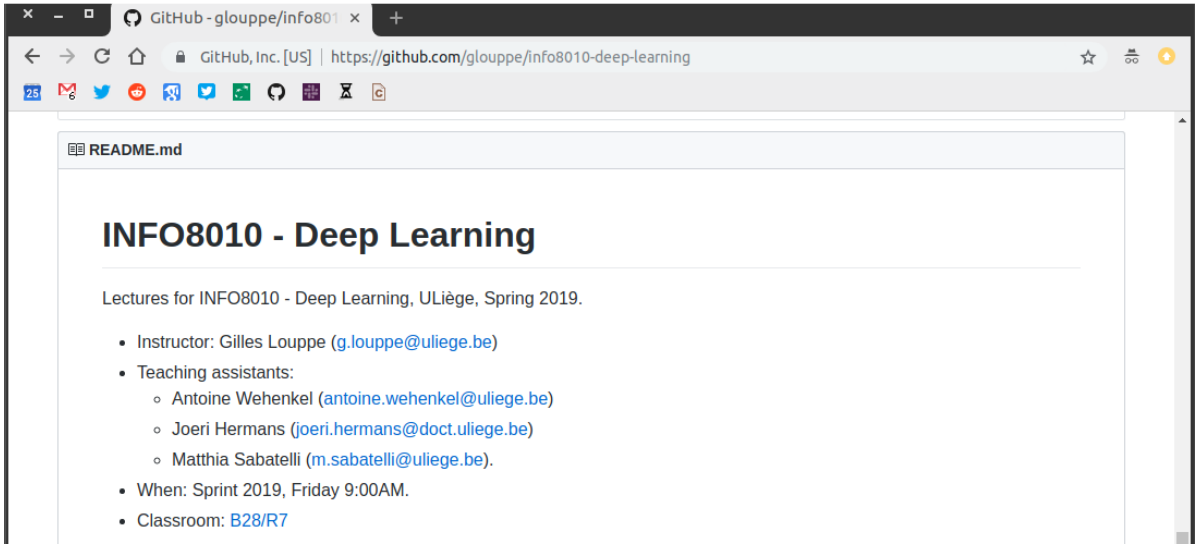
- Theoretical lectures
- Tutorials
- Q&A sessions

Materials

Slides are available at github.com/glouppe/info8010-deep-learning.

- In HTML and in PDFs.
- Posted online the day before the lesson (hopefully).

Some lessons are partially adapted from "EE-559 Deep Learning" by Francois Fleuret at EPFL.



Textbook

None!

Resources

- Awesome Deep Learning
- Awesome Deep Learning papers

AI at ULiège

This course is part of the many other courses available at ULiège and related to AI, including:

- INFO8006: Introduction to Artificial Intelligence
- ELEN0062: Introduction to Machine Learning
- INFO8004: Advanced Machine Learning
- INFO8010: Deep Learning ← you are there
- INFO8003: Optimal decision making for complex problems
- INFO0948: Introduction to Intelligent Robotics
- INFO0049: Knowledge representation
- ELEN0016: Computer vision
- DROI8031: Introduction to the law of robots

Outline

(Tentative and subject to change!)

- Lecture 1: Fundamentals of machine learning
- Lecture 2: Neural networks
- Lecture 3: Convolutional neural networks
- Lecture 4: Training neural networks
- Lecture 5: Recurrent neural networks
- Lecture 6: Differentiable inference and generative models (part 1)
- Lecture 7: Differentiable inference and generative models (part 2)
- Lecture 8: Bayesian deep learning
- Lecture 9: Theory of deep learning
- Lecture 10: Applications

Philosophy

Thorough and detailed

- Understand the foundations and the landscape of deep learning.
- Be able to write from scratch, debug and run (some) deep learning algorithms.

State-of-the-art

- Introduction to materials new from research ($\leq$ 5 years old).
- Understand some of the open questions and challenges in the field.

Practical

- Fun and challenging course project.

Projects

Reading assignment

Read, summarize and criticize a major scientific paper in deep learning.

Pick one of the following three papers:

- He, K., Zhang, X., Ren, S., & Sun, J. (2016). Deep residual learning for image recognition. arXiv:1512.03385.
- Andrychowicz, M., Denil, M., Gomez, S., Hoffman, M. W., Pfau, D., Schaul, T., ... & De Freitas, N. (2016). Learning to learn by gradient descent by gradient descent. arXiv:1606.04474.
- Zhang, C., Bengio, S., Hardt, M., Recht, B., & Vinyals, O. (2016). Understanding deep learning requires rethinking generalization. arXiv:1611.03530.

Deadline: April 5, 2019 at 23:59.

Project

Ambitious project of your choosing. Details to be announced soon.

Evaluation

- Exam (50%)
- Reading assignment (10%)
- Project (40%)

The reading assignment and the project are mandatory for presenting the exam.

Let's start!