

# Deep Learning

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# Logistics

This course is given by:

- Theory: Prof. Gilles Louppe ([g.louppe@uliege.be](mailto:g.louppe@uliege.be))
- Projects and guidance:
  - Joeri Hermans ([joeri.hermans@doct.uliege.be](mailto:joeri.hermans@doct.uliege.be))
  - Matthia Sabatelli ([m.sabatelli@uliege.be](mailto:m.sabatelli@uliege.be))
  - Antoine Wehenkel ([antoine.wehenkel@uliege.be](mailto:antoine.wehenkel@uliege.be))

Feel free to contact any of us for help!



# Lectures

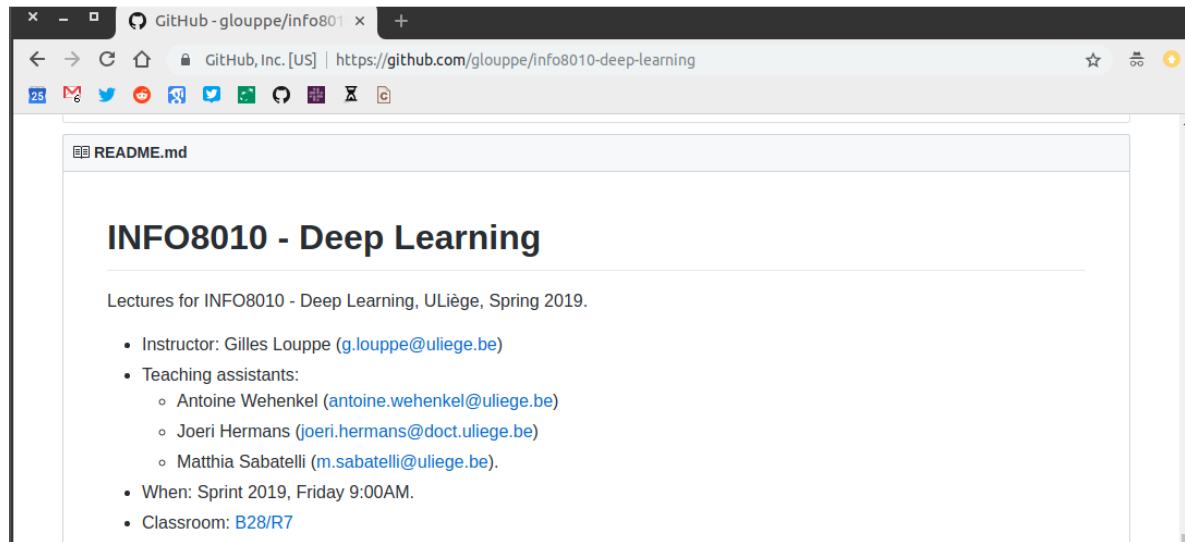
- Theoretical lectures
- Tutorials
- Q&A sessions

# Materials

Slides are available at [github.com/glouppe/info8010-deep-learning](https://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 (EPFL).



# Textbook

None!

# Resources

- [Awesome Deep Learning](#)
- [Awesome Deep Learning papers](#)

# Philosophy

## Thorough and detailed

- Understand 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.

# 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



# 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](#).

Further instructions will be announced soon.

## **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.

