Introduction to course formats and requirements

Elements of machine learning

Jens Petersen

About us

Lecturers

- Jens Petersen, Assistant Professor, IMAGE Section
- Marleen de Bruijne, Professor, Machine Learning Section
- Silas Ørting, Postdoc, IMAGE Section



Teaching Assistants

- Nanna Munk Berg
- Casper Lisager Frandsen
- Shakir Yousefi

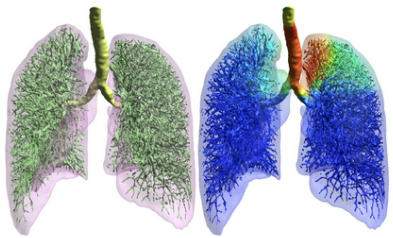
About me

Assistant Professor, IMAGE section at DIKU and Department of Oncology at Rigshospitalet

I also teach the Applied Programming course.

Research

- Medical image analysis
  - Segmentation
- (Interactive) Machine learning
- Applications
  - Radiation therapy of cancer
  - Chest imaging



About you

Please fill out the questionnaire at
`https://absalon.ku.dk/courses/56253/quizzes`

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Course is tailored to the Computer Science, data science specialization...

We will not teach Python unless you feel there is a need for it...

Some advise from us to you

- Follow the course website on Absalon regularly
- Start in amble time with the assignments! (you will need not only time to think but also time to compute)

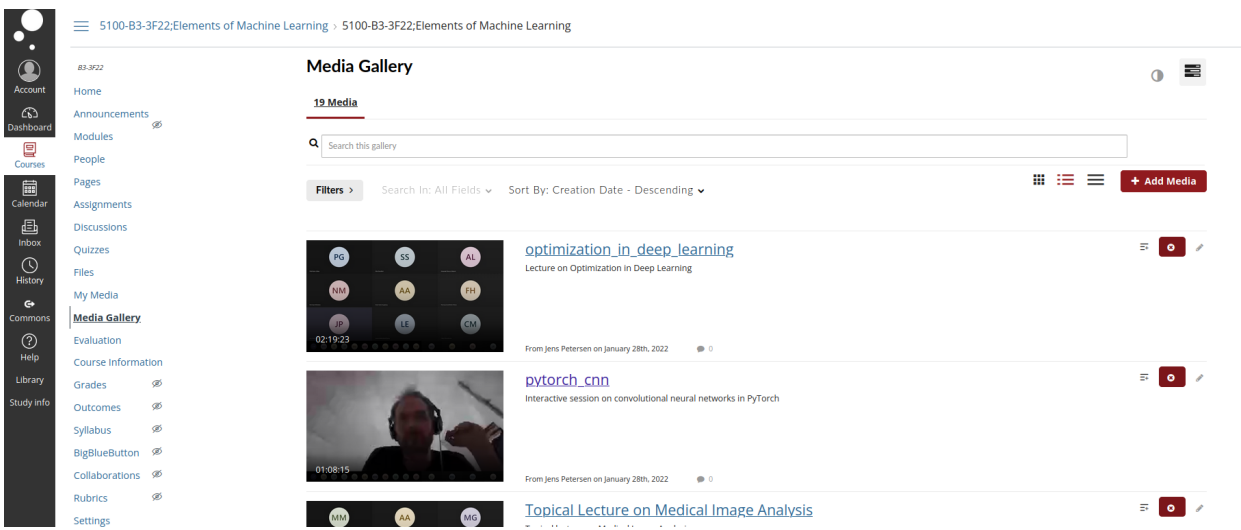
Format

Classic format of lectures and exercise classes

- Lectures Mondays and Fridays (10-12)
- Exercise classes Tuesdays (13-17)

Lectures

- We prefer interaction, so please raise your hand and comment or ask questions.
- We do not expect recording lectures will be possible, but last years lectures can be found in the Media Gallery.
- We may decide to experiment with flipped classroom in some weeks.



Exercise classes and online help

Absalon

- Use the Absalon course room discussion board throughout the weeks.
- We check and answer questions posted here outside exercise hours.

We are considering an online option in addition to the physical exercise class, likely using Discord

- Online meeting point during and outside exercise hours.
- TA will host meetings you can join during exercise hours to discuss answers to specific questions

Assignments

- We will have 4 assignments (with handins approximately biweekly)
- Every student must submit an individual report
  - Group discussions are allowed
- Final grade is based on an average of the points achieved on each assignment
  - Preliminary points will be given by TAs and final will be given by teachers at the end of the course.
  - So in principle you do not have to hand in every assignment (but it is a good idea to do so!)
- For the re-exam the grades of the handed in assignments count along with the result of the oral exam. You may resubmit assignments prior to the re-exam.

Assignments - what is expected?

We do not want to read your code!

- Please describe what you have implemented in words, illustrations and/or possibly pseudo-code to such a degree that we could potentially implement it ourself.
- We do, however, want your code attached to the handin to allow us to settle plagiarism issues.

Describe your results!

- Do not just display bare graphs, numbers, or equations!
  - Explain what to read from the graph, how you arrived at the solution, and components of equations.

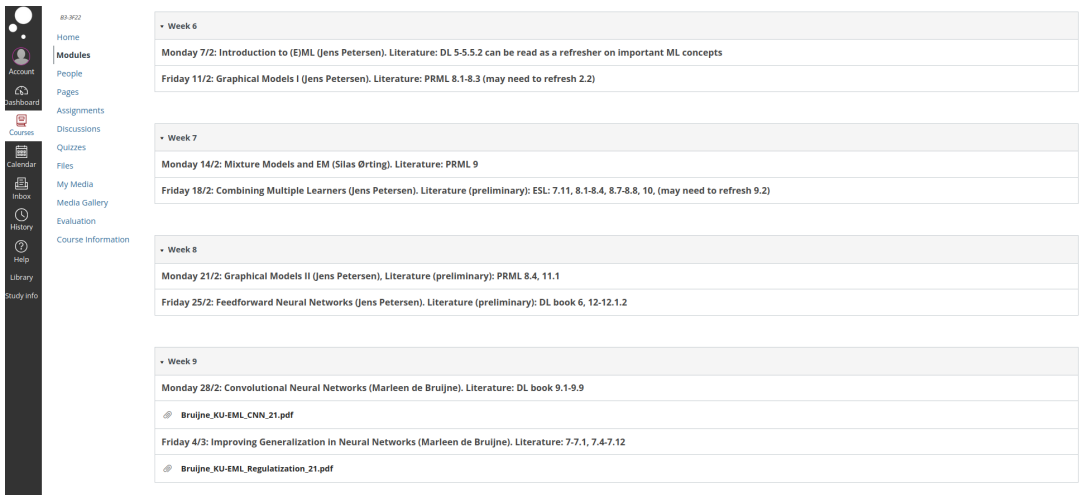
Please provide feedback

Third time the course is held

- Let us know early if something works/does not work.
- We will gather feedback both from TAs and you as the course runs and in the final weeks.

Schedule and content

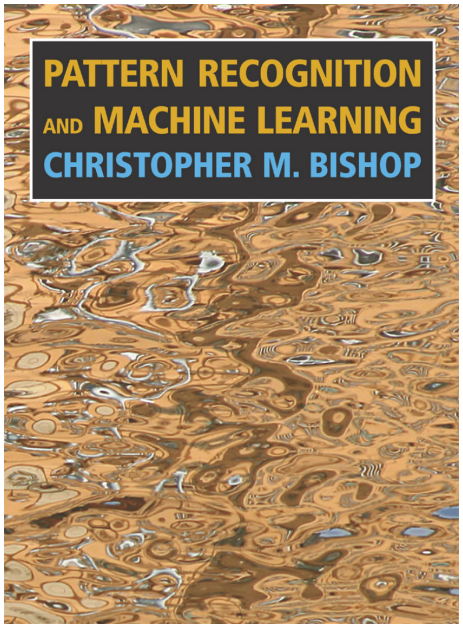
An updated schedule and a list of planned content can be found on the course Absalon page.



Link: `https://absalon.ku.dk/courses/56253/modules`

Choice of textbooks (and why?)

No single textbook covers all of our chosen topics



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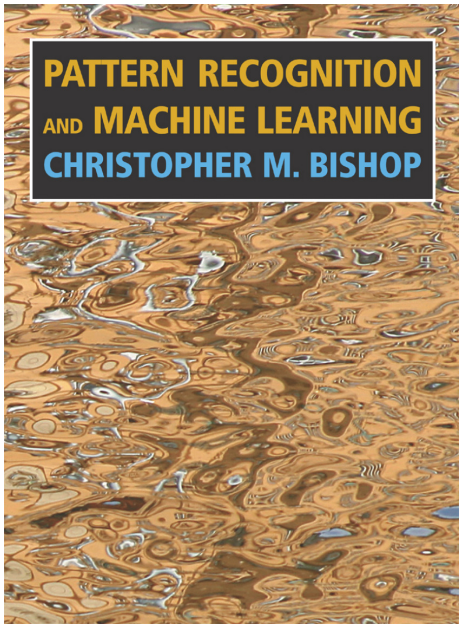

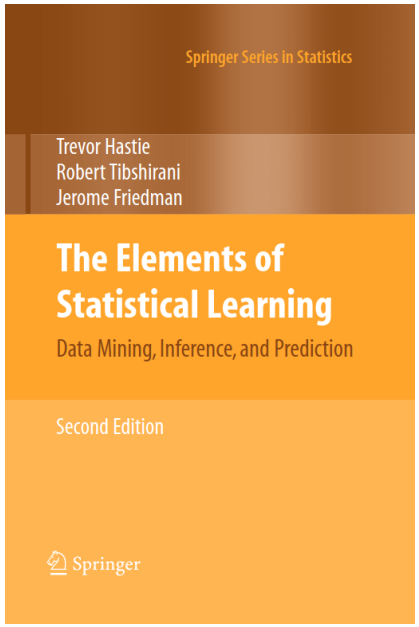

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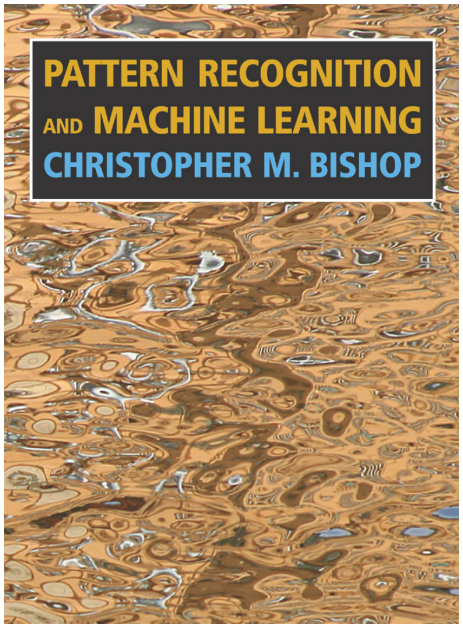

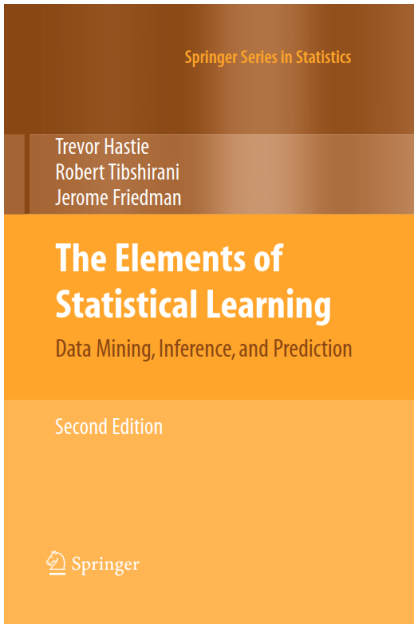

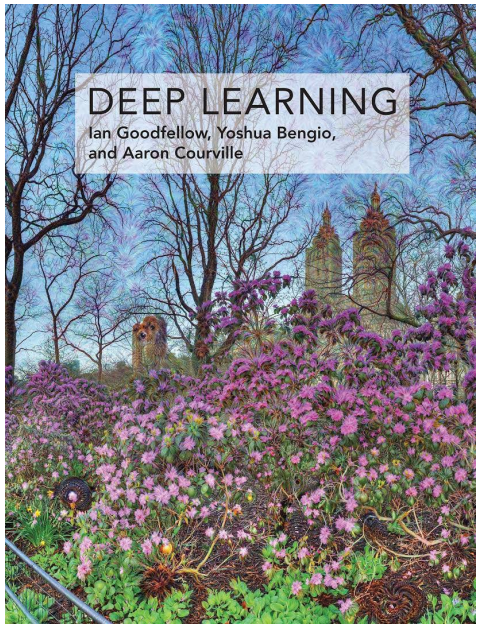

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- `https://web.stanford.edu/~hastie/ElemStatLearn/`
- `http://www.deeplearningbook.org/`

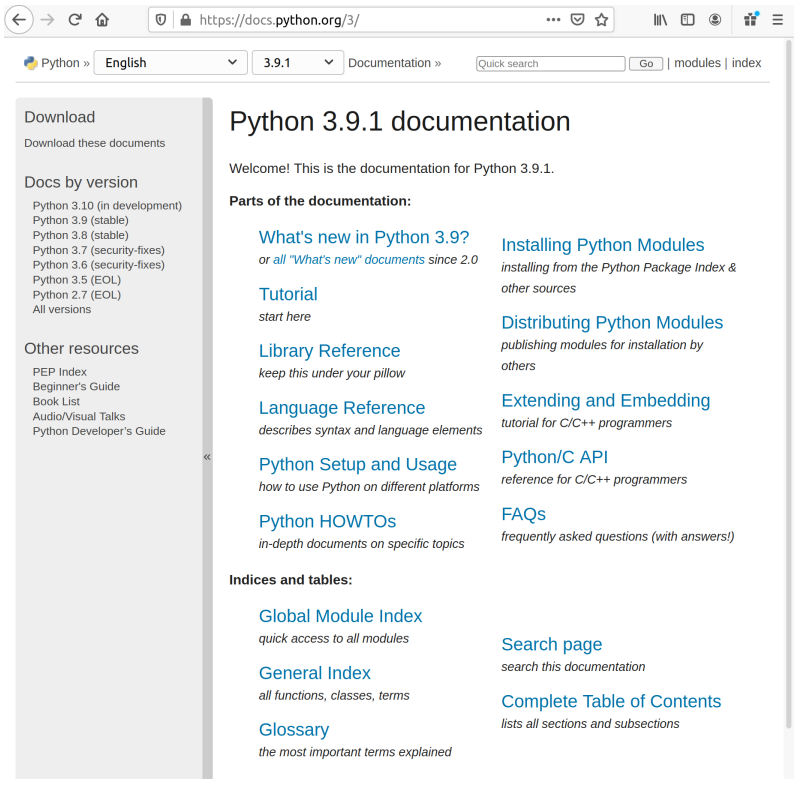
Why Python?

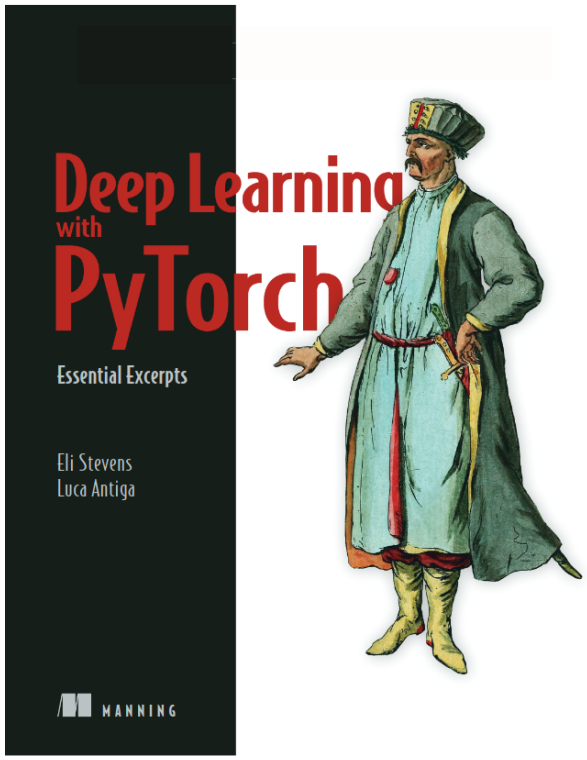
Has become the goto language for doing ML

- Keras, TensorFlow/PyTorch, Scikit-learn
- Scipy
- Pandas
- Numpy
- Matplotlib

Platform independent, big and growing community.

Python resources





Available freely at:

`https://docs.python.org/`

`https://pytorch.org/assets/deep-learning/Deep-Learning-with-PyTorch.pdf`

Scientific programming

Software and libraries you may need

- PyTorch, Scikit-learn - deep learning and machine learning
- Scipy - software for mathematics, science, and engineering
- Pandas - data manipulation, analysis and clearning toolkit
- Numpy - high performance tools for handling multidimensional arrays
- Matplotlib - plotting library
- Jupyter - Jupyter Notebooks will be used in teaching to demonstrate python code

Consider downloading a distribution of data science libraries like `https://www.anaconda.com/distribution/` to minimize library conflicts.

Some notes on the first assignment

Now available at
`https://absalon.ku.dk/courses/56253/assignments`

- The rest of today we will be used for introducing basic ML concepts
- We will not have time to cover all of the content relevant for the first exercise before tomorrows exercise class (8/2)
  - The material for Friday (11/2) and Monday (14/2) is the most relevant for exercise 1. So consider reading this to prepare for tomorrow.
- We are planning the remaining exercises based on content that will have been covered by the time they are given.

Questions?