TX00DH43-3001
Introduction to Deep Learning

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Draft schedule

15.1	Introduction to course. Course practicalities. Background for deep learning. Types of machine learning. Linear regression with minimal artificial neural network. Input normalization. Vectors, matrices, and tensors. Getting started with Python, Numpy, Tensorflow, and Keras.
22.1	Logistic regression. Activation functions. Fully connected (dense) networks with hidden layers. Cost function. Under- and overfitting. Using training / validation / test sets.
29.1	K-fold validation. Forward and backward propagation. On optimization algorithms. Model capacity. Evaluating model performance. Regularization. Dropout layers.
5.2	Image recognition. 2D convolution, pooling. Data augmentation. Transfer learning. Using pre-trained Keras models.
12.2	1x1 convolution. Bounding boxes and YOLO algorithm. Convolution network visualization.
26.2	Recurrent ANNs. Long Short-Term Memory and gated recurrent unit networks. Processing text. Word embeddings and word2vec.
5.3	Generative networks. Neural style transfer. Generative adversarial networks. Autoencoders.
12.3	Recap. Other topics. Conclusions.

Course practicalities

Weekly meeting 15.1 - 12.3 13-16. Another weekly time slot for questions etc TBD as needed.

7 **exams**: 22.1 - 12.3 at 13:00-13:20. Exam points 0-20 / exam. Material covered in exams: lectures + other assigned material. **Alternative** way: final exam at last session (12.3) covering the whole course material. Alternative way is **not recommended**, is an exception, and **must be applied for beforehand**. No resits will take place.

Weekly **exercise(s)**. Due date is next week Mon @13:00. Exercise points total 0-100.

Weekly **reflection** of 100-150 words on own learning. Due date is next week Mon @13:00. Reflection points 0/7/14 / reflection.

Course grade = (sum of 5 best weekly exams)*0.65 + (weekly exercise activity)*0.2 + (weekly reflection activity)*0.2. To pass, minimum of 50% of exam points and total points is needed.

On reflection assignments

Purpose of the reflection assignment is to enforce learning by coming back to the learning process of last week. Reflection could touch upon the following topics: what has been new or surprising, what has been hard or complicated, what are topics about which you would like to know more etc.

Reflection must be whole sentences and paragraphs, totalling 100-150 words. Reflection ***must be returned as plain text*** in the assignment (no attachments of any sort).

On exercises

Programming exercises must be returned as notebooks.

Please make sure to write in the notebook comments, explanations, observations the exercise text mentions as markdown cells (see http://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/Working%20With%20Markdown%20Cells.html for markdown formatting capabilities). **Write your name and and student id in the first cell of the notebook.**

Materials

Slides, example notebooks, web pages, and articles referred to in the slides.

“Deep Learning with Python” by Francois Chollet is followed quite closely in the course. Not everything in the book will be covered, and some topics are not covered in the book. First 3 chapters of the book are freely available, as well as jupyter notebooks for all the book examples.

Keras: http://keras.io

Extra material: “Deep Learning” by Goodfellow, Bengio, and Courville. Available in html format at http://www.deeplearningbook.org/.