

Syllabus

1. Course Description

- a. Title of a Course: «Introduction to deep learning»
- b. Pre-requisites: basic courses in Calculus, Linear Algebra, Theory of Probability and Mathematical Statistics, Machine Learning 1
- c. Course Type (compulsory, elective, optional): compulsory
- d. Abstract:

The goal of this course is to give learners basic understanding of modern neural networks and their applications in computer vision and natural language understanding. The course starts with a recap of linear models and discussion of stochastic optimization methods that are crucial for training deep neural networks. Learners will study all popular building blocks of neural networks including fully connected layers, convolutional and recurrent layers.

Learners will use these building blocks to define complex modern architectures in TensorFlow and Keras frameworks. In the course project learner will implement deep neural network for the task of image captioning which solves the problem of giving a text description for an input image.

The course is based on MOOC “Introduction to deep learning” <https://ru.coursera.org/learn/intro-to-deep-learning> (Platform - Coursera.org, Developer – HSE)

2. Learning Objectives: To familiarize students with the basic concepts, models and algorithms of neural networks.

3. Learning Outcomes:

- Know principles of neural network models;
- Have skills in training and applying basic neural network models

4. Course Plan:

№	Topic	Total	Course format (in hours)		self-study
			lecture	seminar	
1	Introduction to optimization. (1-st week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)	10	0	2	8
2	Introduction to neural networks	10	0	0	10

	(2nd week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)				
3	Deep Learning for images (3rd week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)	10	0	0	10
4	Unsupervised representation learning (4th week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)	10	0	0	10
5	Deep learning for sequences (5th week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)	10	0	0	10
6	First programming project (6 week of MOOC course “Introduction to deep learning” https://www.coursera.org/learn/intro-to-deep-learning)	10	0	2	8
7	Second programming project	16	0	2	14
	Total	76	0	6	70

5. Reading List

Ian Goodfellow, Yoshua Bengio, Aaron Courville “Deep learning”, MIT Press, 2016
(<http://www.deeplearningbook.org/>)

6. Grading System

Cumulative grade = 80% online course + 20% additional project

Final grade = 75% cumulative grade + 25% final exam

Rounding of the cumulative grade and final grade must be performed according to the rules of arithmetic. There is no possibility to get an extra point on the resit to compensate the low cumulative grade.

7. Guidelines for Knowledge Assessment

Students are encouraged to work together to help each other in understanding the course material and completing the homework problems. However, everybody has to write up his/her own solutions. Late homework will not be accepted. The common mistakes made in the homework will be discussed during the seminars.

After completion of online course, students will be presented with additional programming assignment, which is based on material, mostly covered by online course, but which required additional reading. Reading materials will be given.

Exam covers material, which has been presented in online course.

8. Methods of Instruction

The discipline is delivered through online course with additional seminars, and a set of practical tasks.

9. Special Equipment and Software Support (if required): Computer classes