How to prepare for the exam Introduction to Deep Learning (2021)

Wojtek Kowalczyk
w.j.kowalczyk@liacs.leidenuniv.nl

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The exam will consist of several questions and small problems that will test your knowledge and understanding of the key concepts that have been covered during the course and the practical assignments. It will have a form of a multiple-choice quiz, where, for every question or problem you will have to find the correct answer. Additionally, in some cases, you will be asked to write down a formula or provide your own justification of the selected answer. In principle, exam questions will be related only the the material that has been covered during our lectures and practicals.

It will be a "closed book exam" so you will not be allowed to use any notes, textbooks, smartphones, calculators, etc. The best way of preparing for the exam is studying the relevant fragments of the textbook, slides and recorded lecturs. Each chapter of your textbook ends up with example problems and/or questions. Study these problems, trying to find answers and verify your ideas with the textbook answers (provided in Apendicies). Additionally, you should be prepared to questions related to the practical assignments (A0, A1, A2, and A3).

To get an idea of the format of the exam study the exams (with solutions) from 2018 and 2019 in the folder "Old exams". Note that some topics, e.g., Bayes Rule, Restricted Boltzman Machines, Contrastive Divergence algorithm, etc., have not been covered in this year edition of the course, therefore you don't have to study these topics. Moreover, there will be no questions that would require knowledge of Keras and TensorFlow - you are supposed to master these while working on practical assignments.

The material that you should study includes:

1. **Introduction:**
   Slides: first applications (NetTalk, ALVINN), Overfitting and Regularization.

2. **Single Layer Perceptron:**
   Slides: The perceptron learning algorithm; Linear Separability; Cover's Theorem; Gradient Descent Algorithm.

3. **Multilayer perceptron and Backpropagation:**
   Slides, Chapter 10

4. **Training Deep Neural Networks:**
   Slides, Chapter 11. Vanishing gradients problem; various activation functions; weight initialization heuristics, various loss functions; momentum; Nesterov momentum; Batch Normalization algorithm (the key idea's behind it, no formulas)

5. **Convolutional Networks:**
   Slides Lectures 5 and 7, 8; Chapter 14. Terminology, key idea's behind LeNet, AlexNet, ResNet architectures; Transfer learning; Classification and Localization; Object Detection; Semantic Segmentation; Fully Convolutional Networks

6. **Recurrent Networks**
   Slides Lecture 8; Chapter 15. Backpropagation Through Time; LSTM networks; key problems with training recurrent networks; example applications.

7. **Autoencoders and GANs:**
   Slides Lectures 9; Chapter 17. Key ideas behind these networks; applications;

8. **Reinforcement Learning:**
   Slides Lecture 10; Chapter 18. Key concepts: environment, actions, rewards; Q-Learning; details of the Atari DQN algorithm. Only things that have been covered during the last lecture!