Machine Learning: from Theory to Practice
Exam - 2h

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1. Explain why one needs to define a performance measure to talk of learning.
2. How is the k-Nearest-Neighbors classification method related to conditional density estimation?
3. Why is there a need to make a competition between different learning algorithm?
4. What is a V-fold cross validation scheme and how to use it?
5. How is justified the choice of $V = 5$ or $V = 10$?
6. Explain the underlying principle of the penalization schemes.
7. What is the principle of the Principal Component Analysis?
8. What is its relation with the SVD?
9. Describe the two kind of ensemble methods proposed to stabilize decision trees?
10. What is the gradient boosting algorithm?
11. What is the principle of the graph spectral clustering?
12. Provide a loss function with appropriate penalties that allows to address semi-supervised regression ?
13. Explain how matrix factorization is a way to solve collaborative filtering in recommendation systems ?
14. Explain what is a representer theorem and how it can be useful in the framework of Reproducing Kernel Hilbert Spaces ?
15. What is the kernel trick ?
16. What are the parameters of a Neural Network?
17. How the Convolution Neural Networks used for instance in image processing reduce the number of those parameters?
18. What is the principle of the back-prop algorithm?
19. How to construct a bag of words representation of a text?
20. How to use this representation to classify text in an unsupervised way?