Deep Learning: Exercise Sheet 10 (SoSe2018)

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Question 18: Autoencoders Basics (10P)

Answer the following questions with a maximum of two phrases:

a) Is an Autoencoder for supervised learning or for unsupervised learning? Explain briefly.
b) What is the difference between an Undercomplete and Overcomplete Autoencoder?
c) Why do we need sparse autoencoder? Explain briefly.
d) What is the objective of Denoising Autoencoders and Contractive Autoencoders?
e) What is the similarity between autoencoder and PCA method? How are the two different? What constrain would you apply to an autoencoder to make it similar to a PCA method?RNNs.

Question 19: Sparse Autoencoders (10 Points)

For some $x \in \mathbb{R}^3$, we want to learn an autoencoder that encodes x as a two-dimensional vector $h \in \mathbb{R}^2$ using some parameters $W \in \mathbb{R}^{2\times 3}$ and nonlinearity g

$$h = g(Wx)$$

and a decoder that from h is supposed to predict the original x using parameters $V \in \mathbb{R}^{3\times 2}$:

$$\tilde{x} = Vh$$

Additionally, we want to regularize the hidden encoding h, so we overall want to minimize the loss:

$$\mathcal{L}(x, W, V) = \sum_{i=1}^{3}(\tilde{x}_i - x_i)^2 + \lambda \sum_{i=1}^{2}|h_i| \qquad \lambda > 0$$

Compute the gradients of the loss function for all model parameters!

How to submit?

DO NOT FORGET TO WRITE YOUR NAME ON YOUR SHEET! Nameless files will NOT be graded! The new submission method is via LearnWeb. https://www.uni-hildesheim.de/learnweb2018/course/search.php?search=3108

Warning!

If we detect **Plagiarism** on your solution, you will receive no points for it. If a second plagiarism attempt is detected, you might fail the class or be expelled from your program. You are allowed to discuss solutions, but if you work on a group, you must indicate on your sheet with whom are you working with. Group submissions earn 0 points, but counts as participation.