

In this exercise we consider **Chapter 3 & Chapter 14** of the book ‘Deep Learning’ (Probability Theory and Autoencoders).

1. Probability

- (a) Bertrand’s Box Paradox (3)
- (b) Entropy and Kullback Leibler Divergence. (4)
- (c) Distributions and CLT. (4)
- (d) For course improvements, we would like your **feedback about *this* question**. At least tell us how much time (**hours**) you did invest, if you had major problems and if you think it’s useful.

Points for Question 1: 11

2. Autoencoder

- (a) Implement VAE._init_. (1)
- (b) Implement VAE.encode. (1)
- (c) Implement VAE.reparameterize. (2)
- (d) Implement VAE.decode. (2)
- (e) Implement the loss function. (2)
- (f) Implement sampling from the learned representation. (1)
- (g) Complete the missing parts of the plotting function (sample_on_grid). (1)
- (h) Experiment with weighting the KL divergence and analyze the results. (4)
- (i) For course improvements, we would like your **feedback about *this* question**. At least tell us how much time (**hours**) you did invest, if you had major problems and if you think it’s useful.

Points for Question 2: 14

You can achieve a total of **25 points** for this exercise. Additionally you can achieve **1 bonus point** for answering the feedback questions.

Please send the **solution *notebook* of your group of three** via ILIAS until **17.12.2018 (two weeks) 12 pm (noon)**.

Note: Jupyter notebooks will be executed **from top to bottom**. To avoid point deduction check your notebook by the following steps: 1. Use the python 3 kernel (Kernel > Change kernel > Python 3), 2. Run the full notebook (Kernel > Restart & Run All), 3. Save (File > Save and Checkpoint).