



Machine Learning (SS 23)

Assignment 08: Boosting and Gradient Descent

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This assignment sheet consists of 3 pages with 2 Programming tasks:

Submit your solution in ILIAS. Make sure to list full names of all participants, matriculation number, study program and B.Sc. or M.Sc on the first page. Optionally, you can *additionally* upload source files (e.g. PPTX files). If you have any questions, feel free to ask them in the exercise forum in ILIAS.

Submission is open until Monday, 26th June 2023, 12:00 noon.



Task 1 (Programming): Boosting

Please download the Jupyter notebook `08_ada_boost.ipynb` and the dataset `df_arabica_clean.csv` provided on ILIAS. Follow the instructions in the Jupyter notebook.



Task 2 (Programming): Gradient Descent

Given a dataset of the form $D = \{x_i, y_i\}_{i=1}^N$ with N training samples, implement and train linear regression $\hat{f}(x) = w^T x + b$ with the following objective functions using gradient descent:

$$MSE = \frac{1}{N} \sum_{i=1}^N (\hat{f}(x_i) - y_i)^2$$

$$Corr = -\frac{1}{N} \sum_{i=1}^N e^{-\|\hat{f}(x_i) - y_i\|^2}$$

Corr is the correntropy objective function that is defined above. This loss function is a minor extension of the MSE loss function which is robust to various types of noise such as the impulsive noise. Impulsive noise is a noise with a large value n which is added to the output of one sample i.e., for the i th sample, the output changed to $y_i = y_i + n$ before training. Note that the correntropy loss function is used for regression task as an alternative of MSE loss function. Plot and compare the prediction of linear regression trained via MSE loss with the linear regression trained with Correntropy loss. Explain and justify your observation about difference between MSE and Correntropy. Please download the Jupyter notebook `ImplementationOfGradientDescent.ipynb`. Follow the instructions in the Jupyter notebook.