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PPGEE2249 - Aprendizado de Máquina - Assignment 3
Prof. Daniel Guerreiro e Silva

Instructions

- You may use a text editor (Word, LibreOffice, LaTeX, etc.) to write your answers.
- The use of machine learning libraries (e.g., scikit-learn, Keras, PyTorch, MATLAB/Octave toolboxes) is allowed.
- AI-based tools (Gemini, ChatGPT, etc.) may be used for assistance. However, you will be considered the sole author of the entire document (both text and code) and will assume full responsibility for any cheating, plagiarism, or meaningless content.
- Submit all your answers in a single PDF file and your code in a separate ZIP file.

Questions

1) Train and evaluate a Feedforward Neural Network for a **multiclass classification task**. Split your data into a training set, a validation set (used to define the stopping criterion — e.g., number of epochs), and a test set for the final evaluation of the model. The output layer should use one Softmax neuron per class, and the training objective should be the minimization of cross-entropy loss. Describe your dataset, the network architecture (hidden units, layer dimensions, and number of layers), and discuss the overall performance (data splitting strategy, classification accuracy, and confusion matrix).
2) Train and evaluate a Decision Tree on **the same classification problem** chosen in Question 1. Present the resulting tree (depth, rule-based description) and compare its performance with the results obtained in Question 1.
3) Perform an experiment testing different kernel functions and hyperparameter configurations to obtain the best SVM classifier for a **binary classification task,** using a dataset of your choice. Don’t forget to discuss the results.