TS Lab Classification

In this laboratory work, you will classify heart sound recordings.

General Rules

- You can work in small groups: 1-2 people
- Deadline: 18.12.24 23:59
- To estimate performance of the algorithm you should report the following metrics:
  - Accuracy, Precision, Recall
  - AUC-ROC, F1-Score
- You should submit a Jupyter notebook with brief descriptions of what happens in each cell.

In this task your goal is to develop an interpretable model/algorithm for classifying heart sound recordings of abnormal and normal hearts. It means that you need to apply some clever feature engineering techniques.

[HINT: Theoretically, recording a normal heart rate should behave like a normal time series with fairly simple deterministic dynamics. However, in an abnormal situation, the recording of the heartbeat may shift to a chaotic area.]

You are allowed to use very simple ML models such as logistic regression, SVM, decision tree. The optimal result would be to find a feature space in which the classes are linearly separable.

Grading

1. (0-8 points) Implement algorithms for computing Laupunov exponents, Entropy-Complexity plane, Kolmogorov-Sinai entropy, fractal dimension, Hurst exponent. Use obtained values as features. Try different combinations. Report the results. You may also consider using some preprocessing (frequency filtration).
2. (0-2 points) Train a CNN on spectrograms of sound recordings. Compare the results.