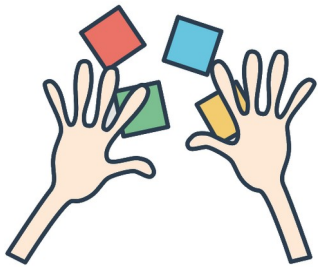


Hands-on: #1

1. Understanding and Execution of AIS and DNN Models for Anomaly Detection

You will work with three different approaches:

- Clonal Selection Algorithm (CSA) with a time window
- Negative Selection Algorithm (NSA) with a time window
- Deep Neural Network (DNN) (and with Autoencoder in Keras)

a) Análisis del Código

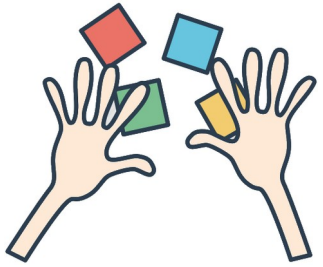
- Read and analyze the implementation of the mentioned algorithms for anomaly detection.
- Identify the key components of each method, including:
  - How immune system-inspired algorithms detect anomalies.
  - How the autoencoder is trained and used for anomaly detection.

b) Experiment with Simulated Data

- Use a synthetic streaming time-series dataset to test the algorithms.
- Implement the methods and observe their behavior on this dataset.

c) Comparative Analysis

- Compare the performance of CSA, NSA, and the DNN Autoencoder based on key metrics (e.g., precision, recall, F1-score, and anomaly detection rate).
- Discuss the strengths and weaknesses of each method.



Hands-on: #2

1. Experimentation with a Real-World Dataset

- Now, you will apply the algorithms to a real dataset for anomaly detection in streaming data.

  - Dataset: Numenta Anomaly Benchmark (NAB)
    - NAB is a widely used dataset for anomaly detection in time-series data.
    - You can find it on Kaggle: Numenta Anomaly Benchmark Dataset https://www.kaggle.com/datasets/boltzmannbrain/nab

Instructions

a) Model Evaluation on the NAB Dataset
- Train and evaluate CSA, NSA, and the DNN Autoencoder on NAB data.
- Tune hyperparameters as needed to improve performance.

b) Analysis and Discussion
- Compare the effectiveness of each method.
- How does AIS-based anomaly detection differ from autoencoder-based detection?
- Discuss any observed limitations, scalability issues, or advantages of each method.
- Consider aspects such as time complexity, false positives, and generalization ability