

Zamanya: a Framework for Time-Series Abstractions for Healthcare Analytics – Segmentation, Clustering and Pattern Analysis for Sleep Data –

Project Description: Temporal abstraction is a well-known data analysis technique that is frequently applied in the health domain to analyze complex multivariate clinical histories, i.e. the series of relevant clinical events occurring to a patient. A clinical history is in general made up of a set of temporal sequences related to some information, e.g., a sleep signal. Since the evaluation of the status of a patient is frequently based on how his/her clinical variables evolve over time, the availability of systems able to automatically detect temporal patterns from data could support physicians in the difficult task of following a large number of patients.

Temporal patterns detection can be particularly useful for a variety of medical analyses, such as data exploration, temporal reasoning, anomaly detection, and prediction, e.g., sleep quality. It can be exploited in decision support systems to perform automatic detection of qualitative patterns in the data.

We propose Zamanya, which is a framework and a stand-alone library of algorithms for explanatory time-series prediction. It provides a collection of algorithms to perform temporal abstractions and preprocessing of time series health data, a framework for defining and executing data analysis workflows based on these algorithms, and a GUI for workflow prototyping and testing.

Features of Zamanya.

1. Detection of sleep/awake segments;
2. Prediction of sleep quality;
3. Segmentation and clustering of actigraphy data;
4. Explanatory model (XAI);
5. Recommendation using Reinforcement Learning.

Disclaimer and Learning Opportunities: The interns will enhance their programming skills in Python and acquire new knowledge in

- 1) Designing the Zamanya framework using the concept of temporal abstractions;
- 2) Integration of existing code into the Zamanya framework;
- 3) Experimentation with existing health data (sleepdata.org);
- 4) Development of GUI for workflow prototyping and testing.

In this internship, each student will be mentored and assigned to –only– one of the above objectives.

Duties/Activities: The intern will run and test different instances of the machine learning code on real data. The code in python will be provided.

Required Skills: Python

Preferred Intern Academic Level: undergrad / B.Sc.

Expected Team Size: 4 interns

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