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A new Neural Network architecture for Time Series Classification

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Time Series Classification (TSC) is an important and challenging problem for many subject-matter domains and applications. It consists in assigning a class to a specific time series, recorded from sensors or live observations over time.
TSC finds application in different fields, such as finance, medicine, robotics and physics, and it can be used mainly for: Failure prediction, Anomaly detection, Pattern recognition and Alert generation.
There are many algorithms that are designed to carry out time series classification. Depending on the data, one type might produce higher classification accuracies than the other types. In the last decade, with the advent of Machine Learning and AI, a lot of algorithms have been developed using, for example, the Neural Networks, to perform this task.
Here we present a new Neural Networks architecture, called Convolutional Echo State Network (CESN), for the detection of patterns and for the classification of univariate and multivariate time series. This architecture arises from the union of the Convolutional Neural Networks (CNNs), typically used for pattern recognition in images and videos, and the Echo State Networks (ESNs), used mainly for forecasting time series from their past history.
CESN results being suitable for the TSC tasks, both for univariate and multivariate TS, showing in parallel a good accuracy and a good sensitivity with datasets previously tested with other existing algorithms. We applied this technique to a simulated data set based on accelerometers and gyroscopes to detect falling condition.

Collaboration

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