Anomaly Detection to Improve Security of Big Data Analytics

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Motivation

Big data analytics largely rely on data. Because of their central role, it is fundamental to ensure the security and correctness of data used in these applications. Anomaly detection could help to increase the security of big data analytics applications.

Goal

Applying anomaly detection requires a designer to select a technique, implement it, and train it for their use-case. In this work we explore the possibility of providing a library of anomaly detection techniques that are universally applicable.

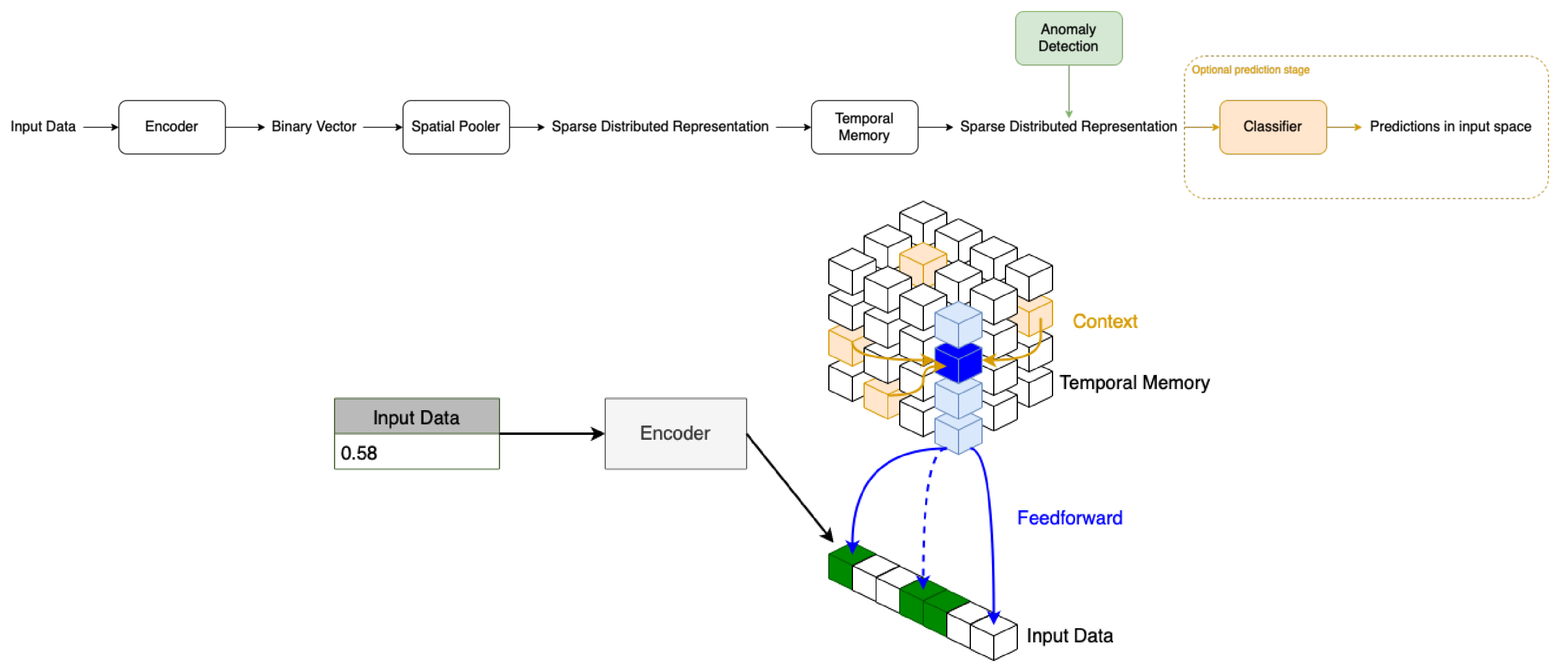
Improved Security

In addition to cryptographic primitives, anomaly detection can play a pivotal role in security. In a nutshell, anomaly detection learns the normal patterns of data and detects data points which fall outside of the norm. When used for security purposes, anomaly detection allows to identify anomalies in data themselves, possibly introduced by malicious actors which exploit legitimate access to the system to perform adversarial machine learning.

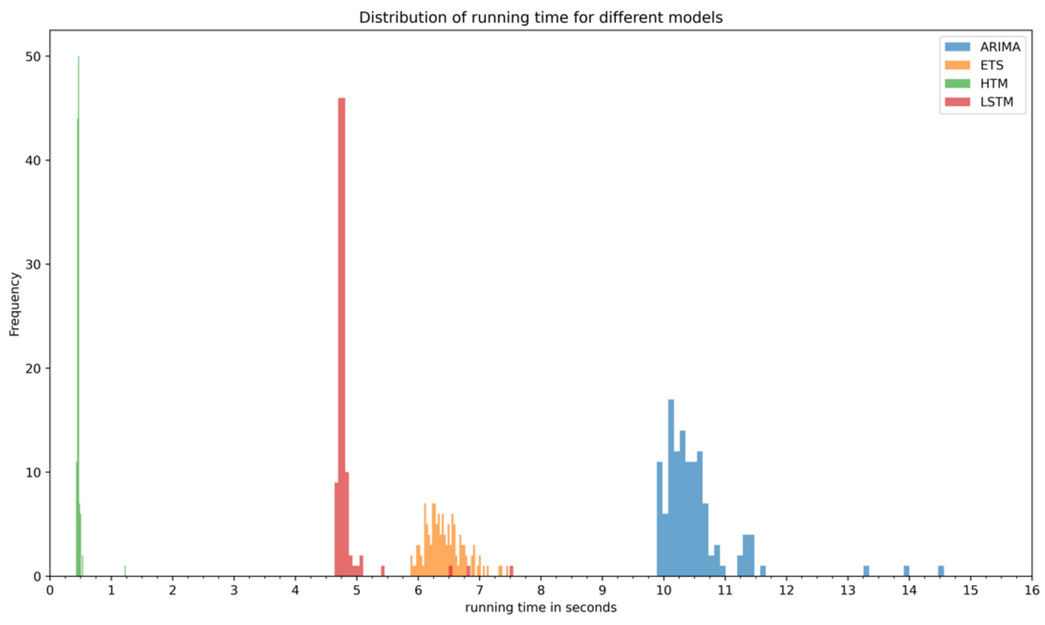
Benefits of HTM

Hierarchical Temporal Memory is lightweight, allowing it to be deployed on both low-end and high-end computational devices. It performs continuous online, unsupervised learning which makes it suitable for a large variety of use-cases. It is insensitive in its' hyperparameters. Lastly, the encoders used by HTM make it a highly versatile technique.

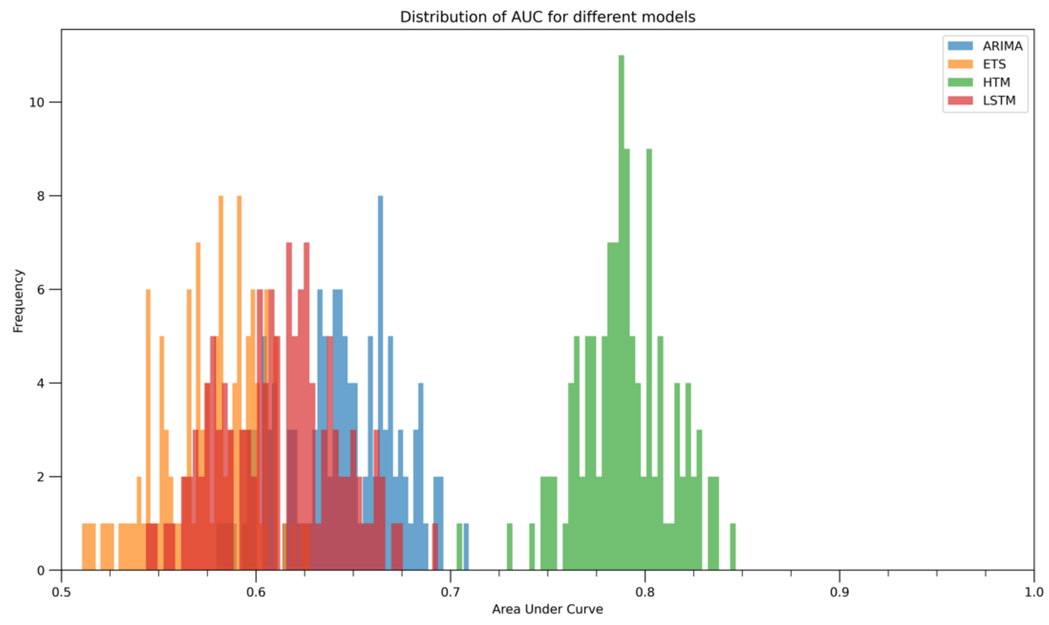
Hierarchical Temporal Memory



Running Time



Anomaly Detection



Conclusions

Anomaly detection is an interesting tool to enhance security in big data analytics. We focused on HTM as a universally-applicable technique for anomaly detection because the encoders allow it to handle a wide variety of input data similarly. The preliminary results show excellent performance of this technique compared to other popular anomaly detection methods.

Short Paper

Contact

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