Detecting Anomalies over Message Streams in Railway Communication Systems

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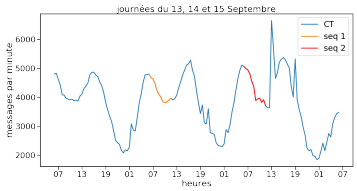
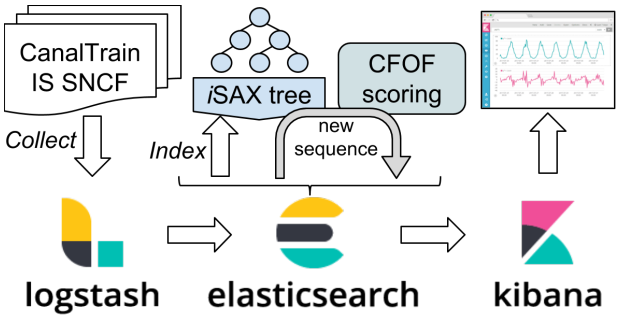
Lucas Foulon[1,3], Serge Fenet[1], Christophe Rigotti[2], Denis Jouvin[3]

[1]Université Claude Bernard Lyon 1, CNRS, LIRIS, UMR5205
[2]Université Lyon, INSA Lyon, CNRS, INRIA, LIRIS, UMR5205
[3]Production Ferroviaire, SNCF Mobilité, DSI Voyageurs



GOALS

- Monitor on real-time the proper functionning of the information system
- Support high volume of streaming data
- Warn when an anomaly occurs



OUR DATA

- Traces containing information about messages flowing in the information system: number of messages, latency between differents checkpoints, …
- Built by analyzing the content of the data stream: Sent/ Received timestamp, type of device/service, ...
- Interfaced with the central platform of the SNCF IS (CanalTrain) through ELK open source products

METHOD

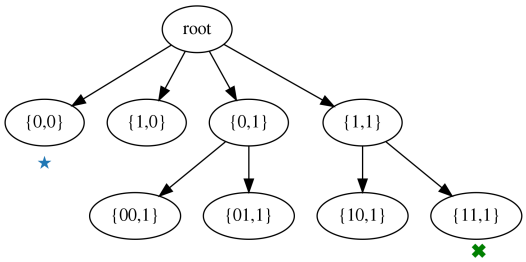
Use of CFOF anomaly measure [Angiulli, ECML PKDD 2017]

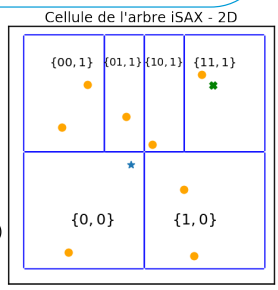
- Unsupervised
- Based on the stucture of the local neighborhood
- Adapted to high dimension data
- But not adapted to data streams,

Use of the iSAX indexation tree [Shieh & Keogh, DAMI 2009]

- Based on a modification of the SAX discretization
- Suited for times series indexation and similarity search
- Efficient access using distance boundings
- Support Dynamic Time Warping, weighting, and very high volumes (billion time series)

Proposition : *exploit the properties of the iSAX tree to accelerate the computing of the CFOF score in order to apply it to voluminous data streams*





RESULTS

- Reduced complexity allowing the efficient use of the CFOF score on high volume data streams
- High quality of the estimated score
- Real time detection of IS anomalies
- One parameter controlling the detection
- Incremental update of the tree

IN PROGRESS

- From tree to forest to reduce dimensions and accelerate the computing
- Multi-scale and multi-indicators anomaly detection
- Testing the robustness to regime changes

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