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DETECTING ANOMALIES OVER MESSAGE STREAMS IN RAILWAY COMMUNICATION SYSTEMS

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GOALS

• Monitor on real-time the proper functioning 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 different 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 structure 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 time 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