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Graph Anomaly Detection with GNNs: A Case Study on Predictive Maintenance for ENI's Industrial Machinery

In mission-critical industries, continuous operation exposes equipment to wear that can escalate into costly failures and downtimes. Early anomaly detection is, therefore, essential to maintaining seamless operations. Graph Neural Networks (GNNs) are emerging as a powerful tool for predictive maintenance, offering unparalleled understanding of data from complex interconnected systems of components found in industrial sectors. This talk presents a case study focused on ENI S.p.A.'s rotating machinery, such as high-performance gas compressors and turbines.

Our approach combines Generative Adversarial Networks, a reconstruction-based framework, and GNNs for effective, interpretable anomaly detection. By representing multivariate time series data as graphs, we employ an adversarially regularized graph auto-encoder to capture normal operating conditions. This design enhances interpretability by allowing users to visualize network connections and pinpoint anomalous nodes, leading to actionable insights and improved maintenance strategies.

Giorno preferito

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