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Analysis and Improvement of Generalisability of Anomaly Detection Methods

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Machine Learning (ML) has gained significant prominence in the field of engineering due to its adaptability and versatility. An example of its practical application is in anomaly detection, which serves the fundamental purpose of providing a binary response to the question, "Has an issue arisen?". Most machine learning and anomaly detection projects strive to provide generalisable solutions that are robust to changes within systems. This is of particular importance when components that are subject to anomalies are upgraded; the behaviour and values in the system remain unchanged, but the data resolution may be higher, and anomalies may manifest themselves in slightly different ways. An ideal ML solution would be able to detect anomalies as accurately in this new system as in the old one with minimal intervention or retraining. However, cases like the one described do not happen frequently and therefore it is difficult to test generalisability of models. The methane moderator of Target Station 1 at ISIS originally had an anomaly detection model. Following an upgrade, this work will explore how well the original model generalizes for the system such that it can be easily adapted from the old version of the moderator to the newer one. The original model used a combination of a 1 dimensional convolutional neural network binary classifier and a hypothesis test. The outputs of those two models would be used in a weighted sum. We will also investigate other methods to improve the generalizability that will allow for more flexibility with minimal changes or training when adapting the model from an old training set to a newer one.

Primary Keyword

anomaly detection

Secondary Keyword

Tertiary Keyword

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