Alarm Floods Management by Extracting Structure Features

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Abstract. Alarm floods indicate specific abnormal episodes, each of which has uniquely causal mechanisms between sources of industrial alarms, ultimately leading to causally dependent alarms. In that regard, online alarm flood classification based on causality differences could provide support for alarm handling, root cause analysis, and predictive maintenance. In this paper, the structure feature of alarm floods is explored for alarm flood classification. The structure feature reflects causal dependencies among alarm variables in alarm flood, achieving desirable discriminate properties for classification due to its interpretable physical meaning. Technically, we develop a probabilistic function that characterizes the alarm data distribution and parametrizes causal dependency probabilities. Instead of solving the parameters by traditional optimization methods, a deep learning model is exploited to generate the parameters and thereby gains the ability to transform an alarm flood to structure features in representation space. Besides, a general classifier is established based on structure features, enabling the online application. Experimental results illustrate the interpretability of structure features and show their effectiveness for alarm floods classification.

Keywords: Alarm Floods Classification, Causal Analysis, Deep Learning