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# A Temperature Monitoring System with Neural Enhancement in Food Supply Chain Transportation

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## Abstract:

In this paper, we propose a novel but simple data analytics approach to detect abnormalities in the time series data from IoT sensors. The proposed approach reduces the chance of false-positive alerts being sent to the users. From a data analytics perspective, we consider the case where IoT sensors are installed to measure one or more parameters relevant for any application. In a majority of IoT applications, the sensor data is being used not only to sense a parameter, but also to generate automatic alerts if the parameter deviates significantly from preset thresholds. For example, the parameter could be temperature if we consider the application of maintaining food at optimal temperature. For such applications, we propose a threshold-based scoring mechanism to evaluate temperature conditions during food storage and transportation. The temperature ranges associated with suboptimal and detrimental cooling conditions form the basis of the score, not only facilitating effective data visualization but also identification of cooling irregularities. Additionally, we showcase the utility of this score in curating data for detecting anomalies and generating forecasts. Furthermore, we introduce a monitoring system based on a quality metric that builds upon an aggregated version of the score. This system is inherently interpretable, making it highly valuable from an operational standpoint. We emphasize its capability to significantly reduce the occurrence of false positive alerts of a system based on the initial score. We establish a link between the score and the quality metric with some basic neural network architectures. This enables us to optimize temperature thresholds, addressing uncertainties associated with arbitrary weight assignments and incorporating operator input. We believe this research offers a straightforward, robust and interpretable solution that holds industry relevance as being readily applicable.