A Decision Support System for Evaluating Smart Plug Forecasting Pipelines

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Abstract

This research aims to design a Decision Support System (DSS) to help users evaluate, assess, and compare Artificial Intelligence (AI)-based pipelines for electricity consumption forecasting within a building premises, utilizing time series data from smart plugs. The objective is to support energy data analysts in making informed decisions concerning the adoption of optimal forecasting solutions, particularly pertinent to challenges such as resource allocation in industrial settings, plug scheduling, and overall electrical building efficiency integration within AI systems. In this study, the conventional formulation of a DSS, which comprises an interface, data management subsystem, model management subsystem, and knowledge management subsystem, has been tailored for evaluating time series pipelines. Particular focus was on enhancing the knowledge management subsystem by leveraging domain-specific expertise, statistical metrics, and the system's ability to provide accurate and detailed insights. In addition, the created DSS not only uses classical accuracy evaluations but also inspects the complexity of the pipeline, the computational efficiency, the training time, and the adaptability rules to evaluate both the outcome and the usability of the pipeline on a potential AI system. Additionally, to enhance the quality of the outcomes of the assessment process, the designer's insights are collected through a short questionnaire. The user-system interaction has

been considered by incorporating a user-friendly interface. Once the DSS has analyzed the information, it produces a report with its findings and assessment. Presently, the envisaged DSS framework is undergoing its final implementation phase within a software demonstration, slated to be subjected to testing using real-life application scenarios pertinent to plug-level load forecasting. The dataset used is sourced from the University of California, San Diego, comprising readings obtained from over 150 smart plugs deployed across various office buildings spanning a duration exceeding one year post the COVID era. With the proposed framework, this research is believed to contribute to the field of energy management by providing a comprehensive DSS for industrial energy consumption forecasting and by supplying decision-makers with an evaluation tool which helps them select appropriate, easy-to-incorporate and ready-to-use pipelines in energy organizations to optimize energy usage.

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