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A Case Study on Machine Learning-Based Project Performance Forecasting for an Urban Road Reconstruction Project

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Abstract : In construction projects, predicting project performance metrics accurately is essential for effective management and successful delivery. However, conventional methods often depend on fixed baseline plans, disregarding the evolving nature of project progress and external influences. To address this issue, we introduce a distinct approach based on machine learning to forecast key performance indicators, such as cost variance and earned value, for each Work Breakdown Structure (WBS) category within an urban road reconstruction project. Our proposed model leverages time series forecasting techniques, namely Autoregressive Integrated Moving Average (ARIMA) and Long Short-Term Memory (LSTM) networks, to predict future performance by analyzing historical data and project progress. Additionally, the model incorporates external factors, including weather patterns and resource availability, as features to improve forecast accuracy. By harnessing the predictive capabilities of machine learning, our performance forecasting model enables project managers to proactively identify potential deviations from the baseline plan and take timely corrective measures. To validate the effectiveness of the proposed approach, we conduct a case study on an urban road reconstruction project, comparing the model's predictions with actual project performance data. The outcomes of this research contribute to the advancement of project management practices in the construction industry by providing a data-driven solution for enhancing project performance monitoring and control.

Keywords : project performance forecasting, machine learning, time series forecasting, cost variance, schedule variance, earned value management
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