

ABSTRACT

The prediction of cash flows poses a central challenge in lifetime work accounts (LAZ) due to the highly variable and complex payment patterns of customers. This study investigates how representations generated by TS2Vec, a self-supervised learning approach, can contribute to cash flow forecasting. To enhance feature extraction and capture additional time series dependencies, TS2Vec is extended with a frequency domain. Furthermore, various augmentation methods with different intensity levels are implemented to systematically adjust the difficulty of the pretext task and improve model robustness. Additionally, the impact of fine-tuning and hyperparameter optimization on the quality of the representations and the prediction accuracy is examined.

Initially, the different model variants are tested on the original TS2Vec data to analyze whether the newly developed augmentation methods already enhance representation quality and prediction accuracy. This is followed by validation on generic data to further evaluate the model's fundamental functionality and ensure that the generated representations are suitable for forecasting. Finally, the model is applied to real cash flow data from lifetime work accounts to assess the effectiveness of the representations in practical scenarios.

The analysis of the results reveals that particularly complex augmentations and the frequency domain show improvements after pretraining, which is also reflected in the evaluation results. Additionally, fine-tuning significantly enhances the quality of the representations, while hyperparameter tuning does not yield further performance gains. Despite these advancements, challenges remain in accurately predicting short-term fluctuations and handling groups with highly variable deposit behavior.

The results highlight the potential of self-supervised learning for cash flow forecasting in lifetime work accounts but also underline the need for further optimizations - especially in managing strong payment fluctuations and customers with irregular or missing deposits.