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*Multi-Modal Deep Learning for Midcap Credit Rating Prediction Using Text and Numerical Data*

The credit rating of a company is a critical factor in determining its financial health and assessing its ability to meet its financial obligations. In this talk, we present a fusion of deep learning models for predicting company credit rating classes using structured and unstructured datasets of different types. The structured datasets used in the model include market, bond, financial ratios, and previous rating information as covariates. An unstructured dataset consisting of earning call transcripts is used to capture additional information that might not be present in the structured data. The models combine different fusion strategies with well-known deep learning models such as Convolutional Neural Network (CNN), Long Short-Term Memory (LSTM), Gated Recurrent Units (GRU), and Bidirectional Encoder Representations from Transformers (BERT). We apply data fusion strategies in terms of levels and techniques, including early and intermediate levels, concatenation, and cross-attention techniques. Our results show that a CNN-based multi-modal model with two fusion strategies outperforms other multi-modal techniques. Furthermore, comparing simple architectures with more complicated ones, we find that the more complex deep learning models do not necessarily have the highest performance given the structure of the text data modality. Finally, we compare the impact of different rating agencies on short/medium/long-term performance and find which rating companies have the better performance when predicting future rating movements. The findings of this paper highlight the importance of incorporating unstructured data into credit rating models and provide insights into the effectiveness of different fusion strategies and rating agencies in predicting credit rating classes.