MULTIMODAL ANALOGICAL REASONING
MARFIN AND IMDB (MULTIMODAL VISION & NLP GENRE CLASSIFICATION)

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INTRODUCTION

The MARFIN project is revolutionizing financial risk assessment by employing Multimodal Analogical Reasoning over knowledge graphs. This innovative approach integrates diverse financial data sources, including market trends, asset performance, and economic indicators, to uncover hidden relationships and patterns.By fusing visual and textual cues, researchers aim to enhance genre classification accuracy, while financial institutions seek to mitigate potential losses and optimize investment strategies using MARFIN's advanced risk identification techniques.The IMDB Multimodal Vision & NLP Genre Classification dataset offers a curated collection of movie posters and detailed plot summaries for genre classification, combining visual and textual information.

METHODOLOGY

For the MARFIN project, which aims to develop a novel approach for financial risk identification using Multimodal Analogical Reasoning over knowledge graphs, the methodology can be outlined as follows:

Data Acquisition:
- Gather diverse sources of financial data including market trends, asset performance, economic indicators, and textual information from reliable sources.
- Ensure the data covers a wide range of financial instruments, market sectors, and time periods to capture the dynamic nature of financial markets.

Preprocessing:
- Cleanse and preprocess the collected data to remove noise, inconsistencies, and missing values.
- Standardize data formats and units to ensure compatibility across different sources.
- Transform textual information into structured data using natural language processing techniques.

Knowledge Graph Construction:
- Construct a multimodal knowledge graph representing relationships and interdependencies among financial entities, market trends, economic indicators, and textual information.
- Encode entities, attributes, and relationships into a graph structure that captures both semantic and contextual information.

Multimodal Analogical Reasoning:
- Develop algorithms for multimodal analogical reasoning over the constructed knowledge graph.
- Exploit analogical reasoning principles to infer potential risks based on similarities and patterns identified across different modalities.
- Utilize graph-based inference techniques to propagate risk signals and identify emerging patterns.

Risk Identification and Mitigation:
- Apply the multimodal analogical reasoning approach to identify potential risks in financial markets.
- Analyze the inferred risk signals and prioritize them based on their severity and potential impact.
- Develop strategies for risk mitigation and optimization of investment portfolios in response to identified risks.

Evaluation and Validation:
- Evaluate the performance of the MARFIN approach using historical financial data and known instances of financial crises or market downturns.
- Validate the effectiveness of risk identification and mitigation strategies through backtesting and scenario analysis.
- Compare the results obtained using MARFIN with traditional risk assessment methods to assess improvements in risk identification accuracy and timeliness.

Deployment and Integration:
- Integrate MARFIN into existing financial risk management systems or investment platforms.
- Provide user-friendly interfaces and visualization tools to enable financial institutions and investors to interpret and act upon the identified risks effectively.
- Continuously update and refine the MARFIN system based on feedback and real-world performance.

Data preprocessing for IMDB involves feature extraction from both visual and textual modalities, including standardization, resizing, and tokenization, as well as word embedding and padding.The Multimodal Siamese Network architecture comprises twin subnetworks, processing images and text separately, typically utilizing CNNs for images and RNNs or transformer models for text. Representations from each modality are merged via a fusion layer.During training, a suitable loss function, such as contrastive or triplet loss, optimizes the model parameters. Pairs of movie instances are fed into the network to minimize distances between similar representations and maximize distances between dissimilar ones.Evaluation assesses the model's genre classification accuracy on a separate validation or test set, utilizing metrics like precision, recall, and F1 score to gauge effectiveness.

DATASET

Taiwan Economic Journal
TEJ Ratings ◦ Risk ◦ Index ◦ Databank

The data FOR MARFIN were collected from the Taiwan Economic Journal for the years 1999 to 2009. Company bankruptcy was defined based on the business regulations of the Taiwan Stock Exchange.

The IMDB Multimodal Vision & NLP Genre Classification dataset consists of high-quality movie and series poster images along with detailed plot summaries. The dataset focuses on four primary genres: Action, Comedy, Horror, and Romance. Each genre contains a diverse set of images and plot descriptions, providing a comprehensive representation of the dataset.

RESULTS

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Fitting 5 folds for each of 18 candidates, totalling 90 fits
Training accuracy: 1.0
Test accuracy: 0.967
              precision    recall  f1-score   support

           0       0.97      0.99      0.98      1313
           1       0.62      0.31      0.42        51

    accuracy                           0.97      1364
   macro avg       0.79      0.65      0.70      1364
weighted avg       0.96      0.97      0.96      1364
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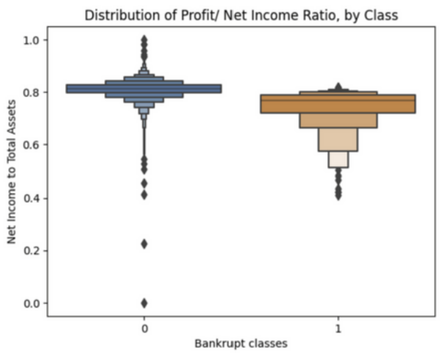

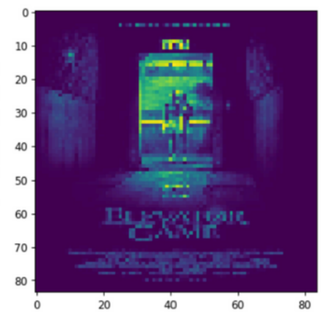

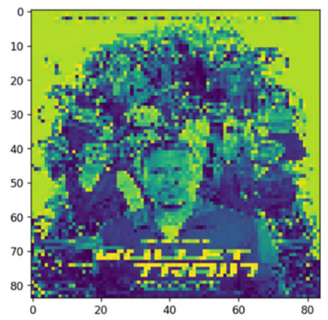

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Percentage of companies predicted to go bankrupt: 1.91%
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CONCLUSION

MARFIN's multimodal knowledge graph and analogical reasoning framework provide a potent tool for navigating financial complexities. Integrating diverse financial data and drawing parallels between entities, MARFIN enhances risk assessment and decision-making. Through analogical reasoning, it identifies potential risks and opportunities by uncovering historical patterns. Ultimately, MARFIN empowers users with valuable insights, aiding in risk mitigation and opportunity maximization in finance.Similarly, the IMDB Multimodal Vision & NLP Genre Classification dataset showcases the effectiveness of multimodal analysis, especially the multimodal Siamese network. By leveraging visual and textual data, it achieves precise genre classification, highlighting the importance of diverse data in machine learning. This research advances multimodal analysis in film studies and beyond, emphasizing the significance of embracing varied data sources for comprehensive classification tasks.

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