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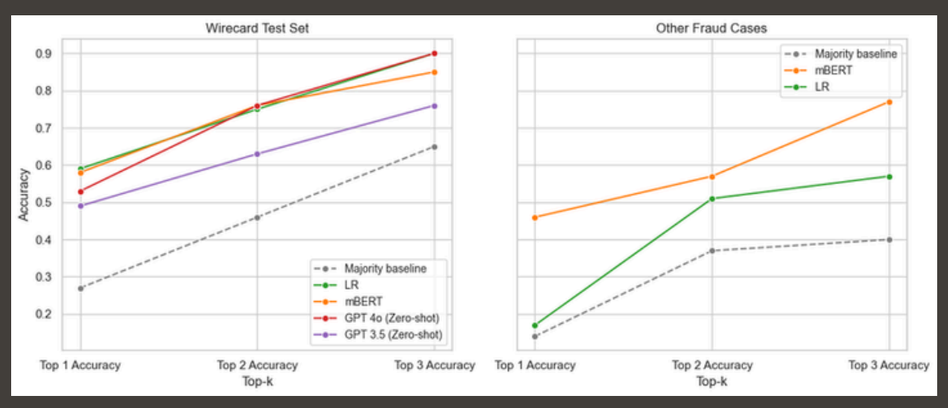
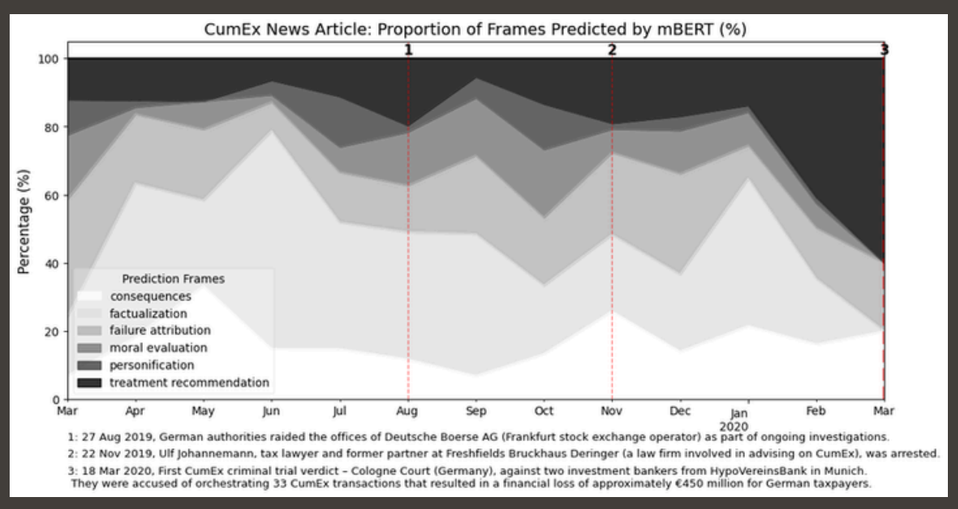
Automated Media Framing Analysis in *Corporate Fraud Scandals*

Method	Wirecard Test Set		Other Fraud Cases	
	Accuracy	Macro F1	Accuracy	Macro F1
Baseline				
Majority baseline	0.27	–	0.40	–
LR	0.59	0.53	0.17	0.05
LR + LLM Data Augmentation	**0.60**	0.54	**0.17**	**0.11**
LR + Exclude First Paragraph (Train set)	0.54	0.48	–	–
LR + Exclude First Paragraph (All dataset)	0.46	0.41	–	–
LR + Translation Data Augmentation	0.55	**0.55**	–	–
Transformer Models				
mBERT	0.58	**0.58**	0.46	0.30
mBERT + LLM Data Augmentation	0.47	0.43	0.37	0.23
mBERT + Exclude First Paragraph (Train set)	0.46	0.46	–	–
mBERT + Exclude First Paragraph (All dataset)	0.40	0.42	–	–
mBERT + Translation Data Augmentation	0.55	0.54	–	–
XLM-Long (window=1024)	0.56	0.49	0.51	**0.37**
BERT-German	**0.61**	0.54	0.37	0.23
XLM-R-Large	0.57	0.50	**0.60**	**0.37**
LLMs				
GPT-4o mini (Zero-shot bounding prompt)	0.41	0.32	0.20	0.10
GPT-4o mini (Zero-shot contextualizing prompt)	0.41	0.35	0.20	0.11
GPT-4o mini (Zero-shot articulation prompt)	0.42	0.31	**0.31**	0.20
GPT-4o mini (Zero-shot directionality prompt)	0.41	0.26	0.29	0.19
GPT-4o mini (Zero-shot voting)	0.56	0.46	**0.31**	**0.21**
GPT-4o mini (Chain-of-thought & Zero-shot)	0.52	0.43	–	–
GPT-4o (Zero-shot)	0.54	0.47	–	–
GPT-3.5 (Zero-shot)	0.49	0.35	–	–
GPT-3.5 (One-shot)	0.32	0.26	–	–
OpenAI o1 (Zero-shot)	**0.57**	**0.52**	–	–
LLaMA 3.1 8B (Zero-shot)	0.39	0.32	–	–
LLaMA 3.1 8B (LoRA fine-tuned)	0.44	0.36	–	–





mBERT performs the best overall

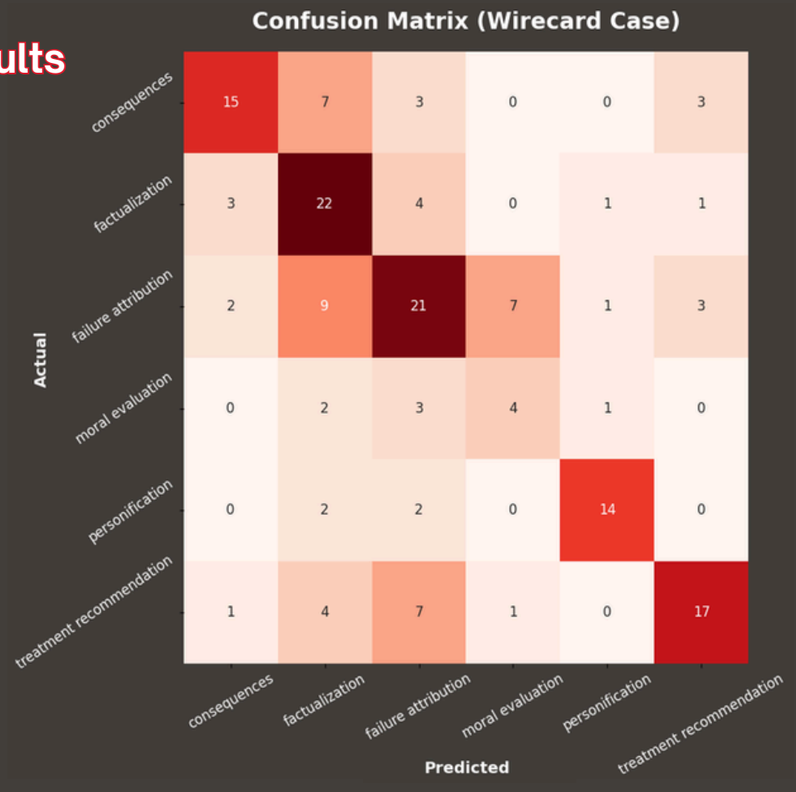
With an accuracy of 0.58 and a Macro F1 of 0.58 on the Wirecard test set (160 articles), and an accuracy of 0.43 with a Macro F1 of 0.30 on the New Case dataset (35 articles).

When evaluating under a top-3 prediction setting, mBERT significantly outperforms the baseline in both Wirecard test set and other fraud cases, highlighting its stronger frame recognition capability when considering multiple candidate predictions.

Each frame yields different results

As shown by F1 scores of mBERT on Wirecard test set: Personification (80%), Treatment Recommendation (63%), Consequences (61%), Factualization (57%), Failure Attribution (51%), and Moral Evaluation (36%).

From the confusion matrix, we observe that the model tends to confuse certain frames. For example, it often predicts Failure Attribution and Consequences as Factualization, and predicts Treatment Recommendation and Factualization as Failure Attribution.



CumEx Fraud Scandal

We applied the mBERT model to analyze 768 news articles on the CumEx Fraud Scandal—a major European tax fraud involving banks, investors, and lawyers exploiting loopholes to claim refunds on unpaid taxes. Our focus is on 2019–2020, a period marking the shift from initial exposure to legal prosecution (see the stacked-area chart for results).

Given the mBERT model's accuracy of 0.58, future work should consider using the top three predicted frames per article. More clearly annotated data from a wide range of fraud cases is needed to curb over-fitting, strengthen the model's ability to separate overlapping framing cues (especially in nuanced frames like moral evaluation).

Background

Media framing in fraud scandals refers to how the media shapes public perception by *selecting* certain aspects of a story and making them *salient* through rhetoric and stylistic devices.

Building on prior research that identified **6 frames** in media coverage of the Wirecard fraud scandal, this study develops **a classifier model to automate media framing analysis** focusing on a fraud scandal.

Methodology

Baseline: Majority frame baseline & Logistic Regression
Pre-trained language models: Fine-tuning technique using Multi-lingual models e.g. mBERT, XLM
LLMs: In-context learning techniques e.g. zero-shot, few-shot learning, Chain-of-thought (CoT) and Fine-tuning technique
Top-k evaluation: the model is considered correct if the actual frame appears among the top-k highest scoring frames

Dataset

Using 795 newspaper articles on the Wirecard (Germany, June 2020) fraud scandal, annotated with 6 frames, to develop the model. Based on selection through bounding & contextualization and salience captured through articulation & directionality, the 6 frames include:

Failure Attribution (27%)

Focus on oversight bodies' malpractice in accounting fraud

"The affair surrounding the crooked financial firm Wirecard can be summed up in one word: TOTAL SCREW UP! [...] Germany as a financial center has disgraced itself to the bone."

Factualization (19%)

Focus on key facts about the fraud

"The scandal caused an 80 percent plunge in the company's stock price over the last two days."

Treatment Recommendation (19%)

Focus on needed reforms for oversight bodies and auditors

"Tighter access for the financial regulator BaFin. Greater liability for auditors. Much more transparency by companies in their balance sheet disclosures."

Consequences (18%)

Focus on the financial and reputational impact on the company and stakeholders

"Worst affected: Small investors! All those who have invested their hard-earned savings in order to use the returns to pay for their retirement."

Personification (11%)

Focus on top managers' criminal behavior

"Entertaining and action-packed, but also pretty incredible. [...] Now he [COO Jan Marsalek] has pulled off a cinematic escape of his own."

Moral Evaluation (6%)

Focus on the lack of morality among stakeholders

"He [CEO Markus Brown] did what he had presumably also done before as Wirecard boss: He lied! [...] He tricks, he ruthlessly pursues his own advantage."

Based on
Oelrich, S., & Siebold, N. (2024). Media framing in Wirecard's fraud scandal: Facts, failures, and spying fraudster fantasies. Critical Perspectives on Accounting, 100, 102755. https://doi.org/10.1016/j.cpa.2024.102755