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DEMONSTRATION

Leveraging Artificial Intelligence as a Decision Support System in Belgian Commercial Courts

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Abstract

In Belgium, each commercial court has at least one Chamber for Companies in Difficulties (CCD), tasked with the early detection and investigation of financially distressed companies. While the CCD's primary objective is to promote recovery by encouraging financially distressed companies to take action, it also has a regulatory function by facilitating the orderly removal of companies that lack the willingness or capacity to recover. To identify companies, CCDs rely on a database of red flags. Based on these red flags, CCDs can decide to open files, investigate companies, and act accordingly. Given the economic stakes and the resource-intensive nature of the current manual process, we are working on a pilot project at the CCD of Antwerp to develop an AI-based judicial decision support system to assist CCD judges in selecting and prioritizing cases.

CCS Concepts

• **Computing methodologies** → **Machine learning**; • **Applied computing** → **Law**.

Keywords

Commercial Court, Bankruptcy, Machine Learning, Decision Support System

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1 INTRODUCTION

AI holds significant yet understudied potential in commercial courts, particularly for the early identification of financially distressed companies and the prediction of their bankruptcy risk. Early detection is crucial, as it increases the likelihood of successfully rescuing viable firms [1], while the timely liquidation of non-viable ones helps preserve value for creditors. This is especially important in light of the relatively low creditor recovery rates observed in Belgium [2].

While AI-based bankruptcy prediction has been widely studied [4], few studies focus on its application in judicial contexts. To the best of our knowledge, we are among the first to develop an AI-based decision support system to help judges identify financially distressed companies and determine appropriate actions.

2 LEGAL CONTEXT

Each Belgian commercial court has at least one Chamber for Companies in Difficulties (CCD), tasked with detecting and investigating financially distressed companies. The CCD's primary goal is prevention – raising awareness and encouraging precautionary measures – while its secondary, regulatory role involves referring companies deemed beyond recovery for bankruptcy proceedings [5].

To detect distressed companies, CCDs rely on red flags indicating possible financial distress, centralized in the KNICLI database. KNICLI includes information on, e.g., debts related to social security, VAT, and taxes; seizures; a financial health score by the Belgian central bank; delays in filing annual accounts; and employee counts. The CCD of Antwerp relies heavily on KNICLI, making it an ideal partner for our pilot project.

Due to the high volume of flagged companies, the process begins with a selection step. As selection criteria vary across time and jurisdiction, inconsistencies may arise. For each selected company, a file is prepared and reviewed by the president of the CCD. Based on this review, the president may refer companies with no prospect of recovery for bankruptcy proceedings, close files where there is no immediate risk or schedule the case on a CCD meeting for further assessment. After this meeting, the CCD may close the case, defer

Table 1: Confusion matrix

	TP (Bankruptcy)	T? (Investigation)		TN (Closure)	Total
		Later bankruptcy	No later bankruptcy (yet)		
PP (Predicted Bankruptcy)	53 (54.1%)	31 (51.7%)	23 (34.8%)	41 (39.8%)	148
PN (Predicted Closure)	45 (45.9%)	29 (48.3%)	43 (65.2%)	62 (60.2%)	179
Total	98	60	66	103	327

Table 2: Summary evaluation metrics

Experimental setting	ROC-AUC	Average Precision	Recall@10%	Precision@10%
Test set companies (all decision types)	0.626	0.610	0.152	0.750
Test set companies (only investigation decisions)	0.605	0.582	0.133	0.667

it for future review, request additional information, initiate a more in-depth investigation or refer the case for bankruptcy proceedings.

3 DECISION SUPPORT SYSTEM

The ultimate goal of our decision support system is to assist CCD judges in selecting financially distressed companies. The current version constitutes a necessary preparatory step toward that goal: it ranks companies – all of which have already been selected by the CCD – according to their likelihood of being referred for bankruptcy, enabling the CCD to prioritize those most at risk.

To train our system, we utilize two data sources: (1) the KNICLI database, containing red flags for 9,657 distressed companies in Antwerp (36,320 entries), and (2) CCD decisions for 1,741 companies (2,869 decisions, including 248 presidential decisions). Since each company may have multiple KNICLI entries and CCD decisions, we match each CCD decision to the most recent preceding KNICLI entry. This ensures that predictions rely solely on information available at the time of the decision. In total, we include 1,843 CCD decisions matched to a preceding KNICLI entry, covering the period from March 2023 to February 2024.

We grouped the decision outcomes in three categories: case closure (28.11%), investigation (46.07%), and referral for bankruptcy (25.83%). We train an XGBoost model [3], selected for its strong performance with tabular data and recognized in bankruptcy prediction research [4]. To avoid data leakage, all decisions related to a company are kept within either the train or test set. Furthermore, we exclude investigation decisions during training, as they do not constitute final outcomes and may introduce noise into the data.

However, we include investigation decisions during testing to evaluate the system’s performance on real-world cases with intermediate outcomes. We label an investigation decision as a bankruptcy if it is followed by a bankruptcy decision at a later stage, and as a closure otherwise. As some companies may still go bankrupt at a later stage, this labeling introduces a degree of uncertainty.

4 RESULTS

Table 1 shows that the system struggles a bit with identifying true positives (bankruptcies), correctly identifying only 54.1%. However, the system performs well at identifying true negatives (closures), with an accuracy of 60.2%. For investigation cases, the system performs better at predicting non-bankruptcy cases (65.2%) but fares worse with bankruptcy cases (51.7%).

Table 2 further highlights the system’s performance. In the complete test sample, it performs moderately well at distinguishing distressed from non-distressed companies, with high Precision@10% for accurate top-ranked predictions. When we only consider investigation decisions, all metrics (unsurprisingly) decline slightly, indicating reduced effectiveness for this category.

5 FUTURE WORK

Our next step is to collect and integrate annual account data, which we expect will significantly enhance the system’s predictive power.

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