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DIREGA – Building Decision Support for German Register Law

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Abstract. The interdisciplinary project DIREGA aims to analyse the joint application of linguistic, symbolic, and sub-symbolic AI techniques to German register law. This analysis is based on a dataset consisting of all past applications, related documents, and decisions of German register courts in the Free State of Bavaria. Corpus queries and sub-symbolic AI methods will be used for information extraction which then instantiate facts for the symbolic reasoning pipeline based on a manual formalization of the relevant laws. The goal is to build a prototypical implementation checking register applications and providing a detailed explanation for acceptance (or rejection) to aid legal professionals such as notaries in drafting and reviewing such documents.

Introduction The German commercial register is a public directory providing essential information about companies such as representation and liability. Its main objective is to ensure that both the respective companies and third parties can rely on the entered data and refer to it in the event of a dispute. Therefore, its entries need to be updated continuously. Companies are obliged to submit register applications for any entries to be updated and providing supplementary documents for review. These applications are manually drafted by a public notary, filed with the competent register court for decision.

The DIREGA (*Digitaler Registerassistent/Digital Register Assistant*) project aims to aid legal professionals such as public notaries in drafting and reviewing these register applications for the first time in an automatized manner. Such assistance will range from full automation of "soft cases" to human-in-the-loop machine support for "hard cases". The project team spans five disciplines: Law, Computational Linguistics, Pattern Recognition, Theoretical Computer Science, and Knowledge Representation. We have a dataset containing real documents and information about affected legal subjects regarding their current and historical state in the German commercial register of the Free State of Bavaria.

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Challenges We will address challenges associated with interdisciplinary legal AI at large as well as the special requirements posed by the specific legal application domain. General challenges primarily relate to creating a pipeline spanning a broad range of AI subdisciplines each bringing their own methods, terminologies and tool support. The different approaches need to be coordinated while embodying quality criteria such as transparency of the translation from law to code. A more domain-specific challenge pertains to the resulting prototype system having to fulfil criteria such as explainability [1,2] (how well can the system explain itself?), correctness [3] (do results consistently match gold-standard decisions by humans?) and scrutability [4] (can the system represent and manage targeted user dissent about its decisions). This has to take place within the ongoing debate among stakeholders on how the requirements from legislation such as the EU AI Act can be operationalized [5,6]. The state of the art in the various collaborating disciplines offers a broad range of solutions for many of the sub-problems faced in the project that need to be incorporated into a comprehensive pipeline. Accomplishing this in a close-to-application setting is the overarching goal of DIREGA.

Approach Starting point of the envisioned pipeline are the application documents, including requests to registry courts, enforcement documents and interim orders, which are processed to extract the relevant information. We aim to identify and classify issues in the documents, addressing challenges such as the absence of a labeled dataset providing structured reasons for declined documents. To arrive at a list of issues for every declined document, we analyze human-generated text responses from the German commercial register using information extraction methods, including Large Language Models and Rule-based Systems [7,8].

In the rule-based part of our pipeline, we directly exploit linguistic patterns indicating the presence of relevant statements with the help of a dedicated query language [9]. Not only does this avoid hallucinations that a pure LLM approach would be prone to; it also enables defining fine-grained nuances requiring legal expertise into our information extraction while minimising the need for annotating vast amounts of data. To this end, the documents are processed with state-of-the-art NLP tools including syntactic information and legal named entities [10,11,12].

The extracted reasons are structured in a standardized format including the identified issue, its classification, and, if available, potential solutions related to the issue. Since the human-generated text responses lack annotation regarding the specific issues encountered in the documents, we will manually annotate a subset of responses for test and validation purposes, enabling a systematic comparison of our different applied methods. We investigate integrating a Retrieval-Augmented Generation framework to detect inconsistencies with the current legislation, enhancing explainability by mapping identified issues to specific legal norms.

The extracted information is then combined with formalized legal knowledge relevant to the register processes forming the input to a suitable reasoner, especially with respect to explainability of the results. The requisite maintainable legal knowledge base will be created manually in a principlied and reproducable process driven jointly by legal, theoretical computer science, and knowledge representation experts. The resoning results will then be processed to produce a detailed explanation for the envisioned decision understandable for legal professionals and provides an interface to receive and react to their counterarguments.

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