Modelling Causation in Evidence-Based Legal Reasoning ICAIL Doctoral Consortium

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1 Research Questions

Research questions in this project revolve around issues of causation in evidence based legal reasoning:

Q1 How can understanding causation improve evidence-based legal reasoning?
Q2 How can causal analysis be integrated in the existing evidential reasoning approaches?

Further subquestions allowed to identify the main angles of investigation in this interdisciplinary study:

Q3 What are the specificities of legal causation in comparison to other fields of study? What are the relevant aspects of causation considered in case law?
Q4 What role does causation play in legal responsibility attribution?
Q5 What role does language play in causal analysis? How can understanding legal causal language improve formal analysis of causation?
Q6 How can formal theories of causation aid in analysing legal causation? Do any of the formal theories provide an advantage over the current legal analysis of causation?
Q7 In what ways the current evidential reasoning theories could be applied to explain and evaluate causal links in case law?
Q8 What is the role of evidence in legal causal analysis? How can the guidelines given to legal decision makers be improved for a more transparent reasoning about causation? What sort of causal theories work and doesn't work in law?

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2 Initial Hypotheses

H1 By analysing case law, the main legally relevant discussions of causality can be identified showing some of the reasons for confusion and inconsistencies in this area. By providing tools and guidelines to legal reasoners when dealing with evidence-based causal analysis, we can improve how legal reasoners understand causation, which would improve legal reasoning and decision making.

H2 Legal causation issues identified through case law can be explained and assessed by using an integrated causal framework based on the current evidential reasoning approaches showing insights beyond the ones available through legal analysis.

3 State of Art

The State of the Art of evidence based legal reasoning relates to several fields, e.g. logic and law, evidence [29, 1], and argumentation in artificial intelligence [7, 28]. In regards to causation, there exist various approaches to causation which have their roots in formal logic and computational theories [12, 5], language studies [22], philosophy [11, 10] and law [13, 14, 23]. This section will focus on the fundamentals of these fields of research in relation to the study of causation in law.

3.1 Legal and philosophical theories of causation

Causation plays a central role in legal reasoning, especially in the evidence based analysis and liability attribution. But despite the essential role of causal analysis in law, mainstream theories of legal causality have difficulty covering all legally relevant instances of causation. According to Hart and Honore [13]), a cause is defined as something that is a *'necessary element of a set of conditions jointly sufficient for the result'* (NESS) [14]. The basic idea behind this approach is to capture a stronger causal link than what can be provided by the common 'but-for' clause that is an intuitive type of counter-factual reasoning used by human agents. In particular, Hart and Honore's approach is meant to extend the coverage of causation to cases when multiple antecedents are sufficient to produce the event at issue. However, this approach falls short in complex cases and instances of intervention, preemption, and omission.

One of the points about modelling causation emphasised by legal scholars is the importance of keeping the specific needs of legal reasoners in mind [23]. While certain aspects of causation might seem interesting and relevant for scientists or philosophers, such discussions are not always helpful for legal practitioners in courts. Besides the NESS test in legal reasoning there are several practical approaches developed through the needs of legal practitioners. An example of

such developments can be observed in the tort law [30], where cause-in-fact is a core element of legal analysis. At this point, the guidelines on causal reasoning in other areas of law are vague and opaque, putting significant burden on the legal reasoner, which in turn exposes such judgments to subjective understanding of causation and biases.

3.2 Language of causation

Law as a highly textual field is often analysed through linguistic methods. The aspects of causal analysis are no exception. One of the dominant approaches in the field of law and causation has been proposed by Lawrence Solan [22, 20, 21]. The empirical study by Solan [22] showed that the terminology used in the courtrooms can influence the jury and other reasoners to a level where it might be difficult to distinguish between the legal concepts of 'enabling' something and 'causing' something. His observations showed that despite there being special expressions with prescribed causal meaning in law, in large, the language of causation heavily relies on everyday use of language where causal links are often implicit and vague. Ideas of common sense reasoning in causation are in accord with the works of Hart and Honore [13]. While in everyday reasoning this distinction has proportionally small impact, in legal terms that might change the severity of the sentences awarded. Furthermore, the studies until this point have not given answers to questions regarding implicit and explicit evidential support that is often prescribed to causal links through various expressions (both formal and informal).

3.3 Formal theories of causation

Causation is an important and challenging research topic in most branches of science. The focus of this work is on the formal theories of causation that have potential application in law. In particular, the central theory for the analysis is the structural approach to causation, the 'actual causation' theory, by Judea Pearl [15] which looks at the underlying structure of causal relationships. The theory claims to be applicable to most causal structures at the very core level of the causal link between events. In legal terms, it is closest to ideas of 'cause-in-fact'. Further developments of the 'actual causation' include extensions proposed by Halpern and Hitchcock [11], based on ideas of defaults and normality to provide basis for comparing and contrasting the core causal models; and further integration of the structural models in logic and computational approaches by Lifschitz and Bochman [5]. Both of these provide additional tools for analysing causation in law, which as identified above is a complex instance of causation due to the various levels of analysis beyond physical causation. An alternative theory to causation that provides some relevant insights is the approach from the field of the logic of action, in particular, the STIT theory of causation (*'sees to it that'*) [19].

3.4 Evidential approaches and causation

With the increasing complexity of evidence presented at courts, evidential reasoning approaches provide useful insights into legal reasoning from various perspectives [26]. The three most prominent approaches in this field of research are the argumentative [25, 28, 29, 17], scenario based [16, 3, 4], and probabilistic [9, 8, 6]. Each of them provides its own advantages of understanding the mind and actions of legal reasoners. For instance, the scenario based approach appeals to cases with a clear narrative of events and emphasises the use of scenarios in human reasoning. It provides an overview of the case with a coherent story of events, exposing missing links and human biases. All the approaches aim not only to provide a better understanding of evidence based legal reasoning, but also draw inspiration from the limitations of human reasoners and propose ways reasoning could be improved. Furthermore, there have been attempts of various combinations among these approaches to provide a more comprehensive account of one's reasoning in specific domains [2, 27, 24]. Causal analysis in these studies are at their early stages and have a potential of augmenting the various theories of evidential reasoning.

4 Problem Identification

Legal reasoning encompasses various aspects of causation. Besides causation-in-fact, law also considers evidence, norms, precedents, expert witness testimonies, and other variables relevant to causal analysis. Existing formal theories of causation are not directly applicable to law due to the highly technical features of the theories and simplified understanding of legal causation. There have been attempts of combining various formal approaches to analyse legal cases, but there still remains a gap between formal theories of causation and the practical needs of causal analysis in law. In particular, it can be observed that there are significant discrepancies between the legal and formal approaches due to the vague guidelines given for the legal causal analysis and the complicated, technical subject matter. However, so far the solutions have not yet been proposed through terms of causation. Due to the significant impact of causal analysis in legal liability attribution, it is important to develop and apply current approaches with an aim of reducing unclarity and uncertainty in legal reasoning.

5 Methodology

While there are many interdisciplinary approaches to legal analysis, there is no dominant methodology underlying the investigations of causal reasoning in law. The preliminary research for this project started with thorough literature based analysis of the field of evidential reasoning and causation. In order to incorporate ideas from legal practice, case scenarios from real case law were used to evaluate and illustrate causal models in law. Such analysis requires thorough reading and understanding of the legal and causal concepts before the abstraction of

the many details can be conducted. This exercise required a development of a method for abstracting causally relevant links in real cases and then a way of modelling them in terms of strict and defeasible rules [18]. To further analyse causal models they were considered in various hypothetical scenarios with legal relevance. Based on results from the case studies, a comparative framework for choosing the relevant evidential reasoning methods has to be developed. Furthermore, comparative analysis of the case studies allows for the relevant theories to be further integrated, providing a better understanding of causation in law as well as an opportunity to show the main differences among the legal and formal theories through a case study. Further work involves assessing the causal models and abstracting them to a framework that is based on the evidential reasoning theories to reason about causation in real cases. Such a framework would incorporate various formal and semi-formal approaches to causation with an aim to increase the explanatory and analytical value of causation.

6 Preliminary Ideas and Contributions to the Field

The initial ideas for investigation revolved around understanding specificities of causation in law through case studies. The hypothesis that understanding causation better would help to improve legal reasoning was challenged by the complexities of applying formal theories of causation. Early results of the study showed that formal theories in their current shape are not directly applicable in law and require further integration with other legal reasoning approaches. The investigations in case law showed that despite there being guidelines on how to reason about causal links, it is not always possible to observe them in practice. There seems to be a heavy reliance on the legal reasoner to make the right decision when analysing evidence and attaching it to the causal hypothesis without sufficient guidance.

This work aims to help bridging the gap between practical and theoretical approaches to causation by providing a better understanding of causation in law and creating an integrated framework for analysing evidence based legal reasoning, focusing in particular on the link between the hybrid theory and causation. This study provides comprehensive analysis that aims to improve the understanding of legal causation in real cases. As liability attribution in courts is often based on causal analysis, it is important we work towards ensuring that such causal analysis is systematic and reliable to ensure a higher level of predictability in the judgments. One of the more specific aims of this project is to show case examples where Pearl's formal theory of causation provides a clearer analysis of the actual cause in a legal scenario than Hart and Honore's approach. Early analysis supports this claim through a hypothetical case scenario of preemption, which explicitly distinguishes between Pearl's and Hart and Honore's theories on causation. Based on some initial results, we propose possible developments that could adapt the formal theories of causation for use in the legal

domain.

This research provides new insights in causal reasoning in law through an evidential reasoning framework. This work considers already established formal approaches to find new practical applications in law. The proposed approach to analysing law provides original outcomes due to the focus on a core aspect of legal reasoning that has not yet been formally developed in law.

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