

Explainable Legal Case-Based Reasoning (XL- CBR) in Asylum Adjudication: Evidential Analysis and AI Prediction

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Designing explainable AI solutions for use in asylum adjudication requires research teams to adopt the methods and techniques most suited to the data and the overarching task. The Case-Based Legal Reasoning approach allows researchers to develop AI for use in adjudication scenarios characterised by an attenuated evidential matrix, social intersubjectivity and the foregrounding of narrative coherence over rationalism and inferential coherence.

1-11-2022

The perception of asylum adjudication as a ‘lottery’¹ has led to the variegated deployment of AI-based tools in European immigration administration, such deployments generating further concerns that pre-existing human biases may be replicated and exacerbated by automated expert systems.² In response to these concerns, researchers have proposed the introduction of novel Explainable Artificial Intelligence (xAI) techniques, in order to bring transparency and interpretability to ‘black-boxed’ asylum decisions. The development of such rule-based legal xAI systems is predicated upon the elaboration of a cross-disciplinary, domain-specific ontology, acquired through the admixture of sectoral expertise with foundational data-science techniques. However, such an elaboration necessarily rests upon the accurate determination and articulation of a set of rules that reflect the semantic hierarchy and the conceptual relations which together structure the instant decision-making process: a process which necessarily operates under an overarching set of legal precepts, and which should conform to the ideals of robust and rational evidential analysis.

However, consequent to the development of rule-based (legal) ontologies, researchers identified a problem: the accrescence of ‘knowledge bottlenecks’. Knowledge bottlenecks - the inability of domain experts to articulate expertise across disciplinary boundaries – constitute a significant obstacle to knowledge acquisition, attendant upon the interfacing of rules-based ontologies with a tacit and experiential body of domain expertise.³ Whilst a diverse array of cognitive, mathematical, and social methods have been advanced to address resource-consuming ‘knowledge bottlenecks’⁴, within the legal sphere a hitherto-undocumented issue remains. This relates to the heterogeneous nature of legal adjudication across juridical sub-fields. Specifically, whilst adjudication in domestic and international civil and criminal cases may yield a comparatively robust and tractable evidential matrix - accurately explicated, normatively grounded, and conforming with rationalist precepts - adjudication in asylum cases frequently proceeds absent the inferential desiderata which together compose Twining’s rationalist formulation.⁵ Indeed, adjudication on credibility issues in asylum tribunals may proceed absent the necessary granularity of proposition and inference that is a central feature of adjudication in the criminal and civil courtroom, at both domestic and international levels.

Evidentially-attenuated domains of legal adjudication, such as those encountered within the asylum domain, may prove resistant to analysis and - in response to the instant requirement to deliver a robust xAI ontology - necessitate innovative technical approaches. Therefore, taking note of prior research

¹ Ramji-Nogales, J., Schoenholtz, A. I., & Schrag, P. G. (2007). Refugee roulette: Disparities in asylum adjudication. *Stanford Law Review*, 60, pp.295-412.

² Katsikouli, P., Hamilton, W.B., Gammeltoft-Hansen, T. *et al.*, Machine Learning and Asylum Adjudications: From Analysis of Variations to Outcome Predictions, Conference paper submitted for *Artificial Intelligence and Law*, 2021 (under review).

³ Feigenbaum, E.A. (1992). A Personal View of Experts Systems: Looking Back and Looking Ahead, Knowledge System Laboratory, Report n. 92-41 (KSL, Stanford); N. Tishby, N., Zaslavsky, N. Deep learning and the information bottleneck principle, *2015 IEEE Information Theory Workshop (ITW)*, (2015) pp.1-5.

⁴ Casanovas, P., Casellas, N., & Vallbé, J. J. (2011). Empirically grounded developments of legal ontologies: a socio-legal perspective. In *Approaches to Legal Ontologies* (pp. 49-67). Springer, Dordrecht.

⁵ See Twining, W. *Rethinking Evidence*, (Cambridge University Press, Cambridge, 2006), at p.73

which has hitherto focussed upon the characteristically circumscribed nature of asylum adjudication, (limited to witness credibility and the establishing of a “well-founded fear of persecution”) this project - cognisant of the relative affordances of procedure and evidence across diverging systems and domains.

– proceeded through successive stages of experimental modelling, utilising Wigmorean and Bayesian Network approaches, in order to create a domain-specific xAI ontology. In so doing, the instant project disclosed a mode of adjudication less consistent with Rationalist approaches than with abductive heuristics, thus comparatively resistant to elaboration in directed acyclic graphical (DAG) form.

In order to address this limitation, the project proposes a novel solution, utilising a legal case-based reasoning (L-CBR) methodology and associated techniques within the asylum domain.⁶ Case-based reasoning (CBR) is a memory-based problem-solving paradigm - conversant with AI, and grounded in legal reasoning. CBR systems solve new problems by retrieving stored ‘cases’ that describe similar prior problem-solving episodes, and can adapt those episodic features and solutions to fit new requirements or, in the context of the instant project, use the feature data to derive an aggregated set of robust co-variance ‘heatmaps’, each depicting the complete set of material adjudicative factors, as well as demonstrating the comparative value of their inter-relations. The project will thereby demonstrate the ways in which CBR can be implemented to form the basis for a comprehensive legal ontology, thus facilitating the creation of xAI algorithms for asylum adjudication. Furthermore, the project proposes a method for automated bias identification in asylum decisions utilising CBR alongside generalisation analysis. Specifically, utilising the aggregated sets of covariant maps will allow for multivariate outlier detection in the broader dataset. These outliers will then form the focus for analysis – on the micro-level – of the relevant operable inductive propositions, using ‘generalisation analysis’⁷, in order to determine the presence and nature of divergent and unarticulated major premises (i.e. bias). Thus, the researcher will have the ability to rapidly detect and analyse objectively sourced micro-level biases within the dataset. The results will therefore complement prior work on meso-level intuited biases.⁸ Furthermore, the output data will offer the potential for a robust L-CBR methodology to contribute more broadly to debiasing in the field of Natural Language Processing.⁹

⁶ Ashley, Kevin D. "The case-based reasoning approach: ontologies for analogical legal argument." *Approaches to legal ontologies*. Springer, Dordrecht, 2011. 99-115.

⁷ Anderson, T.J., Generalisations and Evidential Reasoning, in Twining, W., Dawid, P., and Vasilaki, M., (Eds.) *Evidence, Inference and Enquiry* (2011: Oxford University Press: Oxford), pp. 225-244.

⁸ Chen, D.L. and Eigel,., Can Machine Learning Help Predict the Outcome of Asylum Adjudications? (December 30, 2016). Proceedings of the ACM Conference on AI and the Law, 2017.

⁹ See, for example, <https://jura.ku.dk/ciir/english/research/legalese-danish-language-processing-for-legal-texts/>; Kwan, Michael, et al. "Reasoning about evidence using Bayesian networks." *IFIP International Conference on Digital Forensics*. Springer, Boston, MA, 2008.