Detailed Proposal for Dissertation

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Data analysis of legal case annotations

Statement of Ethical Compliance:

Data Category: E

Participant Category: 0

I can confirm that I have read the ethical guidelines from the university, and that they will be followed throughout the entire project. Further details can be found in the relevant sections of this proposal. The annotated dataset was produced on a research project undertaken at the University of Liverpool and have given me formal ethical approval was applied for and granted for this project.

Project Description:

Recent studies have begun within the University to produce a dataset, which will be used within this project, using legal cases from the European Court of Human Rights (ECtHR). The court hears cases and determines whether the Articles of the European Convention on Human Rights have been violated or not, according to the facts of the case. This project aims to analyse the data provided from the dataset to conclude why the students decided that a case was a violation or not, if the students agreed or disagreed on the factors relating to these cases, and potentially discover patterns from the dataset that contributes to a case being a violation case or not. As a result of this, it may in turn assist the training and testing of machine learning tools being developed to decide legal cases fairness.

Aims & Requirements:

Aims:

- Present patterns from the dataset in an informative manner and to understand why there are agreements or disagreements from the students on the factors contributing for a case to be a violation or not whilst coming to a justified conclusion on why this is the case.

Requirements:

- Analyse data the dataset which covers the students' annotations on violation and non-violation cases.
- Analyse the potential patterns from the data set and identify why these patterns have occurred.

- Determine if potential anomalies or outliers have impact on the analysis of the data and why these may have occurred within the dataset.
- Analyse the performance of the different groups of annotators i.e. those with and without legal domain knowledge
- Conclude what patterns have emerged from the data analyse and what factors have led to these patterns and conclusions.

Key Literature & Background Reading:

Artificial Intelligence and Law (AI) is a very recent subfield of research that began during the 1980s with the first International Conference on AI and Law (ICAIL) being held in Boston in 1987, and only a year after this the first JURIX was held in 1988 [1]. The ECtHR today benefits from the foundation that was laid out during these times, and now AI is a key tool within the ECtHR justice system. Dr Nikolaos Aletras outlines the importance of AI within the ECtHR with the next quote “We don't see AI replacing judges or lawyers, but we think they'd find it useful for rapidly identifying patterns in cases that lead to certain outcomes. It could also be a valuable tool for highlighting which cases are most likely to be violations of the European Convention on Human Rights” [2]. With how important AI in law is today, the ECtHR acts as a test bed for further development with the AI currently sitting at a 79% accuracy of predicting the judicial decisions of the ECtHR [2]. Dr Vasileios Lampos stresses that more work is to be done with the development and why the ECtHR serves as an important part of the development due to the data that it possess “Ideally, we'd test and refine our algorithm using the applications made to the court rather than the published judgements, but without access to that data we rely on the court-published summaries of these submissions" [2].

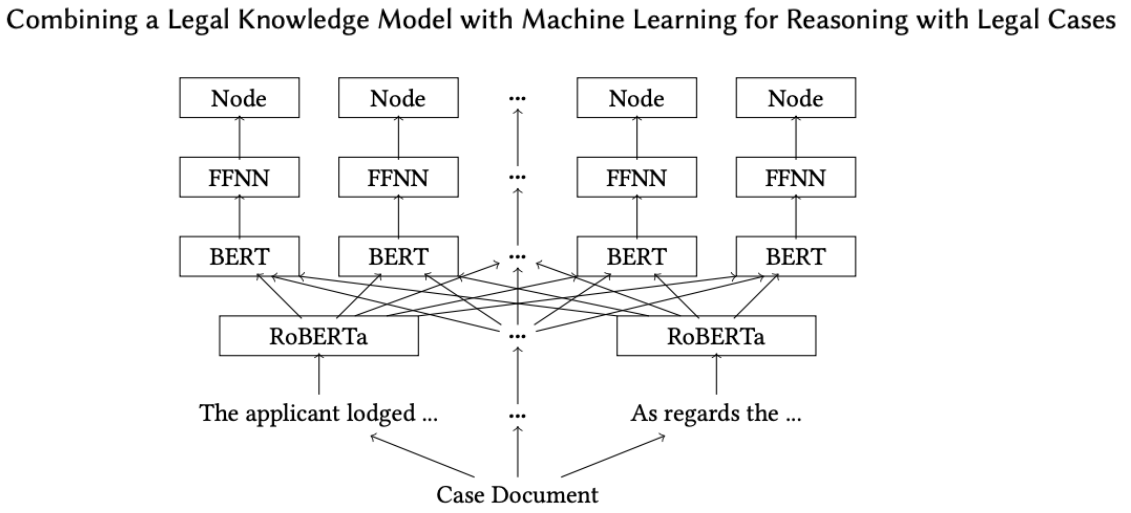
Along with the purpose of this dissertation to help provide analysis of potential patterns within violated and non-violated cases and share the results of this whilst furthering development, it ties in with the original purpose of why these conferences started to be held and the modern-day needs for development. The conference goals are illustrated in the journal set out by Berman and Hafner, who both had been leading figures behind ICAIL and founded the dedicated journal. In an editorial in one of the first issues they stated that ICAIL was “…to provide a forum for sharing research results, problems, and ideas about computational models of law and legal reasoning” [1]. These figures set the foundations of tracing the development of this subfield and headed it into the position it finds itself today with universities now contributing to the research like the ICAIL and JURIX done at the University of Liverpool [3] [4].

The two papers discussed below provided me with legal context I may not have had before but also the understanding of how AI is being used within law to predict the outcomes of the cases. It served me well to get to grips with the technologies used in AI along with what the process is for the AI to conclude on if a case was a violation or not.

The first of these two papers were the JURIX 2022 research paper which tackles the issues surrounding Reasoning with legal cases using symbolic methods like Abstract Dialectical Framework (ADF) with Machine Learning methods like Hierarchical Bidirectional Encoder Representations from Transformers (H-BERT) [3]. The ADF is represented in a table where each node is associated with an ID, a label describing the node, a list of the children node

and a set of acceptance conditions. The conditions come in the form of accept or reject and from here the user is questioned to determine which leaf notes are accepted, thus the leaf nodes have acceptance conditions in terms of the responses to one or more questions, such as “ACCEPT IF Q7 => Q9” [3]. The H-BERT has an encoder that reads text input and a decoder that produces a prediction from contextualising relations between words from the inputted text [5] it’s task in this case is to help learn to ascribe the base-level factor input for the ADF. The leading issue this paper highlights is not being able to justify the outcomes produced in satisfactory legal terms and do not exploit the structure inherent within legal domains and outlines a new hybrid approach to reasoning in legal cases using a new ADF in conjunction with H-BERT [3].

The second paper was the ICAIL 2023 research paper which highlights the complexity, length and sparsity of legal case documents with using Natural Language Processing (NLP) [4]. These methods are critically lacking explain ability and justification of the outputs, which are seen as essential for legal applications. The paper underlying goal was to display the possible effectiveness of using H-BERT models to ascribe to an Angelic Domain Model (ADM) to represent the legal knowledge in a structured way. The ADM allows for a justifiable outcome of a case by connecting it to the nodes of the ADM, where the nodes are the key legal issues and factors representing stereotypical patterns of facts relevant to a particular legal domain [4].



These paper outlines the overwhelming need to discover patterns within legal cases and has provided me with the wider context of what potential patterns are needed to be picked up on to determine a case and push me to understand the legal literacy so that I can better prepare by analysis and allow myself to understand it in the eyes of what is needed of AI in Law.

Data Sources:

When conducting this analysis, the dataset has been provided from the university. This dataset has been created by taking students with legal backgrounds with domain experience and one group without and for each group to look at the ascription of factors to determine which are applicable in individual cases and select the option they thought was most applicable to the violation cases and the non-violation cases.

There were 16 students in the domain group and 11 in the non-domain group and the results of the students have been compiled into the dataset. Students was allowed to choose one option for each factor, one example of a factor was the "Integrity of Evidence", and the options the students could choose from ranged from *positively ascribed, negatively ascribed, not ascribed,* where *positively ascribed* is incremented if the student feels the factor was relevant to the case and satisfied, *negatively ascribed* is incremented if the student feels the factor was relevant to the case and unsatisfied, and *not ascribed* is incremented if the student feels the factor was not relevant to the case.

The dataset has already been anonymised to protect information of the students involved, this activity was given ethical approval by the University, and every measure will be followed to ensure the confidentiality of the data remains this way [6]. Alongside the dataset mentioned above, I will also be using the HUDOC dataset throughout the project [7]. The HUDOC provides metadata of the cases that the students have assessed and will therefore add more context at times to the cases and further my understanding of the data and the cases all together.

Development & Implementation summary:

When performing the key analysis of the dataset used for this project, I will create a workflow plan to manage my way through the dataset in a functional manner to keep the standard of work at the highest level throughout the project. I will split each area of work up evenly, for example spending a similar amount of time looking at the students results with domain experience and the students without the experience. With the analysis stage being the bulk of this project, it is important to prioritise this as without it, there would be no way to articulate the patterns found from the dataset in an informed way, so most of the time will be spent on this. By doing so, I believe it will allow for the dissertation to come across more informed and patterns will have more justification.

Along with the dataset being, I will use the HUDOC dataset also throughout the analysis stage. Whilst the main dataset will be used to discover patterns, the HUDOC dataset will provide more context to the cases and consequently could provide slightly more context about each case that was assessed by the students compared to the dataset from the University as this only tells me if the student thought the factor was apparent in the case or not.

Test & Evaluation:

Rather than testing the dataset, analysis will be performed to discover potential patterns within the cases being analysed. After a pattern may be discovered I plan on checking over the dataset to ensure that my assumptions of a case or cases is correct before starting to understand why this pattern has become apparent. This will ensure that when I come to write up the findings of this project, I will be able to have justifiable reasons to the conclusions and be able to trust the validity of it. The evaluation of this project will therefore be accurate because of the measures put in place to ensure the accuracy of the work and therefore, be able to compare this to the original aims of the project and asses if the measures have been met or not. Ultimately, from all this I believe a clear pattern will emerge and allow for a justified conclusion potentially aid to the development of AI within the legal sector.

Project Ethics & Human Participants:

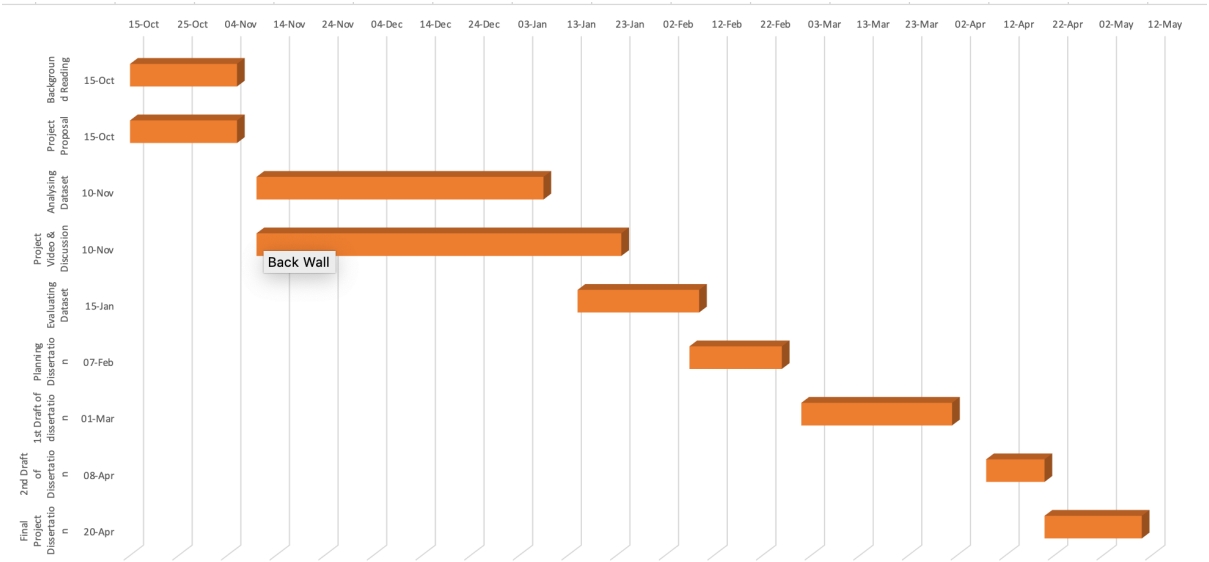
I have read the ethics guideline stated by the university [7] and will meet these standards throughout the whole course of my dissertation. The dataset mentioned in the data source section will be the main area where I will need to try my upmost to stay in the ethical guidelines. Whilst the dataset from the University has already been anonymised, it is still my task to make sure the data does not go elsewhere, for instance if I wanted to display the data in a more readable way for example. The university has provided the permission to use this annotated dataset for this project. The annotated dataset was produced on a research project undertaken at the University of Liverpool and for this project, formal ethical approval from the university was applied for and granted. The dataset can be used for ongoing research purposes, in line with the ethical approval granted, and finally there should be no need for any human participants in this dissertation at all.

Bcs Project Criteria:

The Criteria:	How my project meets the criteria:
An ability to apply practical and analytical skills gained during the degree programme.	Throughout my years of study at the University, there are many modules that I believe has given me the skills to prepare myself for this type of project, some of the modules are Software Engineering, Cyber Security and Analytical Techniques. I believe some aspects from most of my course will be shown throughout this module in various ways.
Innovation and/or creativity.	The innovation this project will show is the fact this type of analysis is required to further the research the University has already been doing and hopefully by the end be of use to allow new types of research and or analysis.
Synthesis of information, ideas and practices to provide a quality solution	Through using analytical techniques and skills learnt throughout my time at university, articulating that in a report manner will show how I have understood the information within this project. With the conclusion at the

together with an evaluation of that solution.	end of this dissertation and evaluating the results of my work will meet this criterion.
That your project meets a real need in a wider context.	Recent studies have started within the University around this topic already and resulted in the annotated dataset being produced [3] [4]. With taking on this type of project I hope to add new further research into this area and allow for further growth, could in turn could allow for development of tools to improve machine learning within this sector.
An ability to self-manage a significant piece of work.	With the significance this project weighs for the degree and the fact it is for the whole academic year, I believe by the end it will show my abilities to manage a significant piece of work with needing to meet deadlines along the way and balance the time need for this project along with other modules and assignments alongside this.
Critical self-evaluation of the process.	With the conclusion at the end of this project, it would allow me opportunity to be self-critical with the analysis I have done and to see if what I have done has met the aims and requirements set out in this proposal which in turn will allow me to evaluate the work that I have produced.

Project Plan:



Risks & Contingency Plans:

Risk:	Contingencies:	Likelihood:	Impact:

Running out of time	Whilst keeping to my project plan, I will allow myself significant time ahead of deadlines to make sure all work is done to the highest of standards but also to allow myself time to submit work at deadlines like the Project video for example.	Low	Whilst running a day or two later personal deadlines is not ideal it would not be as significant as if I was late to submitting the Project Video which could alter my grade at the end of the dissertation significantly.
Hardware failures	I will set regular times to save my work I have done not only to my computer but to external sources such as a hard drive and cloud storage.	Low	For as long as the backups are accessible and kept up-to-date only a small amount of work would be lost which could be done perhaps in a few hours.
Loss of work/backups	I will also store backups on several different sources such as the cloud or external hard drives as it will provide another way of storing my work if one source fails for any reason.	Medium	For as long as I have back-ups on different sources and relatively up-to-date only a few hours of work may be lost.
Analysing dataset	The main purpose of this project is the analyse of the dataset, because of this I will allow myself significantly more time for this as it lays the foundation for the rest of the milestones of this dissertation such as the Project Video or starting to plan how	Medium	Incomplete project and impact on overall grade of the dissertation.

	my dissertation will look with the results from the analysis.		
Unforeseen circumstances (i.e: illness etc)	If the project plan is followed whilst illness and other unforeseen circumstances can never be predicted or planned for, if I have set out a good project plan and on top of the work, having a few days of rest for example should not impact the overall result of the project	Low	Could lead to pushing internal deadlines back and or changing my approach to the dissertation

References:

Accessed 6th November 2023:

[1] Bench-Capon, T. (2022). Thirty Years of Artificial Intelligence and law: Editor's introduction. *Artificial Intelligence and Law*, *30*(4), 475–479. https://doi.org/10.1007/s10506-022-09325-8

[2] Ucl. (2022, May 6). *AI predicts outcomes of Human Rights Trials*. UCL News. https://www.ucl.ac.uk/news/2016/oct/ai-predicts-outcomes-human-rights-trials#:~:text=The%20judicial%20decisions%20of%20the,and%20the%20University%20of%20Pennsylvania

[3] Mumford, J., Atkinson, K., & Bench-Capon, T. (2022). Reasoning with legal cases: A hybrid ADF-ML approach. *Frontiers in Artificial Intelligence and Applications*. https://doi.org/10.3233/faia220452

[4] Mumford, J., Atkinson, K., & Bench-Capon, T. (2023). Combining a legal knowledge model with machine learning for reasoning with legal cases. *Proceedings of the Nineteenth International Conference on Artificial Intelligence and Law*. https://doi.org/10.1145/3594536.3595158

[5] Horev, R. (2018, November 17). *Bert explained: State of the art language model for NLP*. Medium. https://towardsdatascience.com/bert-explained-state-of-the-art-language-model-for-nlp-f8b21a9b6270

[6] Echr. (n.d.). *European Court of Human Rights*. HUDOC. https://hudoc.echr.coe.int/#{%22documentcollectionid2%22:[%22GRANDCHAMBER%22,%22CHAMBER%22]}

[7] *Research Ethics*. Research ethics research ethics- research integrity - university of Liverpool. (n.d.). https://www.liverpool.ac.uk/research-integrity/research-ethics/