A Case for a Robot Judge
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Introduction

Providers across the spectrum of the service sector have adopted characteristics of the industrial sector to scale the services they provide more effectively. In an effort to reduce friction, there has been a widespread adoption of computational techniques to commoditise services that were once artisanal. In particular, artificial intelligence systems have been used to improve the efficiency of a number of service sector fields by replacing the need for human involvement. Whilst the legal sector has incorporated some of these practices, particularly in the case of law firms using technology to expedite repetitive tasks, there has been little progress in the way of integration with mainstream judicial proceedings. This is in part due to the perception of the capabilities of artificial intelligence and its scope as a technology. Many legal professionals will concede that the technology has utility in augmenting lawyers' day-to-day productivity, but fewer will agree that it has a place in making court decisions.

However, the systematisation of judicial proceedings is becoming an important vector for the future of law as it transitions from a bespoke service into a more technical commodity. Artificial intelligence techniques such as natural language processing can already be used to predict the decisions regarding claims with a success rate of 86.6% in certain legal fields[1]. The success of these rulings is substantially influenced by the amount of data available for processing[2]. Fortunately, there is also an increasing supply of this data; transparent blockchain technology is being developed to replace the standard centralised ledgers used for the storage of legal documentation[3], improving the accessibility of previously less accessible data, and the amount of case data available for analysis continues to grow annually.

This poses a societal question: at what point can judges be replaced with artificial intelligence counterparts? These legal artificial intelligence systems are commonly referred to as "robot judges"[4], and for the purpose of this essay will be addressed as such. Whilst transitions such as the introduction of algorithmic trading into the financial sector were a natural follow-on from entrepreneurship, the judiciary is somewhat more resistant to change. Its role in society is sacrosanct to many and any change is guaranteed to have a meaningful social impact on the entire population of a country. Small claims courts, however, provide a relatively low-risk environment to pilot the use of robot judges in a formal judicial setting. They afford the opportunity for litigants in person, those who wish to represent themselves in legal proceedings, to make claims for up to £10,000 without the need of a solicitor[5]. Whilst the small claims courts were introduced to expedite the legal process and reduce fees for both parties, the process is not always frictionless: it can often take from six weeks to six months before a verdict is reached. This is an inefficient use of legal resources and an example of the friction that the use of technology has effectively reduced in other industries. And so, with this context in mind, this essay aims to address a central question:

To what extent could a robot judge replace a human judge in deciding the result of small claims court cases?

The Technological Argument

In determining the extent to which the capabilities of a robot judge can match or exceed those of a human judge, it is important to consider the various technologies that underpin its decision-making process. Relevant technologies can broadly be split into two categories:

1. Rule-Based Systems.
2. Machine Learning Systems.

Rules-based systems are characterised by their approach to decision-making finding its foundations in the interpretation of legal codes as a set of predicates in "if-else statements." As a general example, consider the statement `if P1, P2 then E1`; the statement describes the situation where two legal conditions have been satisfied and, as a result, a legal effect can be considered as part of the decision-making process[6]. Such a system is advantageous in that it naturally represents the same problem-solving procedure as would be followed by a human judge while maintaining a uniformity of structure for legal rules that can sometimes be unclear in the free-form texts from which they are derived. In this way, assuming the decision trees for reaching conclusions are well-formed, such systems should be able to outperform human judges given their far broader understanding of the fundamentals of law.

However, cases can not always be so easily decomposed into binary predicate statements. Rule-based systems are limited by their inability to learn from experience and model open-textured concepts in law[6]. In many cases, there is a 'grey area' concerning the outcome of a claim and human judges must often be given significant leverage in determining an appropriate result. For the purposes of determining the suitability of a robot judge for processing small claims, this grey area is limited given the comparative similarity between claims of the same type and the frequency with which they are made. However, since rule-based systems are not capable of taking advantage of this prior experience, they are not suitable for determining the outcome of small claims court cases by themselves.

Machine learning systems on the other hand do benefit from the experience of previous cases. Such systems comprise a number of different techniques, one of which is natural language processing: a field that combines artificial intelligence with linguistics to process large quantities of unstructured text by simulating the human ability to understand spoken language[7]. In the context of legal documentation, natural language processing is used broadly for indexing legal documentation to be searched for common keywords and identifying key pieces of information in unstructured data that may be critical for a case[8]. Such a system is advantageous because it can consider a large number of similar historic cases in its decision-making process when a human judge would have to rely on their experience alone.

However, machine learning systems, even when used in conjunction with rule-based ones to form a more sophisticated artificial intelligence system, still cannot necessarily interpret the law in a way which appropriately determines the outcomes of claims in an unfamiliar context. In this way, artificial intelligence systems in general are currently incapable of producing justifiable conclusions for cases which have limited historical examples for comparison. Ian Dodd of the legal analytics company Premonition commented on this issue by claiming that "the knowledge jobs will go, the wisdom jobs will stay"[1], implying that cases which require expert insight will always require human involvement and those that do not can be satisfactorily handled using alternate methods. Since the context of interest is limited to small courts claims, the use of robot judges becomes a statistical question: how can cases be appropriately delegated between human and robot judges to ensure accuracy and efficiency in the decision-making process?

The Statistical Argument

In the event that a claim is categorised such that there are few cases for comparison, the reliability of the robot judge to provide a decision of satisfactory data-driven expertise is considerably diminished, raising questions over the probability of an erroneous decision being made. Statistical hypothesis testing dictates that the null hypothesis of a case is defined as the assumption that the claimant has served a valid claim. Assuming that the robot judge was incorrect in its ruling, its erroneous decision can manifest itself in one of two ways:

1. **Type I error**: a true claim is judged false, referred to as a false positive.
2. **Type II error**: a false claim is judged true, referred to as a false negative.

Generally of the two, a Type I error is seen as being more serious. The error is perhaps most famously exemplified by the death sentencing of an innocent person after trial. Whilst there is no guarantee that a human judge will not make the same error, the notion that there is a greater expectation on technological innovations to outperform their human counterparts casts doubt upon the suitability of the technology in high-risk scenarios. A similar phenomenon can be observed in the public perception of self-driving cars; in theory they should provide greater protection for drivers, but high profile accidents that usually result from unfamiliar situations contribute towards a more negative outlook on the technology. It is these unfamiliar situations that would negatively impact the accuracy of robot judges in a similar way and reduce their suitability for replacing human judges.

It is clear that reducing the probability of Type I and Type II errors is important for the successful integration of robot judges into the legal system. One way of achieving this is by only assigning cases to the robot judge that have been pre-screened as being members of a category with enough similar cases to warrant automated judgement, leaving the others to human judges. This eliminates the errors that occur as a result of limited case data to support the decision, whilst allowing the robot judge to process the sorts of cases that it can potentially handle more accurately and efficiently than a human judge. The selection of appropriate cases in this way would involve the use of statistical methods applied to structured case data. Data science techniques can be applied to the sets of data to identify important intra-set patterns and confidence intervals can be established to determine the degree of confidence with which cases can be assigned and judged more reliably[9]. These statistics establish two important facts that could effectively govern the use of the robot judge:

- The estimated probability of success in avoiding Type I and Type II errors (determined by the effectiveness of the algorithms and the available data).
- The confidence level that the estimated probability of success is reliable (determined by the sample size).

Using these two statistics, it is possible to determine which cases will be suitable for robot judges and which ones are better suited for human judges. In this way, the extent to which a robot judge can replace a human judge in processing small courts claims is determined by these statistics – the greater the probability of success and the greater the confidence that the filtering process is functioning as expected, the greater the number of cases that can be reliably processed by a robot judge.

Conclusion

The technological and statistical arguments presented in this essay have suggested that the extent to which human judges can be replaced with robot judges in small claims courts is effectively controlled by the availability of relevant case data. For future research into this area, it would be useful to address the following goals:

- The development of a computational legal system based on a combination of rule-based and machine learning techniques to determine the outcome of a legal case.
- The implementation of appropriate data science techniques to determine which cases should be delegated to robot judges and which ones should be delegated to human judges based on the amount of case data available.
- An investigation into the success rate of the computational legal system in correctly assessing the outcomes of a large number of claims.

Whilst fully replacing human judges with robot judges may be pre-emptive, the overall efficiency of the small claims court system would be substantially improved by automating case proceedings for the most common cases. Claims for remuneration resulting from issues such as compensation for faulty services and goods, disputes between landlords and tenants, and wages owed make up the majority of small claims court claims and could satisfactorily be judged based on past experience and the minimally required evidence alone in most situations[10].

There is still a significant amount more technological innovation to be made before robot judges should be trusted to judge cases of any notable novelty and the nature of small courts cases to fall into predictable categories identifies them as suitable for early-stage adoption of the technology. Over time the use of robot judges could extend beyond the small courts, but the relatively low-risk environment these small courts provide would allow time for the general public to accept the merits of the technology without risking well-publicised failures.

References

[1] Rory Cellan-Jones, 'The Robot Lawyers Are Here And Winning' (BBC News, 2019) <https://www.bbc.co.uk/news/technology-41829534> accessed 1 January 2019.

[2] Nick Ismail, 'The Success Of Artificial Intelligence Depends On Data' (Information Age, 2019) <https://www.information-age.com/success-artificial-intelligence-data-123471607> accessed 1 January 2019.

[3] Paul Sachs, 'The Law & Courts: The Case For Blockchain' (Lawyer Monthly — Legal News Magazine, 2019) <https://www.lawyer-monthly.com/2018/08/the-law-courts-the-case-for-blockchain> accessed 1 January 2019.

[4] Steve Lohr, 'A.I. Is Doing Legal Work. But It Wont Replace Lawyers, Yet.' (Nytimes.com, 2019) <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html> accessed 3 January 2019.

[5] 'Make A Court Claim For Money' (GOV.UK, 2019) <https://www.gov.uk/make-court-claim-for-money/court-fees> accessed 8 January 2019.

[6] Mirna El Ghosh and others, 'Towards A Legal Rule-Based System Grounded On The Integration Of Criminal Domain Ontology And Rules' (2017) 112 Procedia Computer Science.

[7] Prakash M Nadkarni, Lucila Ohno-Machado and Wendy W Chapman, Natural language processing: an introduction (2011) 18 Journal of the American medical Informatics Association

[8] Horizon Scanning Artificial Intelligence And The Legal Profession (The Law Society 2019).

[9] Claus Weihs and Katja Ickstadt, 'Data Science: The Impact Of Statistics' (2018) 6 International Journal of Data Science and Analytics.

[10] Amy Roberts, 'Small Claims Court' (MoneySavingExpert.com, 2019) <https://www.moneysavingexpert.com/reclaim/small-claims-court> accessed 5 January 2019.