Towards Shared Understanding of Proof Beyond Reasonable Doubt

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ABSTRACT

The concept of ‘beyond reasonable’ doubt is a standard of the legal system; however, it is a standard that is not well defined. Differences in the way beyond reasonable doubt is applied in different courts suggest the need for shared understanding of the concept. This paper explores the technique of mathematical modeling to illuminate this concept/abstraction in order to have a shared understanding of the concept, by looking for relations between variables that interact to reach the height of this standard of proof. The justification for the standard rests on many several considerations; however, this paper models the summing up process after those justifications. The cases for the prosecution and the defence in a criminal trial were modeled with Kronecker Delta Function; the models were implemented with Visual Basic to create an easy to use User Interface. New ways of thinking for the purpose of enlarged understanding of concepts across disciplines like law will lead to simulation of interest among public and researchers on the need to support reformation process as communities (local, global, academic) are becoming increasingly diverse and interconnected.

Keyword: Reasonable doubt, Standard, Jurisprudence &Relation

1. INTRODUCTION

“The precise origin and development of the standard represented by the words "beyond a reasonable doubt" for criminal trials are uncertain [1].” “Two primary accounts exist regarding when the reasonable doubt standard first appeared in English and American case law [2].” “One theory, outlined by Judge John Wilder May in an influential article written in 1876 [3],” claims that the reasonable doubt standard originated in the Irish Treason Trials in 1798. “The other theory holds that both English and American courts used the phrase earlier in the eighteenth century; proponents of this theory cite its use during the Boston Massacre Trials in 1770 [4].”

The burden of proof in a criminal trial is of fundamental importance. The law concerning such a critical feature of our system of criminal justice should not be left in a state of uncertainty in which both legal practitioners and Judges continue to debate the true meaning of “beyond reasonable doubt”. Nor should it be left in the current unsatisfactory state where it is well known through practical experience and public knowledge that people experience difficulty with the formula and it is commonly misunderstood. “Martins [5] reports that same applies in countries where the jury system is used, and Judges are unable to provide satisfactory explanations when jurors indicate that they are in difficulty understanding the formula.

Certainty as to the meaning of “beyond reasonable doubt” is required and Judges need the flexibility to respond to juror uncertainty and to provide satisfactory explanations.”Clearly, justice (in the specific sense of fairness and due process) cannot be assured, nor is it even likely, in a system where different judges recommend and different juries (where applicable) use discrepant standards for guilt and innocence. When the height of the bar for conviction is left as indeterminate as it currently is, one has no assurance that a judge will decide any given case at trial according to the same standard that a rival judge, handling the identical case, would use.

In her book, Beyond “Reasonable Doubt” and “Probable Cause,” Barbara Shapiro concludes that throughout the development of the concept of reasonable doubt, writers have recognized the importance of the judge (jury) understanding of two central concepts [6]. First, they must understand there are two separate categories of human knowledge. There is the mathematical category in which it is possible to achieve certainty to the highest level. Additionally there is the empirical category in which absolute certainty is not attainable.
2. RELATED WORK

It is well known that no person in a criminal case can be convicted of a crime unless that person’s guilt is proven “beyond a reasonable doubt.” It would be hard to name a legal doctrine more familiar to the general public. But what exactly is proof “beyond a reasonable doubt”? “Whitman [7] opined that anyone who has served as a criminal judge knows that the rule is not easy to understand.”

There is always some possible uncertainty about any case. Exactly what kind of uncertainty counts as a legal “doubt”? Exactly when are legal “doubts” about the guilt of the accused “reasonable”? Judges are sometimes understandably baffled. Even the some of the most sophisticated members of the legal profession find the question too difficult to answer.

“Experiments by Simon and Mahan show that there is a large variance in the way judges interpret the phrase [8].” The first attempt to quantify reasonable doubt was made by Simon in 1970 [9]. In the attempt, she presented a trial to a group of students. Half of the students decided the guilt or innocence of the defendants. The other half recorded their perceived likelihood, given as a percentage, that the given defendant committed the crime. She then matched the highest likelihood of guilt with the guilty verdicts and the lowest likelihood of guilt with the innocent verdicts. From this, she gauged that the cutoff for reasonable doubt fell somewhere between the highest likelihood of guilt matched to an innocent verdict and the lowest likelihood of guilt matched to a guilty verdict.

Many studies have used a utility approach in an attempt to quantify what the standard of reasonable doubt should be. “One such study was performed by Tribe in 1971 [10].” In the utility approach, negative values are assigned to the utilities of convicting the innocent and acquitting the guilty. Values of zero or positive values are assigned to the utilities of convicting the guilty and acquitting the innocent. The standard is then chosen to maximize utility. Though this approach appears sound, it has its problems. For one, this process requires four subjective judgments to define the values of the four utilities—a large degree of subjectivity. Also, these utilities are based on judgments of the severity of the crime and length of punishment which, if made by the jurors, violate the legal system. Finally, the utility approach suggests different standards for different crimes. The law, however, demands one uniform standard.

In light of the deficiencies in previous attempts to understand reasonable doubt, it is believed that a shared understanding of the concept is needed. This new approach takes up the issue of reasonable doubt from the philosophy of science that teaches us that there is no other way of representing "meaning" except in terms of relations between some quantities or qualities; either way involves relations between variables. This other part investigates the uneasy relationships between Information Technology (IT) and law. “Computers have long been utilised in the legal environment [11].” The main use of computers however, has merely been to automate office tasks. There has been more exciting prospects of using Artificial Intelligence (AI) technology to create computers that can emulate the substantive legal jobs performed by lawyers; to create computers that can autonomously reason with the law so as to determine legal solutions. It has been noted that AI always has a dramatic effect upon any other area of study with which it comes in contact.

“Kirby posited that what AI has done in psychology, linguistics, biology and engineering is to bring about the consideration of different types of problem; suggest new possibilities; provide new analogies and methodologies [12].” It is expected that AI will have the same impact on jurisprudence and legal theory. While there was initial excitement in the prospect of using Artificial Intelligence (AI) technology to create computers that can emulate the substantive legal jobs performed by lawyers; to create computers that can autonomously reason with the law to determine legal solutions. “Modeling the law and emulating the processes of legal reasoning have proved to be more complex and subtle than originally envisaged [11].” “This was why; Susskind opined that early legal expert systems were developed with scant regard for jurisprudence [13].” “Blackshield et al when examining judicial reasoning: opined that while the published reasons for decision lend themselves to objective analysis, the underlying processes of thought involved in exploring and resolving a legal problem are so complex and variable that neither judges nor writers on jurisprudence have been able to reduce the process or method to an adequate explanatory or prescriptive model [14].”

“Many researchers have also argued that law is not what legal expert systems would portray it to be. This is because it is self-contained and autonomous, and embedded in social, political, feeling and interest context [15, 16].” That legal concepts draw upon ordinary human experience, is precisely; what makes them so difficult for an artificial intelligence system. “Modeling the law and emulating the processes of legal reasoning have proved to be more complex and subtle than originally envisaged [11].” Technology and the law have always had an uneasy relationship. This is because the legal world has traditionally been very resistant to change. As a profession, law is generally resistant to change. This of course can be explained based on the fact that conservation, predictability and stability are part of law’s essential mission.

In addition, cultural resistance by the bar and legal restrictions on who may practice law are slowing adoption. However, it is becoming clearer that the law cannot afford to continue to lag behind the rest of society in its acceptance and implementation of new technologies. “Kirby noted that the capacity to cope with change is constantly being tested.” “While modern legal practice has adopted IT in many areas, these legal tools do not typically match the sophistication of tools found in other industries [13].” “Besides basic software like word processor and email, law firm often have comprehensive networked document retrieval systems, while courts and government agencies have electronic filing systems [17].”
“However, these tools lack the analytical power of IT used in the other sectors of the business world (Jenkins, 2008) [18].” Skepticism abounds about the efficacy of Artificial Intelligence (AI) applications, and many technical challenges to implementation remain.

3. MATERIALS AND METHODS

In this paper, the focus is on reinterpretation of an existing concept/system (standard of proofs in criminal trials) in an abstract form. We proceed from gathering of information about the concept/system being studied. Unlike in social science rendition that first collect lots of data and then runs regression on it, this study proceeds from observation, then models, which guide data collection. There was an extensive consultation between the researchers, domain experts, and literatures (primary and secondary sources of law). It also involves the use of logic, reasoning intelligence and intuition of the researchers. Thus, the study is based on the internal knowledge of the researcher’s creativity, conceptual thinking and communication skills in capturing the essence of the system/concept under study. In addition, deeper understanding of the system were gained through interview, trends and consultation of relevant materials like books, journals and Internet to answer various questions. This is because each data gathering procedure, device or instrument has its own particular weakness, and there is merit in using multiple methods, supplementing with others to counteract and generate more adequate and balanced information.

A model represents a change on the scale of abstractions: certain particularities have been removed and simplifications are made to derive a model. Models are used as tools for dealing with reality. They are caricatures of real system specifically build to answer questions about it, by capturing a small number of key elements and leaving out numerous details, models help us to gain a better understanding of reality and the design principle it entails. This model is limited to assessment of standard of proof while in actual fact the activity of determining the truth of the parties’ claim by the judge is more elaborate. Computation is the ultimate abstraction of a formal mathematical system, or an axiomatic system. It is defined by the purely syntactic process of mapping symbols to symbols, such mapping is the basis of the concept of mathematical function, and it is all that computers do. This abstraction requires that all the procedures to manipulate symbols are defined by unambiguous rules that do not depend on physical implementation, space, time, energy considerations or semantic interpretations given to symbols by observers.

Standard of proof simply means quality of proof. In other words, there is a minimum or baseline standard that the law, statutory or otherwise, has placed on parties in both civil and criminal litigation to meet before they could be said to have successfully discharged their respective burdens of proof. According to the Black’s Law Dictionary “standard of proof” means:-

The degree or level of proof demanded in a specific case, such as “beyond a reasonable doubt” or “by a preponderance of the evidence.”

In a criminal case, the prosecution is required to satisfy the court that the defendant’s guilt is “beyond reasonable doubt.” In the light of importance of standard of proof to due process and equal protection, this study has taken it on itself to reinterpret the standard. This approach takes up the issue of interpreting beyond reasonable doubt by borrowing the tools and methods of mathematical relation and function, using logic, reasoning, intelligence and intuition for the purpose of enlarge understanding of the concept. The resulting model is a Delta function, referred to as Kroneker Delta function. Let A = a₁, a₂,… aₙ be the set of elements/ingredients of an offence (conditions to be satisfied) and let B= b₁, b₂, …, bₙ be the correspondence proof of each element/ingredient (satisfaction of each condition) respectively. Then

Definition 1.1: A relation between elements of A and elements of B is a subset of A x B.

Definition 1.2: A function from A to B is a relation between the elements of A and B such that each element of A is associated with only one element of B.

If f is a function from A to B we write, \[ f: A \rightarrow B \]

The condition that each element of A is associated with a unique element of B can be stated by saying that, if \( a = b \), then \( f(a) = f(b) \). This is called the well definedness property of a function.

Definition 1.3: If \( f: A \rightarrow B \) A is called the domain of the function and B is called the range.

Definition 1.4: If \( f: A \rightarrow B \) and the converse of the well definedness property is true, i.e., if \( f(a) = f(b) \) then \( a = b \), then the function is said to be one to one.

Definition 1.5: If \( f: A \rightarrow B \) and if every element of B comes from some element of A, then we say that the function is onto.

Definition 1.6: If a function is both one to one and onto, we say that it is a one to one correspondence.

Definition 1.7: If A and B are two sets, and if there is a function, \( f: A \rightarrow B \) which is a one to one correspondence, then we say that A and B are equivalent.

The satisfaction of the equivalent property (condition) is a necessary and sufficient condition by law to be satisfied by the Prosecution in order to convince the Court of the guilt of the defence.
The Model

![Description of the Model](image)

4. RESULTS AND DISCUSSION

**Definition 2.0:** Kronecker Delta Function ($\delta_{ij}$) is a function of two variables $i$ and $j$, which equals 1 when the variables have the same value, $i = j$, and equals 0 when the variables have different values, $i \neq j$.

Let $x_i =$ set of elements or ingredients required to prove the standard of proof

$$V(x_i) = \begin{cases} 1, & x_i = 1 \\ 0, & \text{otherwise} \end{cases} \text{ where } i = 1 \text{ to } n$$

The interpretation of this function goes thus: It does mean that after the court must have heard the cases of the prosecution and the defence, the verdict function $V(x_i) = 1$, if at the end of case, the prosecution was able to: (a) prove all the essential elements of the alleged offence; (b) the evidence adduced by the prosecution has not been discredited as a result of cross examination; (c) the evidence adduced by the prosecution is reliable; and (d) satisfy any other condition(s) which could affect the likelihood of a conviction. In this scenario every $x_i$ represents the element of the offence and the domain/independent variable of the relation, while proved/not proved, or satisfied/not satisfied, or 0/1 represents the outcome of each $x_i$ and the range/dependent variable of the relation. The model is validated by calibrating it to data (outcomes of previous cases) and they were in agreement.

6. MODEL IMPLEMENTATION

![Proof of Elements](image)
7. CONCLUSION

The suitability of any explanation of the term "proof beyond reasonable doubt" is in the eye of the beholder, no explanation will be entirely satisfactory to all. The proposed explanation, however, serves to provide at least a basic framework for the average mind and precludes them from having to invent their own definition. Use of the reasonable doubt standard is indispensable to command the respect and confidence of the community in applications of the criminal law. It is critical that the moral force of the criminal law not be diluted by a standard of proof that leaves people in doubt whether innocent men are being condemned. It is also important in our free society that every individual going about his ordinary affairs have confidence that his government cannot adjudge him guilty of a criminal offense without convincing a proper fact finder of his guilt with utmost certainty. The paper is justified on the following grounds:

(i) Lawyers rarely share common approaches to problem solving (Costanzo, 1994) [19], which might be accounted for in part by the differences in perception, thinking style and personality. A shared model valid for or adaptable to many situations would facilitate discussion about the problem solving process between professionals. The model would contain shared understanding of both process and content. A problem solving model would be used to integrate the approaches of all personality types.

The use of a legal computer model would enhance consistency in decision making and could act as:

a) as a checklist for the categories of relevant risk factors a lawyer needs to avoid;

b) as a directing device for structuring problem solving so that lawyers do not get drawn into one aspect of the problem solving process (perhaps by personal preferences), and forget about other aspects; and

c) as a checklist of choices of thinking, communicating and acting so that all possible choices are considered.

(ii) Demonstration of how legal decisions are made through mathematical modeling and computer implementation will lead to better community understanding of the legal domains. This has the potentials of leading to less public criticism of judicial decision making.

REFERENCES


