

ABOUT TWO APPROACHES TO ASSESS LEGAL ARGUMENT QUANTITATIVELY

Two different approaches to assess legal argument quantitatively on base of logic probability concept are analyzed: Leibnizian approach and objective Bayesianism. Specificities and ranges of application of these approaches are elucidated. In frame of the Leibnizian approach, some formulas, which permit under given initial data to calculate argument strength, were introduced already. However, in nontrivial cases, assigning of the initial data is a matter of human intuition partially, and this intuition seems irreducible today. This circumstance challenges certainty and accuracy of the qualitative assessment, firstly. Secondly, any complete electronic justice prospect must demand a completion of artificial intelligence by artificial intuition, which will not yield up to natural one at least.

Key words: legal argument, logical probability, Leibnizian approach, objective Bayesianism, intuition, complete electronic justice.

Проаналізовано два різних підходи у кількісній оцінці юридичного аргументу, що базуються на понятті логічної ймовірності: Ляйбніцев підхід і об'єктивний байесіонізм. Прояснено особливості й області застосування цих підходів. У межах Ляйбніцева підходу певні формули, котрі дозволяють за відомими вихідними даними обрахувати силу аргументу, вже знайдені. Проте у нетривіальних випадках встановлення потрібних даних виявляється почасти справою людської інтуїції, і ця інтуїція сьогодні видається неусувною. Дана обставина, по-перше, проблематизує достовірність і точність виконуваної кількісної оцінки. По-друге, будь-який проект повного електронного правосуддя повинен вимагати доповнення штучного інтелекту штучної інтуїцією, котра, щонайменше, не поступається за силою природній.

Ключові слова: юридичний аргумент, логічна ймовірність, Ляйбніцев підхід, об'єктивний байесіонізм, інтуїція, повне електронне правосуддя.

Проанализированы два различных подхода в количественной оценке юридического аргумента, базирующиеся на понятии логической вероятности: Лейбницева подход и объективный байесионизм. Прояснены особенности и области применения этих подходов. В рамках Лейбницева подхода некоторые формулы, позволяющие при известных исходных данных рассчитать силу аргумента, уже найдены. Однако в нетривиальных случаях установление нужных исходных данных отчасти является делом человеческой интуиции, и эта интуиция сегодня представляется неустранимой. Данное обстоятельство, во-первых, проблематизирует достоверность и точность выполняемой количественной оценки. Во-вторых, всякий проект полного электронного правосудия должен требовать дополнения искусственного интеллекта искусственной интуицией, которая, по меньшей мере, не уступает в силе естественной.

Ключевые слова: юридический аргумент, логическая вероятность, Лейбницева подход, объективный байесионизм, интуиция, полное электронное правосудие.

Once upon a time Michel de Montaigne, who had relevant education and practice in law, noted a quite interesting observation: "I have heard tell of a judge who, when he come across a sharp conflict between Bartolus and Baldus, or some matter debated with many contradictions, used to put in the margin of his book, 'Question for my friend'; that is to say, that the truth was so embroiled and disputed that in a similar cause he could favor whichever of the parties he saw fit. It was only for lack of wit and competence that he could not write everywhere: 'Question for my friend'..." [1, p. 439]. More then four centuries have gone since then but who will dare to insist that the situation is much better today? Even if such individuals exist, who can object categorically that a lot of investigation versions are put forward and some sentences are elaborated on verisimilar not certainly true grounds?

On the contrary, competent experts will agree that till now in all fields of social space numerous situations exist when it is impossible to avoid non-demonstrative reasoning with verisimilar data – because of complexity of reality, lack of time or other resources, limitation of perception, memory, will, intellect of human beings after all. In field of law these situations are natural, firstly, on the stage of investigation of nontrivial crimes especially at the beginning, when information is incomplete, inaccurate or even contradictory: this creates ground for many different or even mutually

exclusive versions; secondly, on the stage of adversary trial, when competition of opposite parties precedes final sentence and each party articulates its own “absolutely reliable evidence and arguments”, which, nevertheless, not always carry off “weighting on the Themis’ scale” successfully.

Verisimilar data, including a part of legal evidence, in the process of further testing, sometimes quite complex and long-run, must receive definite logical value – either truth or false. However, if right now a piece of data – an articulated proposition – is verisimilar, it is more or less “nearer to truth” only. Such situation-dependent “proximity to truth” and, respectively, not purely subjective but “objectively subjective” degree of belief in the proposition are grasped by concept of logical, or epistemological, probability.

Canadian scholar Ian Hacking showed that birth time of the contemporary concept of probability was around 1660. And from the very beginning it is Janus-faced: “On the one side it is statistical, concerning itself with stochastic law of chance process. On the other side it is epistemological, dedicated to assessing reasonable degree of belief in propositions quite devoid of statistical background” [2, p. 12]. It is worth noting that both these “faces” of probability are important in field of law today. Nevertheless, this article deals with logical probability as a basic concept for the legal argument assessment only.

Gottfried Wilhelm von Leibniz is widely recognized as one of the logical probability founders. “I am particularly interested in that part of logic, hitherto hardly touched, which investigates the *estimation of degree of probability* and the weights of the proofs, suppositions, conjectures, and criteria”, – he proclaimed [3, p. 15]. “Even if it is only a question of probabilities we can always determine what is most probable on the given premises”, – stressed this famous author around 1680 [4, p. 38]. It is important to note that the Leibnizian concept of probability emerged in field of law [see, e. g.: 2, p. 85-91].

Jacob Bernoulli – author of fundamental “*Ars Conjectandi*” – was an epistemological probability founder as well. Bernoulli had important correspondence with Leibniz on this topic [see, e. g.: 5, p. 92-93; 2, p. 145-146].

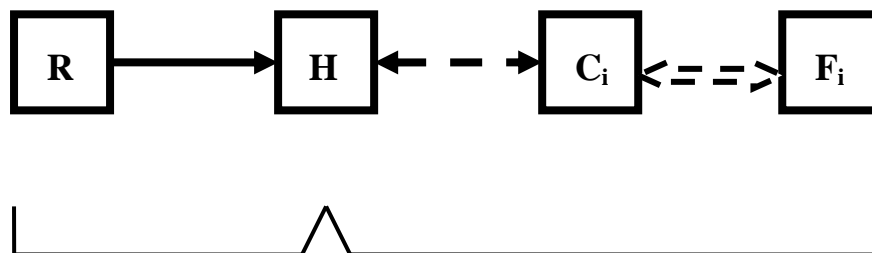
As Leibniz’s philosophy in whole, his conception of probability was rationalistic by essence. It means that argument-building and finding of some truth value or, at least, probability of the argument conclusion are to be determined by power of reasons exclusively – on the ground of assigned initial data by means of accurate rules in accordance with the famous directive “Let us calculate!” Today belief in absoluteness of such sort “calculations of reason” is undermined. But in general algorithm of crime investigation, which is realizable as a special case of the hypothetico-deductive method of knowledge, pure rational assessment of argumentation seems quite appropriate, for instance, on the first stage – when versions are put forward and preliminary comparison of these ones is important. In the pure pragmatic aspect, calculation of strength of the rival versions and their speculative “weighting” might be useful under limits of time and/or any other resources in order to find and work out the most verisimilar ones at first.

At the beginning of 20th century John Maynard Keynes made an important contribution to the Leibnizian approach. The author of well-known “*Treatise on Probability*” emphasized “the existence of a *logical relation between two sets of propositions* in cases where it is not possible to argue demonstratively from one to other” [6, p. 9]. This idea of specific logical relation, or probability-relation, between initial reasons and relevant conclusion has opened a door to assess strength of an argument in terms of logical probability wider. But Keynes did not offer a complete method to assess strength of arguments based on probable premises, or reasons.

Under influence of Keynes Rudolf Carnap deepened understanding of difference between the two “faces” of probability. As he pointed out: “<...> the statements on statistical probability <...> occur *within* science, for example, in the language of physics or in economics (taken as object language). On the other hand, the statements of logical or inductive probability <...> express a logical relation between given evidence and a hypothesis, a relation similar to logical implication but with numerical value. Thus these statements speak *about* statements of science; therefore they do not belong to science proper but to the logic or methodology of science formulated in the metalanguage” [7, p. 75]. Carnap distinguished two main species of probability clearly: logical probability (also called “probability₁”) and statistical probability (“probability₂”) [8, p. 967].

Approximately since the seventies of the 20th century new wave of interest to quantitative approach in legal argumentation has risen especially in frame of the New Evidence Scholarship. This

Scholarship is grounded on the Janus-faced concept of probability definitely [see, e.g.: 9, p. 309]. Today the New Evidence Scholarship exists as interdisciplinary inquiry with wide range of basic ideas, schools, methods, and outcomes. But most often it is still associated with probability and proof, including evidence scholarship that applies formal tools of probability theory, such as Bayes' theorem [10, p. 984-985]. Nevertheless, the situation remains uncertain and far from stability: under these conditions, additional ideas and studies are important. This article aims to discuss one original approach to assess legal arguments quantitatively, which is grounded on the concept of logical probability in accordance with the Leibniz' ideas. This approach is allied but not equivalent to the objective Bayesianism, described, for instance, by Australian researcher James Franklin: "The (objective) Bayesian theory of evidence (also known as the logical theory of probability) <...> holds that the relation of evidence to conclusion is a matter of strict logic, like the relation of axioms to theorems, but less conclusive" [11, p. 546].



Range of application of
the Leibnizian approach

Range of application of the
objective Bayesianism

*Ranges of application of the Leibnizian approach
and objective Bayesianism*

With reference to the hypothetico-deductive method (see the simplest variant on the figure above) it is naturally to correspond the Leibnizian approach with stage of putting forward and preliminary speculative assessing of hypotheses (versions) **H** on base of data about probable reason **R** and strength of probability-relation between **R** and **H**:

$$P(H) = P(R) \times p(H/R).$$

The objective Bayesianism corresponds to stage of final examination, or working out, of the **H** by means of deducing some special conclusions **C_i** and comparing these ones with new observable data **F_i**.

Basic for the objective Bayesianism is the formula, which describes elementary relation between the **H** and relevant conclusion **C_i**:

$$P(H/C_i) \times P(C_i) = P(C_i/H) \times P(H).$$

This Bayes' formula includes terms of *a priori* probabilities **P(C_i)** and **P(H)** as well as conditional probabilities **P(C_i/R)** and **P(R/C_i)**. To calculate the conditional probability **P(H/C_i)** it is necessary to find data about values of three other probabilities including **P(C_i/H)**. In contrast, the Leibnizian approach does not presuppose initial data about **P(H)** and **P(C_i/H)**. Therefore, it is applicable when necessary conditions to calculate any derivations from the Bayes' formula are absent yet. Even more, the Leibnizian approach creates a ground for such calculations.

In accordance with the Leibnizian approach any well-grounded attempt to solve the quantitative assessment problem must take into account two important tasks: 1) by which formulas it is possible to calculate the argument strength under given initial data; 2) how to find, or assign, these initial data including structure diagram, probabilities of basic reasons, and strengths of probability-relations within the argument. Both these tasks were discussed in detail in my previous papers [see, e.g.: 12; 13; 14] especially in connection with some basic ideas of contemporary

Canadian researcher John Black and famous Australian judge David Hodgson. Therefore, now I would like to point out few principal points only.

Some practicable formulas by which under given structure, probability of initial reasons, strength of probability-relations within an argument it is possible to assess the argument strength quantitatively have been introduced already [see, e.g.: 15]. These ones are under discussion, improvement, generalization yet. However, it does not exhaust the quantitative assessment problem: there exists a serious initial data challenge. Assigning of the initial data necessary to assess the legal argument strength (probability of initial pieces of evidence and strength of probability-relations within the argument) in non-trivial cases is not completely objective and rational procedure. When there are some reasonable guidelines, which direct and restrict the assigning, they are unable to eliminate situational insights of individual intuition completely. “Bayes’ theorem can never itself give us the probabilities that it needs to get started, in particular the prior probability of the hypothesis being considered, and the prior probability of each piece of evidence. Since common-sense reasoning is generally required to produce these ‘priors’, there seems little justification for attempting to exclude it entirely, in favour of purely quantitative rules, in later stages of the reasoning process”, – D. Hodgson had insisted [16, p. 64]. In addition, in the realistic situations “Bayes’ theorem can fairly be regarded as a procedure for checking the consistency of one’s intuitions as to probability – and not as anything more than this” [17]. It looks like a tautology but the initial data about different probabilities are itself more or less probable. Probable and approximate character of the initial data spreads with necessity on the quantitative assessment of argument grounded on these data. This challenge seems actual to any quantitative approach based on the logical probability concept.

It is very hard to imagine an investigator or judge who in everyday work evaluates all evidence quantitatively and calculates final decisions by precise formulas exclusively. So, is it a valuable goal to elaborate a complete method to assess the legal argument strength quantitatively? New essential justification for this goal appeared last decades when a new period in the human history called “Informational epoch” begun. An attribute of this epoch consists in catching practically all people on the planet by diverse electronic nets. And if the electronic politics exists, why would not construct complete electronic justice with wholly objective and errorless artificial intelligence as a judge? Some theoretical studies in this direction have been made already; technical elements of e-justice, in particular e-filing systems or omnipresent tracking services became a part of everyday life in many countries; few years ago “European e-justice portal” was established, and so on [see, e.g.: 18; 19].

Ardent adherents of the e-justice idea must remember, however, the long-standing observation of Michel de Montaigne as well as the contemporary conclusion of David Hodgson. They both confirmed essential complexity of some real cases, on the one part, and, on the other part, irreducible role of common sense and intuition in comprehension of these cases. These factors challenge pure rational assessing of legal argumentation. Artificial intelligence, quite powerful and free from the references like “Question for my friend”, would be able to gather massive information and process it more detailed and faster than any judge-human, of course. But would the rational machine be able to assign all probabilities of initial reasons and strengths of probability-relations within arguments necessary for successful assessment? It is worth to remind here one generalization of Keynes: “In *all* knowledge, therefore, there is some direct element; and logic can never be made purely mechanical. All it can do is so to arrange the reasoning that the logical relations, which have to be perceived directly, are made explicit and are of a simple kind” [6, p. 15].

Therefore, at least because of the uniqueness of intuition human beings will not lose the principal role in legal argumentation and, so, in field of law in whole in the foreseeable future. This does not reject neither partial help of the artificial intelligence today, no, presumably, principal possibility to fulfill a complete electronic justice project with a lapse of time. The latter prospect presupposes, of course, a completion of the artificial intelligence by artificial intuition which will not yield up to natural one at least.

Conclusions

In frame of rational attempts to advance legal argumentation and decision-making, it is necessary to pay attention to special approach to assess the arguments quantitatively, which is grounded on the concept of logical probability in accordance with some Leibniz’ ideas.

With reference to the hypothetico-deductive method, it is reasonable to correspond the Leibnizian approach to stage of putting forward and preliminary speculative assessing of crime versions whereas the objective Bayesianism – to further comprehensive working out of these ones. Fulfillment of the Leibnizian approach is possible whereas the precondition to use the Bayes' formula did not appear yet.

Any well-grounded attempt to solve the argument quantitative assessment problem by means of the approach mentioned must take into account two basic tasks: 1) by which formulas it is possible to calculate the argument strength under given initial data; 2) how to find necessary initial data which include structure diagram, probabilities of basic reasons and strengths of probability-relations within argument.

Some formulas to assess the argument strength under given initial database are known today. However, Keynes, Black, Hodgson and others thinkers have stressed that assigning of the necessary initial data is not pure rational procedure and needs in human intuition directly or per common sense, folk psychology, etc. The irreducible role of the intuition in assigning the initial data challenges certainty and accuracy of the legal argument assessment in non-trivial cases. This challenge seems actual to any quantitative approach formulated in terms of logical probability.

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