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COMPLETE ELECTRONIC JUSTICE: PRO ET CONTRA

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I. Once upon a time Michel de Montaigne, who had been educated in law and had relevant practice, 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 than four centuries have gone since that time but who will dare to insist that the situation is much better today?

New essential prospect to overcome the situation described by Montaigne appears last decades when a new period in the human history called «Informational epoch» begins. An attribute of this epoch consists in creation and expansion of numerous implementations of artificial intelligence practically in all fields of the social spaces including catching of the most part of people on the planet by diverse electronic nets. Life in the «new electronic world» enters into competition with «genuine life»… and brings forth the «Matrix» danger? Anyway, if the electronic politics exists, why would not construct complete electronic justice with sufficiently powerful and wholly objective artificial intelligence as investigator and judge? Some theoretical studies in this direction have been made already [2, 3]; technical elements of e-justice, in particular e-filing systems or omnipresent tracking services became a part of everyday life in many countries; about three years ago «European e-justice portal» was established, and so on [4].

Prospect of complete electronic justice potentially includes a set of different aspects and problems. This article is devoted to analysis of one basic problem mainly: is it possible a pure rational quantitative assessment of legal argument in process of decision-making in the field of law?

II. Competent experts agree that 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 the 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 the final sentence and each party articulates its own «absolutely reliable evidence and arguments» that, 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, so to speak, «objectively subjective» degree of belief in the proposition is 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 was 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» [5, p.12]. Both these «faces» of probability are important in the field of law today. Nevertheless, this article deals with logical probability as a basic concept for the legal argument quantitative assessment only.

Gottfried Wilhelm von Leibniz is widely recognized as one of the logical probability found-

ISSN 1995-6134

ers[1]. «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 [8, p.15]. «Even if it is only a question of probabilities we can always determine what is most probable on the given premises», – this famous author insisted around 1680 [9, p.38]. It is important to note that the Leibnizian paradigm of probability emerged in the field of law [5, p.85–91].

As Leibniz's philosophy in whole, his paradigm of probability was rationalistic by essence. It means that argument-building and finding of the argument conclusion probability have to be fulfilled by power of reason 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, of course. But in general algorithm of crime investigation, which is 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 them 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 the 20th century John Maynard Keynes made an important contribution to the Leibnizian paradigm. The author of «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» [10, p.9][2]. This idea of specific logical relation, or probability-relation, between initial reasons and relevant conclusion opened a door to assess strength of an argument in terms of logical probability wider. But when Keynes, among other things, elaborated general and accurate description of the probability-relations for different sorts of arguments, he did not offer a complete method to assess strength of arguments based on probable premises (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» [11, p.75]. Carnap distinguished two main species of probability clearly: logical probability (also called «probability$_1$») and statistical probability (also called «probability$_2$») [12, p.967].

Studies in logical probability in comparison with studies in domain of its twin-rival – statistical probability – were less regular and produced fewer results. Significant steps of Leibniz, Keynes and, for instance, Carnap were separated by centuries or at least decades of years. One clear source of this divergence lies in different target audiences or, better to say, audiences of justification: if statistical probability is a necessary everyday tool of a huge mass of different users for mathematical, natural, economical, etc. theoretical researches and practices, logical probability traditionally is of interest to philosophers, logicians and law scholars partially. Also the difference in audiences of justification is able to explain, at least in part, why logical probability has received some conceptual explication but it still lacks a complete practicable apparatus of quantitative assessment.

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[1] Jacob Bernoulli – author of the fundamental «Ars Conjectandi» [6] – was a founder of epistemological probability as well. Bernoulli had important correspondence with Leibniz on this topic [5, p.145–146; 7, p.92–93].

[2] More explicitly, Keynes had insisted: «Let our premises consist of any set of propositions **h**, and our conclusion consists of any set of propositions **a**, then, if knowledge of **h** justifies a rational belief in **a** of degree **α**, we say that there is a probability-relation of degree **α** between **a** and **h**». And «this will be written **a/h = α**» [10, p.4].

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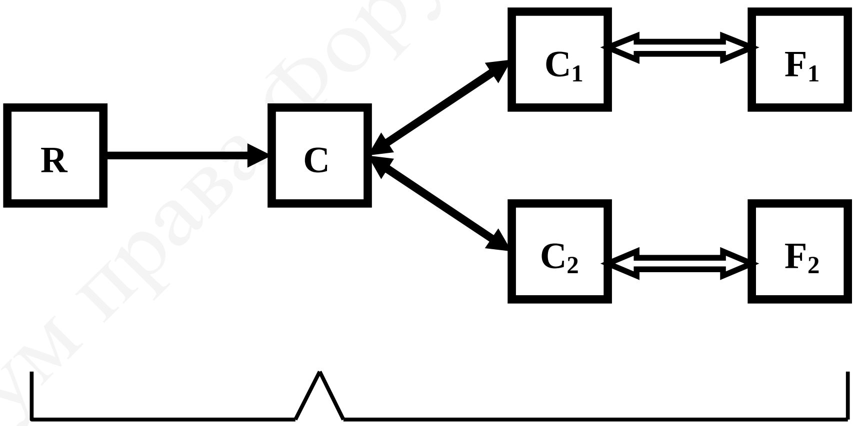
2013-1

Approximately since the seventies of the 20th century a 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. In accordance with a British scholar John D. Jackson, for example, «the Pascal / Bayes school of probability and uncertainty and the Baconian / Cohen school of inductive probability have attached particular attention but a number of others have come to fore» [13, p.309]. Today the New Evidence Scholarship exists as interdisciplinary inquiry with wide range of basic ideas, schools, methods, and outcomes but the most frequently it is still associated with probability and proof, including evidence scholarship that applies formal tools of probability theory, such as Bayes' theorem [14, p.984–985]. Nevertheless, the situation remains far from stability: under these conditions additional ideas and researches are important. Therefore, 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 Leibnizian paradigm. It seems reasonable to identify this approach as 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», – he pointed out [15, p.546].

A formula which describes elementary relation between reason **R** and conclusion **C** supported by this reason is basic for the «objective Bayesianism»:

$$\mathbf{P(C/R) = P(R/C) \times P(C) / P(R).}$$

This Bayes' formula, or theorem, includes terms of *a priori* probabilities **P(C)** and **P(R)** as well as conditional probabilities **P(C/R)** and **P(R/C)**. To calculate the conditional probability **P(C/R)** it is necessary to find data about values of three other probabilities including **P(R/C)**. In contrast, the Leibnizian paradigm does not presuppose initial data about **P(C)** and **P(R/C)**. Therefore, it is applicable when necessary conditions to use the Bayes' formula or some derivative from it are not created yet.



Range of the Leibnizian Range of the «objective paradigm application Bayesianism» application

Figure 1 – Divergence of ranges of the Leibnizian approach and the «objective Bayesianism» applications

With reference to the hypothetico-deductive method (see the simplest variant on Figure 1) it is naturally to correspond the Leibnizian approach with stage of putting forward and preliminary speculative assessing of hypothesis (version) **C** on base of data about probable reason **R** and strength of probability-relation between **R** and **C**. The «objective Bayesianism» corresponds to stage of final examination, or working out, of **C** by means of deducing some special conclusions

ISSN 1995-6134

$\mathbf{C_i}$ and comparing these ones with new observable data $\mathbf{F_i}$.

In accordance with the Leibnizian approach any well-grounded attempt to solve the quantitative assessment problem 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, or assign, these initial data including structure diagram, probabilities of basic reasons, and strengths of probability-relations within the argument.

III. About twenty years ago Canadian logician John Black published an article stimulated by discussion at the Second Conference of the International Society for Study of Argumentation, held in 1990 at the University of Amsterdam. With direct reference to Stephen Thomas and Mark Buttersby, he offered a quantitative approach for assessing degree of support of an argument conclusion by its reasons, and hence the argument strength. This approach was grounded on the well-known probability calculus [16, p.21–30].

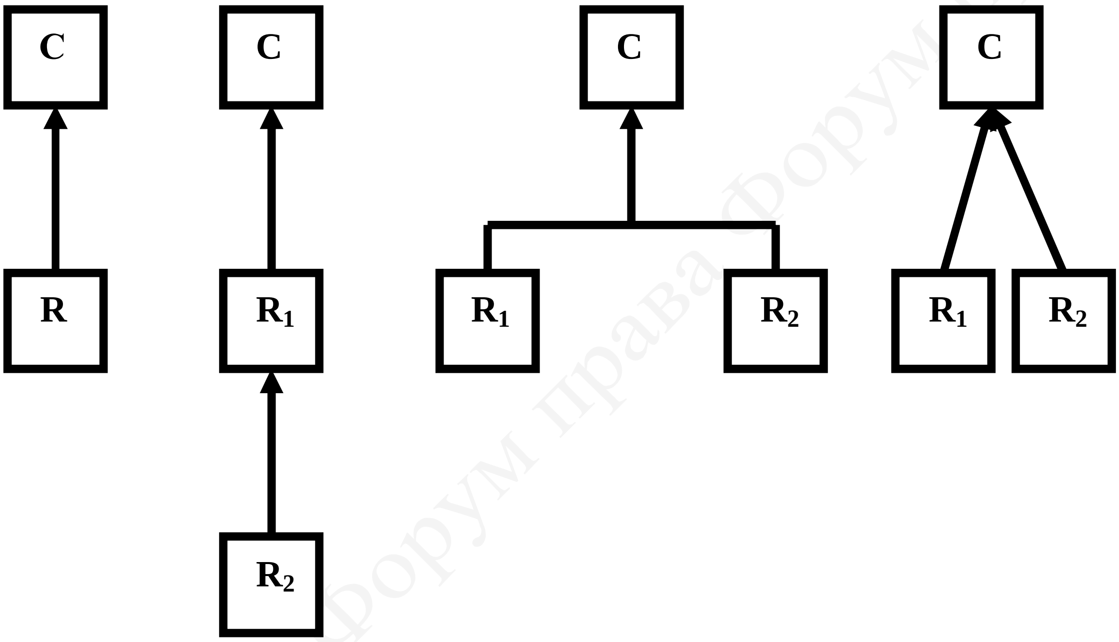


Figure 2 – Diagrams of elementary arguments with different structures

Black summarized formulas to assess strength of a few different elementary arguments (see diagrams on Figure 2). Under given structure the argument strength depends on values of logical probability of initial reasons $\mathbf{P(R_i)}$ and strengths of probability-relations within the argument with final conclusion **C**. For argument with one reason it was proposed (for the sake of convenience a little bit changed notations are used now):

$$\mathbf{P(C/R) = P(R) \times p(C/R)}.$$

Here **P(C/R)** means probability of **C** on hypothetical reason **R**; **p(C/R)** denotes strength of the probability-relation between **R** and **C**, or strength of the support for **C** under given **R**. By definition $\mathbf{0 \leq p(C/R) \leq 1}$.For a serial argument with two reasons:

$$\mathbf{P(C/R_1R_2) = P(R_2) \times p(R_1/\,R_2) \times p(C/\,R_1)}.$$

For a convergent argument:

$$\mathbf{P(C/R_1,R_2) = P(C/R_1) + P(C/R_2) - P(C/R_1) \times P(C/R_2)}.$$

Finally, for a linked argument it was proposed:

$$\mathbf{P(C/R_1\&R_2) = P(C/R_1) \times P(C/R_2) \times p(C/R_1\&R_2)}.$$

There are no principal difficulties to generalize these clear formulas[3] But now it is more important to point out that Black offered a way to calculate not only a degree of support for **C** un-

[3] In addition to the Black’s paper see, e.g. [17, p.64–69].

ISSN 1995-6134

der given reason $\mathbf{R_i}$ but also influence of the relevant counter-reason, directed at conclusion **C** [16, p.25–26].

Let a counter-reason $\mathbf{R_2}$ is put at conclusion **C**, supported by reason $\mathbf{R_1}$. In this case, probability of **C** and, respectively, strength of its «native» argument has to change. In accordance with Black, new value of the strength will be described by the formula:

$$\mathbf{P(C/R_1 \backslash R_2) = P(C/R_1) - P(C/R_1) \times P(\neg C/R_2)}.$$

It is easy to see that $\mathbf{P(\neg C/R_2)}$ means probability of counter-conclusion **¬C**, supported by the counter-reason $\mathbf{R_2}$. Taken together they form relevant counter-argument. The diagram of initial argument and counter-argument is presented on Figure 3. Logic relation between conclusion **C** and counter-reason $\mathbf{R_2}$ is shown by a dot line as well as similar relation between **¬C** and $\mathbf{R_1}$.

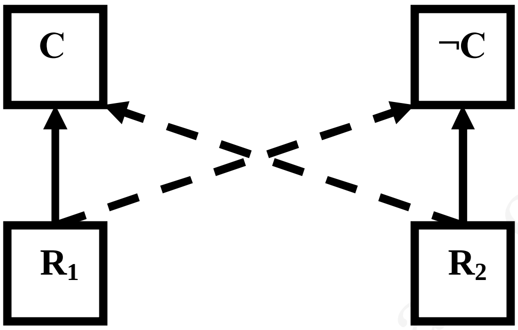


Figure 3 – Diagram of the argument and counter-argument

Let us apply all this to an example.

A prosecutor had accumulated some evidence **G** concerning a defendant and deduced the accusatory conclusion: it had probability **P(C/G) = 0.9**. But lawyers of the adversary party found a person who claims about alibi of the defendant, i.e. counter-reason **R** with probability **P(R)**. How will the strength of the accusatory conclusion **C** under variation of the **P(R)** change?[4] The answer is presented in the next table.

P(R)=P(¬C/R)	P(C/G\R)	P(¬C/R\G)	P(C/G\R):P(¬C/R\G)	$\mathbf{P_N(C/G\backslash R)}$
1	0	0.1	0 : 1	0
0.9	0.09	0.09	1 : 1	0.5
0.8	0.18	0.08	2.25 : 1	0.69
0.5	0.45	0.05	9 : 1	0.9
0.4	0.54	0.04	13.5 : 1	0.93
0.1	0.81	0.01	81 : 1	0.99

Some important results follow from this table. Firstly, when we have a newly calculated argument and counter-argument it is necessary to «weight them on the Themis scale», or compare one with another, again. In other words, we must consider strength of the argument and counter-argument not *per se* but in mutual comparison and relative to the given data only. Actually, if **P(¬C/R\G) = 0.1** as on the first line of the table, it does not mean that the counter-argument is weak because relevant argument is powerless at all. So, newly «weighted», or normalized, strength of the counter-argument $\mathbf{P_N(\neg C/R\backslash G)}$ becomes maximal[5]. It seems quite

[4] Counter-reason **R** with **P(R) = 0**, i.e. certainly false, must be excluded from any fair reasoning immediately.

[5] Normalized strength of the counter-argument is calculated by the formula:
$\mathbf{P_N(\neg C/R\backslash G) = P(\neg C/R\backslash G) / P(\neg C/R\backslash G) + P(C/G\backslash R)}$. Similarly, for the argument:

ISSN 1995-6134

natural because under condition of true testimony about defendant's alibi truth of conclusion «Not guilty» and relevant acquittal are guaranteed (of course, if law norms were not violated and factual data not falsified). If **P(¬C/R\G) = 0.09** and **P(C/G\R) = 0.09** as on the second line, it means only that the argument and counter-argument probabilities are equal and in normalized form each of them has value 0.5.

Secondly, if **P(R) = 0.5**, then the counter-reason **R** does not change initial strength of the argument anyway because it is indecisive[6]. Such sort data keep *status quo*.

Thirdly, weak counter-reasons with **0 < P(R) < 0.5** do not decrease the argument strength but increase it. This 'paradox' means that weak counter-reason raises doubt in the counter-argument validity and so is unable to damage the argument. Not for nothing, Ancient Rome lawyers said: «*Argumenta ponderantur, non numerantur*».

Consequently, some practicable formulas by which under given structure, probability of initial reasons, strength of probability-relations within an argument it is possible to asses the argument strength quantitatively have been introduced already. These ones are under discussion, improvement, generalization yet but all it does not exhaust the quantitative assessment problem.

IV. At the end of the paper, John Black noted that a principal difficulty in quantitative assessing of the argument strength lies in assigning of correct values both to probabilities of initial reasons and strengths of internal probability-relations[7]. The author recognized that in many real cases thought-out intuition plays basic role in assigning these initial data [16, p. 29]. John Maynard Keynes, it is worth noting now, paid attention to intuition, or direct judgement, in similar situation as well [10, p.15, 18–9, 69, 76, etc.]. In addition, the emphasis on intuition was typical for a row of well-known British philosophers including Bertrand Russell and George Edward Moor [19, p.338–340], [20, p. 79–80]. If so, are there any rational guidelines, which are able to direct or restrict the human intuition insights?

Introduced by Jacob Bernoulli and Pierre Simon de Laplace principle of indifference seems a general directive here. In the simplest form, it insists: if there is no *known* reason for predicating of our subject one rather than another of several alternatives, then relatively to such knowledge the assertions of each of these alternatives have an *equal* probability (see [10, p. 45]). This principle is applicable to find probabilities of different alternative things including reasons and probability-relations. For instance, if on base of the data available right now there is no any ground to favour certain truth value of reason **R**, then its probability to be true is equal to probability to be false, and **P(R) = 0.5**. The indifference principle has been criticized many times, for instance by Keynes. As a result, he stated «the principle in a more accurate form, by displaying its necessary dependence upon judgement of relevance and so bringing out the hidden element of direct judgement or intuition» [10, p.60][8]. Therefore, intuition reveals again at the end.

Possible rational guidelines in assigning diverse initial data must take into consideration their nature.

Reasons by nature are divided on two wide categories: normative and descriptive ones. The

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P_N(C/G\R) = P(C/G\R) / P(¬C/R\G) + P(C/G\R). If it is found that **P(¬C/R\G) = 0.1** under **P(C/G\R) = 0**, then **P_N(¬C/R\G) = 1** and **P_N(C/G\R) = 0**.

[6] Three centuries ago, Jacob Bernoulli noted: «One thing is called *more probable* … than other if it has a large part of certainty, even though in ordinary speech a thing is called probable only if its probability notably exceeds one-half of certainty. I say *notably*, for what equals approximately half of certainty is called *doubtful* or undecided» [6, p.211].

[7] Explication of an argument structure and its accurate diagramming, which grasps a network of logical probability-relations, is an additional nontrivial issue here. Canadian expert in informal logic Douglas Walton with coworkers, for instance, studied this issue carefully [2, 18].

[8] In contemporary form, the principle insists that if there are **n** mutually exclusive and collectively exhaustive alternatives, and there is no reason to favour one over another, then we should be «indifferent» and the **n** alternatives should each be assigned probability **1/n** (the alternatives are equiprobable) [21, p.645].

ISSN 1995-6134

first category includes, for instance, norms of law, the second – diversity of factual data. Normative reasons must be comprehended adequately and used in their ranges of definition. If any of these necessary conditions was missing, a norm lost its validity. Set of descriptive reasons, generally speaking, includes all data about events and processes in the Universe accumulated by the humankind. In the field of law, descriptive reasons exist as oral and / or written (by any legal way) propositions stated by defendants, victims, experts, etc. about the legal proceeding issue. The set of descriptive reasons is a source of pieces of evidence. Probability of a proposition-evidence depends on a case peculiarities and one's character: primary or hearsay, direct or circumstantial, etc. Primary and direct evidence are more desirable than analogous hearsay and circumstantial ones.

Strengths of the probability-relations within an argument depend on nature of the inferences used. In case of demonstrative inferences is obvious that strengths of the relations between reasons and intermediate or final conclusions are maximal. For example, in deductive argument with one reason **p(C/R) = 1**. However, in case of nontrivial arguments, constructed by means of non-demonstrative inferences, assigning of their numerical values, required for further quantitative calculation, does not have pure rational algorithms today.

Assigning of values to pieces of evidence and strength of probability-relations to some extent lies in frame of an investigator and judge's special discretion powers. In general case the discretion has, among other things, an important intuitive background. A judge of the Court of Appeal of the Supreme Court of New South Wales David Hodgson proposed clear examples and persuasive comments concerning the actual background of contemporary legal argumentation and decision-making [22]. He criticized the idea about sufficiency of pure mathematical computation of probabilities in accordance with definite rules, including Bayes' theorem: «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». 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», – Hodgson insisted. Even if this conclusion is addressed to the «objective Bayesianism» directly it seems quite relevant to the allied Leibnizian paradigm as well.

The Hodgson's generalization seems quite coherent with early conclusion of Chief Justice of Australia Garfield Barwick about very standard of decision-making within criminal proceedings: «A reasonable doubt is a doubt which the particular jury entertains in the circumstances. Jurymen themselves set the standard of what is reasonable in the circumstances. It is that ability which is attributed to them which is one of the virtues of our model of trial: to their task of deciding facts they bring to bear their experience and judgment» (cited in [23, p.503]). Therefore, not only fact-finding but fact-deciding is grounded on the common sense and experience with internally imprinted intuitive component also.

Consequently, assigning of initial data necessary to assess the legal argument strength (probabilities of initial pieces of evidence and strengths of probability-relations within argument) in non-trivial cases is not completely rational and objective procedure. It looks like a tautology but the data about different probabilities are itself more or less probable[9]. When there are some reasonable guidelines, which direct and restrict their assigning, they are unable to elimi-

[9] Let an eyewitness articulated proposition **E**: «X. was near the scene of crime with probability 0.75». If a judge felt doubts concerning the witness credibility he states **E'**: «Probability of **E** is about 0.5», i.e. this piece of evidence seems indecisive. But is **E'** certain itself? If it is produced by really thought-out intuition and confirmed by additional information about the eyewitness, the judge will insist, e.g., **E''**: «Probability of **E'** is about 0.9", etc. If the first probability is by nature «probability$_2$» then the second and third ones are variants of «probability$_1$».

ISSN 1995-6134

nate situational insights of individual intuition completely. Probable and approximate character of the initial data is carried over the quantitative assessment of the argument constructed by these data with necessity. This challenge seems actual to any quantitative approach based on the logical probability concept.

V**.** Ardent adherents of the e-justice idea must remember both the contemporary conclusion of David Hodgson and long-standing observation of Michel de Montaigne. They confirmed essential complexity of some real cases, on the one part, and, on the other part, irreducible role of intuition in comprehension of these cases. These factors challenge pure rational quantitative assessing of the legal argumentation. Powerful and free from the references like «Question for my friend» artificial intelligence would be able to gather massive information and analyze it faster and more objective 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» [10, p.15].

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

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In prospect of complete electronic justice an original approach to assess the legal arguments quantitatively on base of logic probability concept in accordance with the Leibnizian paradigm is considered. In comparison with the «objective Bayesianism» its specificity and range of application are elucidated. A fundamental restriction is pointed out that is the challenge of fulfillment of the complete e-justice today.

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Тягло О.В. Повне електронне правосуддя: «за» та «проти»

Перспективу повного електронного правосуддя проаналізовано з огляду на можливість кількісної оцінки юридичних аргументів, ґрунтованої на концепті логічної ймовірності відповідно до Ляйбніцевої парадигми. У порівнянні з «об'єктивним Байєсіонізмом» прояснені особливості й область застосування такої оцінки. Вказано принципове обмеження, котре сьогодні є викликом реалізації повного е-правосуддя.

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Тягло А.В. Полное электронное правосудие: «за» и «против»

Перспектива полного электронного правосудия рассмотрена в свете возможности количественной оценки юридических аргументов, основанной на концепте логической вероятности согласно Лейбницевой парадигме. В сравнении с «объективным Байесионизмом» прояснены особенности и область применения такой оценки. Указано принципиальное ограничение, которое сегодня является вызовом реализации полного е-правосудия.