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REMARKS AND CONSIDERATIONS ON THE MATURITY OF LABOUR LAW AS A SCIENTIFIC DISCIPLINE IN THE CONTEXT OF CHALLENGES POSED BY ARTIFICIAL INTELLIGENCE (AI), ILLUSTRATED BY LABOUR LAW REGULATIONS CONCERNING MOBILE WORKERS

Abstract

The study explains non-obvious problems related to the digitization of law implemented in the classical approach, i.e. implemented by humans, as well as in the approach implemented by artificial intelligence or digital intelligence. The study shows only some of the problematic issues resulting from over 15 years of scientific experience in the digitization of law implemented by the author. The number of problematic issues is very large, so this study focuses on elementary aspects related to the digitization of law and the assessment of the degree of maturity of labor law as a scientific discipline. The study indicates the basic sources of problems in the digitization of labor law and suggests basic directions for solving the problems. The study provides numerous examples of labor law norms, which, due to imperfections in their construction, hinder or prevent the digitization of labor law using both classic computer code and artificial intelligence (AI) algorithms.

Słowa kluczowe: sztuczna inteligencja, cyfrowa inteligencja, prawo pracy, cyfryzacja prawa

Keywords: artificial intelligence, digital intelligence, labor law, digitalization of law

ASJC: 3308, **JEL:** K31

Introduction

The court in Białystok is preparing to issue a certain type of ruling using Artificial Intelligence (AI). This is an inevitable direction not only at the level of court rulings but also within the broader framework of legal counseling and the application of labour law. Legal provisions can be excellently converted into code, as they constitute a set of boundary conditions—provided these conditions are certain and coherent. The issue of labour law and artificial intelligence (AI)

is particularly close to me, as both subjects have been the focus of my academic research for many years.

Studying the impact of AI on labour law and the labour market is a natural extension of my academic activities. In this publication, I aim to answer the question: to what extent is AI capable of assuming some functions related to the interpretation and application of labour law? Artificial Intelligence is an advanced, yet ultimately just an algorithm, which can function exceptionally well in an environment of a mature scientific discipline. Conversely, it may prove ineffective in immature scientific fields.

To anticipate some later conclusions—by a mature scientific discipline, I mean one that is internally coherent in scope, logical, mathematical, and free from obvious semantic or structural errors. Thus, assessing the maturity of labour law as a scientific field should be the starting point for future research.

At first glance, the question “Is labour law a mature scientific discipline?” might seem unjustified, or even absurd. After all, legal disciplines—especially labour law—boast a significant number of distinguished scholars, professors, habilitated doctors, and PhDs, all of whom earned their academic titles through hard work. However, many eminent legal theorists have critically examined the scientific character of law, often questioning its academic merit.

Within Polish legal-sociological thought, this dilemma was explored by, among others, Leon Petrażycki, who argued that “no definition of law has been scientifically confirmed,” and that “none is universally accepted as a foundation of scientific knowledge,” nor has “any theory of the essence of law been definitively proven” (Petrażycki 2020).

Thus, questioning the scientific maturity of labour law has both fundamental and practical dimensions—perhaps more so than ever before. We stand on the threshold of AI’s impact on law in general, and on labour law in particular. Labour law has been tightly interwoven with digitalization and programming for decades—perhaps more than most other branches of law.

Payroll and HR software, time tracking systems, tools calculating total labour costs, tachographs, and other digital monitoring systems have been commonplace for years. Over the past 13 years, I have personally developed one of Poland’s recognized payroll and HR software programs (www.PayCoreEngine.pl), which has given me both theoretical and practical experience in the application of labour law through software.

Other branches of law, such as tax or insurance law, are also closely linked to digital tools. Still, labour law belongs to the avant-garde group of legal fields leading in digitalization. Its scope includes: monitoring working hours of both stationary (administrative, factory) and mobile workers (drivers, pilots, machinists, seafarers); digital time tracking; calculating per diems and overnight allowances; wage calculations; determining insurance and tax obligations; calculating total labour costs; and transmitting data to social security institutions and tax offices.

Digitalization now encompasses the near-entirety of work processes and labour relations, including undesirable or legally prohibited behaviours. It also involves visual monitoring, documentation of rest standards, and confirming employees’ rights to dignified rest.

Labour law has long maintained ties with classical algorithms. It is now becoming even more closely connected with programming through AI. Still, we must not overestimate AI’s role. Its logical structures largely mirror human reasoning—unsurprising, as AI is a human

creation. Thus, any legislative flaws, logical errors, mathematical inconsistencies, or the lack of standardized interpretative principles will negatively affect AI's usefulness in labour law. Hence, it is crucial to first determine whether labour law qualifies as a mature scientific discipline—one that is logically, structurally, and mathematically coherent.

It is not my intention to question the legacy of Polish or global labour law scholarship or to diminish anyone's academic achievements. On the contrary, I hold deep respect for labour law scholars and their contributions to this challenging field. Rather, this paper aims to consider whether labour law is mature enough to be applied by AI algorithms in a safe, reliable, and verifiable way.

For over a decade, I have researched the structure and scope of labour law regulations. I convert legal provisions into normative rules and then into code algorithms, which are used to build software—either autonomous or semi-autonomous systems that support or implement labour law.

These years of study have influenced my personal view of labour law as a scientific discipline. I have developed the belief that labour law should be treated as a formal science—based on boundary conditions and normative scope analysis, albeit one that integrates humanistic sensitivity.

This perspective is partially confirmed by jurisprudence theory and, in particular, the principles of legal interpretation, which I have taught at the university level. Legal logic further reinforces the idea that law can be understood as a science governed by mathematical-like principles.

The inspiration for this publication matured over many years, but a conversation with one of Poland's most esteemed labour law scholars acted as the catalyst. I won't mention this renowned professor by name, as I am unsure whether he would want to be identified. However, during our long conversation, we both unexpectedly discovered a shared concern—and perhaps even agreement—that some branches of law, including labour law, might not yet be fully mature scientific disciplines.

For over a decade, my academic work has focused on the certainty of labour law application and legislative principles that support the creation of reliable and scientifically sound legal rules (boundary conditions).

1. What Is Science?

According to the definition provided by the *Polish Language Dictionary*, science is “the entirety of human knowledge arranged in a system of issues; also: a research discipline referring to a specific area of reality” (*Słownik języka polskiego PWN*¹). The primary aspect of this vague and highly general definition is the idea of knowledge “arranged in a system of issues.” This highlights precision and order, which stand in contrast to randomness and chaos. Therefore, one might ask: is the science of labor law a fully precise and orderly discipline?

¹ <https://sjp.pwn.pl/slowniki/naukowo%C5%9B%C4%87.html> (accessed: 16.07.2025).

As Michał Heller argued, “[l]anguage and method are crucial elements of ‘scientific nature.’ According to many scientists and philosophers alike, these two factors determine whether something is scientific or not” (Heller 1992, p. 11). In this context, it is worth considering whether labor law as a science has fully systematized linguistic (semantic) scopes of particular labor law institutions (definitions), whether all linguistic formulations are free from semantic flaws, and whether there exists a consistent method for decoding legal provisions into repeatable and acceptable legal norms.

Referring to Jan Such’s (Such, Szcześniak 2006, pp. 43–44) reconstruction of Einstein’s and Popper’s positions, scientific truth should fulfill at least five important cognitive criteria: generality (a high level of generalization), accuracy, exactness, precision (a high level of accuracy and clarity), high informational content, high logical simplicity, and epistemological certainty (gr. *epistēmē* means knowledge) of scientific statements and theories. One may ask whether the science of labor law cumulatively satisfies all these quantifiers?

2. What Is the Science of Labor Law?

According to the Polish Regulation of the Minister of Education and Science of 11 October 2022 on fields and scientific disciplines (Dz.U. 2025, item 211 consolidated text, as amended), law (and thus labor law) is formally classified within the field of social sciences, alongside economics and finance, socio-economic geography, social communication, security studies, communication and media studies, political and administrative sciences, management and quality sciences, sociology, pedagogy, psychology, and international relations. These regulations do not classify law within the field of the natural sciences, although certain aspects might suggest a relationship between law and scientific subjects. Similar dilemmas arise not only in the classification of law but also in the classification of, for example, economics and finance.

Within the field of social sciences, labor law is part of legal dogmatics—detailed legal sciences dealing with the description and interpretation of positive law. Some academic circles have long recognized the shortcomings of this classification, which does not account for the development of new scientific disciplines—particularly those closely related to the advancement of IT and digitization.

This issue was raised in a 2018 letter titled “Interdisciplinary Scientific Disciplines”, addressed to the Ministry of Science and Higher Education by Professor Włodzisław Duch of Nicolaus Copernicus University in Toruń (Founding Member of the Polish Cognitive Science Society) and Dr. Maciej Witek, Professor of the University of Szczecin (President of the Polish Cognitive Science Society) (Duch, Witek 2018). The authors rightly highlight the need to establish a new area of “interdisciplinary research,” where law (including labor law) could be examined at the intersection with other scientific disciplines (e.g., natural sciences and programming, including artificial intelligence).

My personal research experience over more than a decade confirms the findings presented by the authors. They correctly point out that many scientific fields cannot be classified within the current formal framework—e.g., cognitive science, particularly computational cognitive

neuroscience, for which the Nobel Prize in Medicine was awarded in 2014 to John O’Keefe, May-Britt Moser, and Edvard I. Moser. The authors note that “computational cognitive neuroscience is neither computer science, biology, psychology, nor medicine.” They provide several other examples of interdisciplinary disciplines, including the “computational sciences” area, which is horizontal by nature—computer simulations sit at the boundary of computer science and domain-specific knowledge, and nearly every discipline could be extended with “computational.”

The interdisciplinary nature of science was already emphasized years ago in the chapter *Computer Science and Related Sciences* in the monograph *The Fascinating World of Computers* (Duch 1997), where the author described interdisciplinary connections among fields like computer-based mathematics, physics, chemistry, biology, biocybernetics, economics, cognitive science, as well as computer-based history, philosophy, literary studies, linguistics, machine translation, and law. Therefore, the relationship between law and exact disciplines was likely recognized earlier by natural science scholars than by legal academics. Fortunately, both scientific communities now acknowledge these connections.

Thus, it does not matter whether labor law is formally or historically classified as a humanities or natural science discipline. As Professor Duch correctly points out, what matters is the nature of the subject being studied. In the case of labor law, beyond the humanistic layer (e.g., research on employee and employer dignity), there is unquestionably a technical layer, including computations, logical consistency of legal provisions, the ability to extract (correct) legal norms from those provisions, ambiguities that hinder legal programming, etc.—a domain I have been consistently researching for many years.

A need for a new approach to labor law’s place within the legal sciences was also emphasized by Dr. Janusz Żołyński, who in his scientific publication *Ideas of Labor Law as a Subdiscipline of Labor Law Science (Research Outline)* correctly observed that although labor law is formally part of the social sciences, there is no framework for researching future ideas connected to the “Fourth Industrial (Digital) Revolution.” He wrote: “The need for such research arises due to the current challenges linked to the so-called Fourth Industrial Revolution. These challenges involve technological and organizational changes tied to the use of new digital solutions and, consequently, to changes commonly referred to as globalization. Therefore, there is both a need to model new assumptions for labor law functioning in a dynamically changing reality and to establish a practical framework for how the state, social partners, and other stakeholders in the labor law system should behave” (Żołyński 2014, pp. 11–28).

Thus, scholars from both the humanities and natural sciences emphasize the need for a new view of labor law as a scientific discipline akin to mathematics, chemistry, or physics. This approach is already respected at departments of legal theory and legal logic. If law were not considered, in essence, a scientific subject, we would no longer teach legal interpretation and logic in law schools, and the result would be chaos and anarchy. What protects us from interpretive voluntarism is faith in the strict character of law (*dura lex, sed lex*).

At the same time—and contrary to Einstein’s and Popper’s assumptions—labor law, as a branch of general science, cannot lack the features that constitute the defining quantifiers of science in general. Labor law must present a high level of generality, accuracy, precision,

and informational value, as well as logical simplicity and epistemological certainty in its statements and theories.

This raises the question: how many of these quantifiers are fulfilled within the science of labor law? The answer to this question will help identify research gaps and desirable directions for further study of labor law as a scientific discipline. Labor law undoubtedly meets the quantifiers of high generality (abstraction) and high informational value. It conducts broad and in-depth theoretical analyses, such as on the right to dignity. The scholarly achievements in this area are well-recognized.

However, when it comes to precision, accuracy, logical simplicity, and epistemological certainty of legal theories, the outlook is less optimistic. While some areas meet these standards, my in-depth research on working time regulations and business travel contradicts the notion that labor law is fully mature (Miąsko 2017b, pp. 459–483). Over many years, I have identified dozens of logical and mathematical inconsistencies, incoherence among legal provisions, a lack of precise definitions of legal institutions, and linguistic errors (Miąsko 2024, pp. 77–103). These issues have been discussed both in my published works and in a monograph I have been working on for over a decade, which is currently under academic review (Miąsko n.d.).

The presence of such flaws does not automatically disqualify a discipline from being considered mature. However, the inability of the scientific community to address and resolve these issues may indeed indicate the immaturity of the discipline.

3. The Concept of Labour Law as a Primarily Exact Discipline

The scientific concept expressed by Einstein and Popper aligns excellently with the results of my research and experience concerning selected elements of labour law. These findings indicate that, in principle, labour law constitutes an exact discipline. Alternatively, one could say that labour law can only be considered a mature academic discipline once it has been demonstrated to be exact—with its regulations being precise, logical, simple, and the scopes of legal institutions clearly defined.

It seems obvious that labour law consists of two non-competing areas: the humanistic and the exact (mathematical, scope-based, and logical). The academic output of labour law in its humanistic component is vast and undisputed. In this regard, labour law should unquestionably be recognised as a fully mature, though continually evolving, scientific discipline. However, the situation differs when it comes to its mathematical, logical, and scope-related components, where in-depth scientific research (which I have had the opportunity to conduct for many years) reveals significant deficiencies.

In the past, I had the opportunity to lecture on jurisprudence at a university, particularly focusing on principles of legal interpretation—a specific set of rules that allows for decoding legal norms from statutory provisions.² Currently, I also lecture on the principles of drafting

² Lectures on the subject *The Science of State and Law* at the WSB Academy, branch in Cracow.

legal acts. It is not my intention here to provide a lecture on jurisprudence.³ Nevertheless, I have been working for over ten years on issues related to defining the semantic scope of legal regulations, mainly within the sub-branch of labour law. These efforts have resulted in several published academic studies dedicated to the coherence of labour law regulations (Mazurek, Miąsko 2023; Miąsko 2014, p. 167; Miąsko 2017b, pp. 459–483).

I am also the author and developer of a software application based on labour law and social security regulations—a well-known HR and payroll tool on the market, which records employees' working time and enables the calculation of remuneration for workers employed in Poland and other European Union countries.

I emphasise this aspect again to clarify that the issues raised in the further part of this study emerged in the course of my research on the digitalisation of law (i.e., writing algorithms). While attempting to translate the content of labour law provisions into digital algorithms, I repeatedly found it impossible to properly encode these regulations due to critical mathematical or logical problems, or a lack of consistency in legal provisions.

Based on this scientific and research experience in programming labour law, I assume that one of the characteristics of the scientific nature of labour law must be a repeatable and verifiable system of legal rules. Such a system enables the construction of repeatability and predictability in legal norms—somewhat akin to that found in disciplines like mathematics, physics, chemistry, etc. Later in this study, I will present my own concept and vision of the scientific nature of labour law.

It is very important to stress that my intention is not to diminish the importance or respect due to all representatives of the legal sciences and the entire scholarly legacy of my great mentors. Rather, this publication should be seen as a contribution to the discussion on proposed directions for the development of legal science, particularly in the area of labour law.

The issue of the maturity of labour law must be understood in two ways. Firstly, labour law may be understood as a set of rules governing employment relations. Secondly, it may be seen as the academic study of labour law—a theoretical reflection aimed at understanding the nature of this branch of law for the purposes of legal theory, education, and practice (see Jończyk 1992, p. 11).

Naturally, the academic community may be tempted by the concept of separating these two aspects: on the one hand, the purely technical (legislative) realm of positive law, for which the academic world bears no direct responsibility, and on the other, the abstract, scholarly domain. However, if the academic community were indeed to renounce participation and responsibility for both aspects—the quality and scope of substantive law-making and abstract considerations of legal quality—this would speak poorly of the maturity of labour law as a scientific discipline.

It is obvious that the Constitution of the Republic of Poland sets the principles of legislation in a democratic state, establishing the principle of the separation of powers and granting legislative competence (including the right to initiate legislation) to elected social

³ Lectures on the subject Directions/guidelines in the Language, Legislative and Editorial Techniques of Legislative Text at the Law College of the Nicolaus Copernicus University in Warsaw.

actors—MPs, Senators, and the President. It is natural that the academic community, as a rule, does not possess constitutionally guaranteed prerogatives within the legislative process. These competences are not granted directly either at the constitutional or statutory level—including under the Act of 20 July 2000 on promulgation of normative acts and certain other legal acts (Dz.U. 2019, item 1461 consolidated text) or the Prime Minister’s regulation of 20 June 2002 on the “Principles of Legislative Technique” (Dz.U. 2016, item 283 consolidated text).

However, this does not mean that the academic community in labour law (or any other legal branch) is entirely deprived of the right to participate in the legislative process to ensure the quality of enacted laws. On the contrary—the legislative process explicitly provides for the involvement of experts (including labour law scholars) during the process in the form of **public consultations**. The right to participate in law-making through such consultations applies both at the level of bills and regulations. In practice, scholars may participate in consultations at the ministry level (for government projects), as well as within parliamentary subcommittees.⁴

For many years now, I have actively and successfully taken part in these forms of public consultation (including labour law, e.g. the legal introduction of the “Harvest Aid Agreement,” which I had the honour of initiating⁵) (see also: Miąsko 2018, pp. 145–160). Another excellent example of the academic community’s active involvement in the creation of positive labour law was the Labour Law Codification Commission.⁶ The outcome of the Commission’s work is a separate matter, but it undeniably confirms that the academic community possesses the instruments necessary for active participation in positive law-making.

In my opinion, it is unacceptable—even if not fully conscious within the academic community—to attempt to differentiate labour law science into an abstract academic component and an allegedly non-academic legislative one. Legislation is, in fact, merely a technical element that must be backed by expert—in this case, scientific—approval.

To draw an analogy: in mathematics or physics, it would be inconceivable to pass legislation suggesting that $2 + 2 = 5$ or that the formula for acceleration uses different quantifiers than $a = \Delta V / \Delta t$. Similarly, in the legal sciences (including labour law), it is unacceptable to equate the expressions “after” and “no later than after” (see Art. 12 of the Regulation (EC) No. 561/2006, which governs the working time of mobile workers in the EU), as these are not semantically equivalent. One creates a closed time catalogue, the other—an open one.

Many other examples of inconsistency in labour law terminology are cited in my publication *Law in the Age of Digital Intelligence* (Miąsko 2014), my doctoral dissertation *Legitimacy of Paying a Night Rest Allowance to International Transport Drivers* (Miąsko 2023), and in my yet-unpublished (currently under review) monograph *Explication of the Relationship Between National, EU, and International Working Time Norms for Drivers in the Context of Regulation 561/2006 EC—A Comparative Approach* (Miąsko n.d.).

⁴ https://www.sejm.gov.pl/sejm10.nsf/page.xsp/konsultacje_zasady (access: 1 July 2025).

⁵ <https://www.youtube.com/watch?v=OqkbDw5XpuQ> (access: 1 July 2025).

⁶ <https://www.gov.pl/web/rodzina/nowa-komisja-kodyfikacyjna-prawa-pracy>; <https://www.gov.pl/web/rodzina/bip-teksty-projektu-kodeksu-pracy-i-projektu-kodeksu-zbiorowego-prawa-pracy-opracowane-przez-komisje-kodyfikacyjna-prawa-pracy> (access: 1 July 2025).

I do not wish to list all known cases of inconsistencies in labour law here, as they have already been detailed in my other publications.

In conclusion, I believe that the maturity of labour law—as a branch of legal science—is evidenced, among other things, by its ability to actively contribute to the translation of abstract academic reflection into positive law through the legislative process.

Based on my own experience, I cannot accept the hypothesis that the participation of academics in the legislative process is *a priori* excluded for reasons beyond their control. As a representative of the academic labour law community, I have taken part in all stages of the legislative process—from drafting bills and regulations at the level of ministerial consultations, through work in the Polish Parliament⁷ and Senate, the Presidential Chancellery,⁸ and even proceedings before the European Parliament.⁹

Access to these processes has never been denied to me. For example, I independently submitted a proposal to the Ministry of Family, Labour and Social Policy to amend the legal definition of business travel (Miąsko 2017b, pp. 459–483). Sometimes these proposals were accepted, sometimes not. The fact remains that, in most cases, the initiative came from me—but that is exactly the conscious role of an academic representative.

4. Explication of the Characteristics of a Mature Science of Labour Law

This introductory discussion is exceedingly important—indeed, it is crucial—for understanding the thesis I am advocating: that the fully scientific nature of applying law as a mature academic discipline can only be affirmed when the academic community in a given branch of law develops:

- a) a comprehensive set of legal definitions,
- b) a system of reliable and consistently applied legal norms,
- c) a body of scientifically proven legal norms (verified through research based on logical equations),
- d) legal acts in labour law devoid of incoherent regulations,
- e) legal provisions free of “prohibited and defective phrases” that do not convey reliable information,
- f) legal regulations in labour law that are mathematically and logically coherent,
- g) a list of pre-defined and acceptable “systemic anomalies,” meaning exceptions to the rule.

In my view, the cumulative presence of at least this set of quantifiers allows labour law to be regarded as a mature scientific discipline. Only then does labour law become a logically consistent whole—repeatedly verifiable and empirically proven. I find no sufficiently compelling

⁷ <https://jazdaprawna.pl/podziekowania-z-mownicy-sejmu-rp-dla-kancelarii-prawnej-viggen-za-pomoc-w-opracowaniu-nowej-tanszej-umowy/> (access: 1 July 2025).

⁸ <https://jazdaprawna.pl/prezydent-podpisal-ustawe-wprowadzajaca-nowy-typ-umowy-robotnicy-obrazili-rolnikow/> (access: 1 July 2025).

⁹ <https://www.youtube.com/watch?v=QBM-xsR0Ifk> (access: 1 July 2025).

evidence suggesting that labour law, as an academic discipline, should be subject to different standards of scientific inquiry than physics, chemistry, mathematics, or other exact sciences.

5. Explication of Cases Undermining the Scientific Character of Labour Law

At this point, I will attempt to present nine example areas where I observe a lack of consistency in the scope, mathematical structure, or logical coherence of labour law regulations. Within these areas, I cite fifteen selected examples of phrases (either parts of legal provisions or entire acts) that serve as sources of inconsistency in labour law regulations. Naturally, the presented catalogue is exemplary and open-ended. It would be impossible within the scope of this publication to address the entirety of the inconsistencies within labour law.

Therefore, I have selected certain examples of inconsistencies, which have been the subject of my research for many years (mainly limited to the subject of working time). However, I am fully aware of the broader complexity of the topic. I do not intend to repeat the entirety of my academic work here, as it would be unmanageable due to volume—my research in this field exceeds over a thousand pages. I will instead refer synthetically to selected examples that illustrate the subject and nature of the problem, which complicates the application of AI in the domain of labour law science.

5.1. Analysis of the Relationship Between Legal Provisions and Legal Norms

The digitisation of labour law requires a detailed analysis of the relationship between legal provisions and legal norms. The subject of programming is not the provisions themselves but the legal norms. Artificial intelligence will have to extract legal norms from the text of legal provisions. This requires applying the process of legal interpretation, using both primary and secondary interpretative rules. This is a complex process, which does not always yield unequivocal results. A key task for the academic community in the field of labour law digitisation is to define clear rules of legal interpretation on the basis of which legal norms will be constructed (Miąsko 2017b, pp. 459–483).

One of the problems of legal interpretation is the multiplicity of interpretative rules that do not convey certain information. For example: “When interpreting a provision, one should consider its classification within a particular branch of law (external systematics).” Such a formulation, in algorithmic terms, means nothing; we understand it intuitively, but it is not a reliable source of information—it must be given meaning (by defining boundary conditions) (Miąsko 2017b, pp. 459–483).

A major issue in the digitisation of labour law using AI is determining a reliable catalogue of legal sources. My experience in digitising law has revealed numerous doubts, particularly concerning the status and rank of European Commission Guidelines. Generally, EC Guidelines are not formal sources of EU law, yet a large number are issued in connection with many EU regulations (e.g., over 20 guidelines have been issued for Regulation (EC) No. 561/2006), and

they are treated as legal sources, despite not being adopted by the European Parliament and not formally recognised under Art. 288 of the Treaty on the Functioning of the European Union. Therefore, when programming the law—whether using traditional methods or AI—it will be necessary to decide whether EC Guidelines should be treated as sources of law. Otherwise, decoding legal norms from the text of EU regulations may yield entirely random results.

5.2. The Issue of Undefined Semantic Scope

Another problematic area in legal programming, which gives rise to irresolvable logical problems, involves phrases that do not have a clearly defined normative meaning (i.e., they lack legal definitions), such as:

- a) “should” (in contrast to “must” or “may”),
- b) “from... to”,
- c) “such as” (as opposed to “such”),
- d) “in particular.”

An algorithm always operates on binary values (0 or 1). Something is either true or false—there is no middle ground. While AI algorithms can use associative models and complex reasoning, they still, when faced with uncertain legal content, will produce uncertain norms—effectively, “anti-norms.” To eliminate anti-norms, it is necessary to legally define the semantic scope of certain expressions or exclude ambiguous phrases from legal use.

5.3. Analysis of Logical Errors as Sources of Imperceptible Scope

An example of such interpretative problems is the expression “at the latest after,” which is related to Zeno of Elea’s paradox (mathematically resolved) (Tatarkiewicz 2014; Czerniawski 2009). This phrase is often mistakenly interpreted as “after.” It appears in EU and international labour law, such as in Art. 12 of the Regulation (EC) No. 561/2006 and Art. 9 of the AETR Convention (“at the latest after arrival at location X”). Does “at the latest after” an event mean the same as “immediately after” it? Or does it represent an open-ended time range? Logically, “at the latest after” signifies a point in time imperceptible to human perception and infinitely short—in essence, “never” (see Miąsko 2024). This renders the phrase practically useless—not only unsuitable for AI processing but also irrelevant within time units perceptible to humans.

5.4. The Problem of Contradictory Provisions

One would assume that internally contradictory legal norms should not exist within labour law systems. However, such cases do occur. For example, Art. 26c (2) of the Act of 16 April 2004 on working time of drivers (Dz.U. 2024, item 2020 consolidated text) states: “The weekly working time referred to in paragraph 1 may be extended to 60 hours, provided that the average weekly working time does not exceed 48 hours in a reference period not exceeding four months.”

From a logical standpoint, this implies that one cannot utilise the extended 60-hour working week until the end of the reference period. The provision assumes a reduction in working hours during the earlier or later weeks of that period. However, both logically and from a programming perspective, the first possible moment to apply the 60-hour workweek is on the last day of the reference period—practically, never. AI will not be able to resolve this type of internal contradiction with certainty.

5.5. The Issue of Logically and Legally Valid but Unacceptable Regulations

One example is the first version of the “driver activity certificate” (under the Regulation (EC) No. 561/2006). The international legislator used the term “paid annual leave,” which has a legal definition under Polish labor law. The European Commission equated the institution of “paid annual leave” with that of “rest.” However, under national law, these are not identical terms, and such interpretation by the European Commission has not been accepted by the Polish labor law doctrine or by inspection bodies. This kind of interpretative dichotomy would inevitably lead to problems in applying labor law via AI systems.

5.6. The Issue of Mistakenly Failing To Implement a Legal Act Into the Polish Legal System

Before determining the scope of a legal norm, AI should first establish whether a given act is indeed a valid source of labor law. An example is the AETR international convention, the primary international agreement regulating the working time of mobile workers. Due to a formal omission by the Ministry of Foreign Affairs, this convention was not in force within the Polish legal system for several years, despite the widespread but incorrect assumption by inspection authorities, public institutions, and labor law scholars that it was. Incidentally, I discovered this legal gap during research for one of my monographs (Miąsko n.d.) in 2013, and following my intervention with the MFA,¹⁰ the AETR amendment was finally implemented into Polish law. Therefore, AI should first verify whether a legal act (including international ones) has been correctly incorporated into the labor law system before defining the scope of a legal norm (see Miąsko 2024).

5.7. The Issue of the Role of Legal Doctrine

Another critical area is the assessment of the role of labor law doctrine in shaping the scope of legal norms as interpreted by AI. It is debatable whether AI will be able—or should be allowed—to follow the views of labor law scholars, especially if these views contradict the logical interpretation of the law. Since much of the scholarly work in labor law is devoted

¹⁰ <https://jazardprawna.pl/czy-umowa-aetr-obowiazuje-w-polsce-bedziesz-zaskoczony/>; <https://jazardprawna.pl/aetr-nie-obowiazuje-poskich-przewoznikow-mt-potwierdzilo-teze-kancelarii-prawnej-viggen/>; <https://jazardprawna.pl/ministerstwo-zwroci-nielegalnie-pobrane-oplaty-za-za-atp/> (access: 1 July 2025).

to publishing scientific research findings, it seems logical that AI should take this output into account. However, it is unclear whether AI might position itself as a sort of reviewer or evaluator of academic publications. There is also the risk that AI could become the ultimate authority in verifying the correctness of legal interpretations, potentially marking the “end of science” in labor law. While AI is unlikely to replace scholars in developing the field, it could potentially take over their role in defining the scope of labor law norms.

5.8. The Issue of Synonymous Terms Lacking Legal Definitions

A further challenge in digitizing labor law lies in interpreting synonymous terms without legal definitions, whose meanings may appear similar but in fact refer to entirely different sets. One example is the difficulty AI may have in distinguishing between “normative working hours” and “normal working hours” (Art. 9 (1) of the Act on working time of drivers). Neither Polish nor international labor law has developed a legal definition for “normal working hours,” which has long raised doubts as to whether this term should be equated with “normative working hours” as defined in the Labor Code.

5.9. The Role of “System Anomalies” in a Mature Labor Law Science

Finally, one must not overlook the aspect of human nature’s variability and its (justified and humanizing) aversion to rigid regulations. This gives rise to the important role of so-called “system anomalies”—exceptions like those found in Art. 12 of the Regulation (EC) No. 651/2006 or Art. 13 of the AETR Convention. These modern provisions effectively account for unpredictability. They allow a worker, who is generally obliged to follow labor law norms, to legally deviate from them under certain conditions, either for personal benefit or utilitarian reasons. I have devoted two audiobooks to discussing the significance and legal rank of “system anomalies” in international labor law, both of which were recommended by the Association of Labor Inspectors of the Republic of Poland (Miąsko 2017a).

The above points highlight only a few aspects of interpretative problems within labor law, whether applied by humans or AI. In my other works, I have conducted much more detailed analyses and identified dozens of similar problem areas.

6. Distinguishing Law as a Social Concept from Law as a Scientific Discipline

It is crucial to distinguish the understanding of law as a social construct from the science of law, which is a precise discipline generating repeatable results through the application of defined quantifiers. For me, as a labour law specialist and also a developer of computer applications in the field of labour law, the problems resulting from the lack of clarity in the definition of legal norms, legal definitions, the incoherence of legal regulations, ambiguity, etc., are all too evident. These issues not only hinder the development of software applications but also obstruct

the consistent and reliable application of law itself. This matter presents a major challenge for the science of labour law, especially in the age of artificial intelligence. AI algorithms will encounter the same difficulties in extracting the scope of legal norms—problems stemming from legislative errors, incoherence, and ambiguity—that damage the image of labour law as a mature scientific discipline.

It is worth distinguishing the common belief that labour law is a scientific discipline from objective evidence and arguments that either confirm or refute this thesis. Even if we assume *a priori*, purely hypothetically, that law (including labour law) is a mature scientific field, both public perception and the views of legal scholars may differ for various reasons. I personally know many legal experts, including renowned scholars, who do not consider law (including labour law) to be a full-fledged scientific discipline.

This understanding of labour law as a scientific discipline—on the condition that it is treated as a rigorous subject based on a set of boundary conditions—appears to be a necessity forced by social and civilizational development. This is aligned with the current concept of “living law” (law in action).

The concept I present is close to the theory of legal positivism, where positivism is understood as a doctrine stating that “scientific knowledge can only be obtained through the observation of facts, and thus through sensory perception, especially through experience. The evaluation of these facts is possible through logic and mathematics. Any problem that cannot be solved using this method should be considered metaphysical or ideological and rejected, as it is merely a subjective opinion with no scientific value.”

A similar view was presented by the legal behaviourism approach: “The behavioural reduction of law to patterns of external behaviour ignores the distinction between *Sein* and *Sollen*, between certainty and probability. Yet, this distinction is essential for humans to properly understand the essence of law and its function, particularly in judicial decisions” (Potrzeszcz n.d.).

7. The Destructive Role of the So-Called Dominant Judicial Line of Common Courts and the Supreme Court’s Labour and Social Policy Chamber

My doubts about the fully scientific nature of labour law emerged many years ago, while preparing my doctoral dissertation in this field (Miąsko 2013). In essence, the research problem boiled down to demonstrating that, in a tautological and logical sense, the Labour and Social Security Chamber of the Supreme Court had ignored the logical and substantive meaning of Art. 77⁵ of the Labour Code and Art. 8 of the Regulation (EC) No. 561/2006 for over 20 years. The dissertation proved that the Supreme Court, along with many lower courts, issued rulings that disregarded applicable rules of legal interpretation and basic logical principles. I emphasize the role of the Supreme Court in this specific matter because the analysis of the relevant rulings showed that the adjudicating panels were composed almost exclusively of habilitated doctors, associate professors, and full professors—true academics specializing in

labour law. This led me to investigate what circumstances could have caused such a clear error in judgment by eminent legal scholars.

Even more troubling was the interpretation of EU labour law regulations (in this case, Regulation (EC) 561/2006) in the Supreme Court's rulings. When analyzing the justifications of the Court's rulings in this matter, I gained the impression that the judges (who were also distinguished legal scholars) did not necessarily uphold the need to apply elementary principles of legal interpretation and logic. This raises a fundamental question: is one a legal scholar at all times, or only outside the temporal scope of other duties? The issue is that even if one accepts that in performing a specific role (e.g., that of a judge), one can temporarily "suspend" their scholarly role, in the public eye, negative opinions stemming from erroneous Supreme Court judgments affect the entire academic community—and I'm not convinced that this is unjustified.

The crux of the problem is that the Supreme Court frequently rules not on the basis of individual assessments by specific judges (who are also scholars) but according to the so-called dominant line of Supreme Court case law. This leads to situations where the perspective and expertise of a judicial scholar must yield to the prevailing institutional approach. Naturally, this breeds public dissatisfaction, as well as discontent and frustration within the academic community.

Thus, it is clear that Supreme Court rulings—and also those of common courts—not only fail to validate the role and position of labour law as a scientific discipline but in many cases actively harm its image. I will reference, in paraphrased form, my official correspondence with Professor Małgorzata Gersdorf, then First President of the Supreme Court. This exchange of views was especially interesting to me from a scholarly perspective, as Professor Gersdorf is one of the leading authorities in labour law. Our correspondence concerned the narrow issue of whether travel allowances and overnight per diems should be considered compensatory benefits. Professor Gersdorf, like me, maintained that these were strictly compensatory in nature—meaning they should be reimbursed only when an increased cost was actually incurred by the employee. The matter seemed so clear that she expressed this view in her *Commentary on the Labour Code* (Muszalski 2001; Gersdorf 2005; Gersdorf, Raczkowski, Rączka 2014).

However, despite the fact that both a highly respected authority in labour law and a junior scholar shared this opinion, the Supreme Court took the opposite stance—that such allowances are due even if no actual cost was incurred by the mobile worker. The Court's rulings stood in direct contradiction to the provisions of the law (Art. 8 (8)) and to fundamental principles of legal interpretation—*contra legem*. Case law that violates the law (*contra legem*) is entirely inadmissible, especially when it infringes upon the rights of third parties, as it did in this instance.

At the time, I asked Professor Gersdorf what position she adopted as a scholar and lecturer when the Supreme Court, of which she was President, ruled based on a dominant judicial line that clearly opposed the principles of legal science, including those of labour law. Incidentally, Professor Gersdorf was not alone in her view. Professor Andrzej Świątkowski (2015) also expressed the same strictly compensatory interpretation in his scholarly work. It should be noted that I do not know of a single labour law scholar who claims that travel allowances and

overnight per diems are income-like benefits (pol. *świadczenia przysporzeniowe*). Paraphrasing slightly, Professor Gersdorf replied that she acknowledged the problem as a legal scholar but, as President of the Supreme Court, lacked the tools to shift case law in a direction consistent with legal interpretation principles and logical rules.

This example illustrates one of the serious issues facing labour law as a scientific discipline. The academic community must sooner or later address this issue, or it will continue to bear the burden—and AI will not be able to resolve this dilemma. Courts cannot position themselves as a “third power” in the sense that, by ruling *contra legem*, they take on the role of legislators. Such willful case law undermines the scientific structure of labour law.

8. The Aspect of the Labour Law Academic Community’s Tolerance Toward Destructive Judicial Actions

The example above comes down to the question of how much the academic labour law community respects itself and its own achievements. To what extent is one a labour law scholar by vocation, and to what extent by circumstance? To what extent do we, in our own professional activity, respect the rules and principles of legal interpretation, which make law a serious and scientifically mature discipline—and to what extent do we treat law as a tool for achieving goals dictated by momentary needs?

For labour law—or law in general—to be seriously regarded as a scientific discipline, the academic community must first reach a serious consensus, regardless of any additional functions its members perform. Similar to how mathematicians agreed that $2 + 2$ always equals 4, or that operations within brackets are performed before those outside brackets, or how physicists universally apply the formula $a = \Delta V / \Delta T$ to calculate acceleration. One of the key factors that supports the perception of mathematics and physics as serious and mature sciences is the fact that their respective scholars—mathematicians, engineers, physicists, chemists—adhere to their rules 24 hours a day, 365 days a year, without exception.

It is often observed that judges who rule *contra legem* do not challenge mathematical or physical principles while simultaneously undermining the fundamental principles of legal interpretation or legal logic. This leads to the impression that they sometimes respect foreign disciplines (like mathematics) more than their own (law). Judging based on *contra legem* reasoning is explicitly prohibited under the case law of the Supreme Court, the Constitutional Tribunal, and consistent scholarly doctrine. As the Supreme Court rightly noted in its judgment of 24 October 2012 (III CSK 18/12, LEX 1375408), legal interpretation based on *contra legem* reasoning results in retroactive constructions, because a party applying the law could not have known that a court would interpret the provision contrary to its literal meaning with de facto retroactive effect.

The same position was taken by the Supreme Court in its resolution of 7 June 2001 (III CZP 29/01, OSNC 2001, No. 12, item 171): “The text of a legal provision should be interpreted according to syntactic rules and semantic norms of the language used. It is the legislator’s duty to ensure that their will is properly reflected in the wording of legal acts. The

interpretation carried out by courts, as an element of legal application, cannot evolve into the creation of a desired, and sometimes even socially expected, legal state.”

This position is also supported by other rulings of the Supreme Court: resolution of 25 July 2002 (III CZP 46/02, OSNC 2003, No. 7–8, item 98), judgment of 12 September 2003 (I CK 46/02, LEX 146454), and others.

Furthermore, legal scholars such as Professor Sławomira Wronkowska and Professor Maciej Zieliński argue similarly: “It is impermissible to enact norms with retroactive effect if the subjects of these norms could not reasonably predict such decisions, and if there are no extraordinary circumstances or constitutionally protected values that justify such decisions” (Chojnacka 2012, p. 37). They further note: “the principle of trust in the state requires that retroactive effect not be granted to provisions that regulate citizens’ rights and obligations in a way that worsens their legal situation (judgments of 30 November 1988, K1/88; 8 March 2005, K27/03; 19 March 2007, K47/05). This principle is grounded in values such as legal security, certainty of legal transactions, and respect for acquired rights.” (Chojnacka 2012, pp. 36–37).

The above rulings and doctrinal positions, prohibiting *contra legem* reasoning due to its retroactive effects, constitute a fundamental legislative directive. Since this directive binds even law-making bodies, it must all the more bind the judiciary, which—in line with Montesquieu’s principle of separation of powers—does not hold the authority to legislate.

Perhaps the reason for such prohibited judicial norm-creation lies in the “transparency” of its effects. If an aerospace engineer were to disregard the laws of mathematics or physics, we would see countless visible disasters—collapsing buildings, failed bridges, falling planes, economic collapse. When a scholar-judge violates legal logic and interpretive rules, the catastrophe is the same—only it happens behind courtroom doors, “transparent” to the public, the media, and even most of the academic community. This undermines the perception of law as a mature scientific discipline.

9. Postulate for the Development of Labour Law Science in the Legislative Process

It seems impossible to quickly implement numerous scientific studies aimed at improving labour law and elevating it to the level of a mature scientific discipline without significant involvement of labour law scholars in the legislative process and without limiting the judiciary’s “sovereignty.” Democratically elected legislators (MPs, senators, the President of Poland), as well as ministry officials, generally lack sufficient expertise to resolve the deficiencies of labour law—in fact, they often exacerbate linguistic, interpretative, and structural issues.

Fortunately, in other scientific fields, MPs, senators, ministers, and officials do not decide the scope of mathematical, physical, or chemical formulas. Nor do courts or the European Commission independently formulate interpretations in these areas. Unfortunately for the science of law—and labour law in particular—a broadly defined legislator, often lacking

expertise yet wielding real power, has enormous (sometimes destructive) influence. This reality necessitates strong academic involvement in labour law legislation. Otherwise, labour law may remain underdeveloped for decades, leading AI to produce random, flawed legal outcomes based on imprecise legal inputs.

Conclusions

In this publication, I sought to answer whether labour law is a fully mature scientific discipline capable of effective interaction with AI. In other words: Is labour law sufficiently coherent in scope, logic, and mathematical structure to be applied automatically by AI algorithms without degrading the quality of legal outcomes?

The common belief—present in both media and academic discourse—that law will naturally be handled by AI is superficial. The real question is not whether AI can generate a legal result from given legal texts, but whether it can generate the correct result.

For AI to provide accurate outcomes, three conditions must be met cumulatively:

- a) AI must correctly apply legal interpretation principles,
- b) labour law must be a mature scientific discipline based on clearly defined and logically consistent concepts,
- c) labour law must not be subject to forbidden judicial norm-creation.

This leads to a broader question: Should AI be adapted to serve legal practice, or should labour law adapt itself to AI's operational logic?

I believe that both elements must evolve in tandem. AI is a brilliant tool—but only a tool. It cannot solve obvious problems stemming from definitional, logical, or structural gaps in labour law. Nor will AI define the direction of labour law development. That responsibility—thankfully—remains in the hands of labour law scholars. It is they who must boldly and seriously guide labour law toward becoming a fully mature discipline.

Labour law scholars must actively shape the quality and substance of labour law regulations. If the academic community ensures high-quality legal content, AI will become an excellent tool for enhancing order in the labour market. But if the quality of the law is poor, AI will only deepen the chaos.

Based on the examples and multi-layered analyses presented herein, I conclude that despite the immense efforts of legal scholars, labour law cannot yet be deemed a fully mature scientific discipline.

My intention in this publication was not to diminish the legacy of past generations of outstanding labour law scholars, but to point out the direction that labour law science must follow in the context of the digital era.

The symbiosis of labour law science with modern AI-based legal technology seems inevitable. Whether this direction proves beneficial remains to be seen. With strong academic engagement, AI can become a powerful tool for applying labour law. Without urgent legislative reforms and scholarly involvement, however, AI may become a source of uncontrollable interpretive chaos.

I firmly believe the legal academia now has a historic role to play in shaping the future of labour law, which will, sooner or later, be integrated with AI engines. There are areas where AI will never replace legal scholars. The effort to transform labour law into a fully mature discipline must begin immediately.

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