

DOCTORAL THESIS
The Enforcement of Criminal Law Sanctions through the Contribution of
Artificial Intelligence

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Doctoral Thesis Summary

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Abstract

This doctoral thesis examines the possibilities and limitations of integrating artificial intelligence into the enforcement of criminal law sanctions, against the background of the transformations brought about by the digitalization of society and the accelerated development of intelligent technologies. The research is based on the premise that the enforcement stage is the point at which a criminal sanction produces its concrete effects both on the convicted person and on society. Accordingly, the modernization of this component of the criminal justice system must be carried out in strict compliance with the principles of legality, proportionality and individualization of sanctions, as well as with human dignity and fundamental rights.

The main objective of the research is to identify and establish the legal foundations for the ways in which artificial intelligence may be integrated into the criminal enforcement system in order to enhance the effectiveness of sanction enforcement, individualize enforcement interventions, prevent recidivism and strengthen the process of social reintegration. Artificial intelligence is not conceived as a substitute for human decision-makers or judicial authorities, but rather as a support tool capable of processing and correlating relevant information, facilitating the monitoring of sanction enforcement and providing additional elements to support the decisions of the competent authorities.

The research methodology combines traditional methods of legal research – doctrinal analysis, statutory interpretation, the comparative method and the examination of national and European case law – with an interdisciplinary and forward-looking approach. The emerging nature of the field required the development of scenarios for the application of artificial intelligence to the enforcement of criminal sanctions and their examination from the perspectives of criminal law and the law governing the enforcement of criminal sanctions, criminology, legal ethics, data protection and computer science.

The first part of the thesis traces the evolution of criminal sanctions and sentence enforcement, from predominantly punitive models to contemporary systems oriented towards the protection of fundamental rights, rehabilitation and social reintegration. The analysis highlights the transformation of the purposes of punishment and the need to adapt enforcement mechanisms to the realities of the digital society. It also examines the relationship between the protection of the rights of persons who have committed criminal offences and the protection of victims and society, restorative justice, as well as the potential and risks associated with the use of artificial intelligence tools in the criminal justice field.

A distinct component of the research concerns the transformation of the rights and obligations of convicted persons in the context of digitalization. The thesis examines the right of persons deprived of liberty to communicate, the current legal regime governing the use of telecommunications equipment and the possibility of moving from general prohibitions towards intelligent and individualized forms of control. From the same perspective, it examines electronic monitoring and its potential evolution towards artificial intelligence-assisted monitoring systems capable of providing differentiated and proportionate supervision while maintaining the safeguards necessary for the protection of privacy and human dignity.

The central element of originality of the thesis lies in the conceptualization of a distinct field referred to as Enforcement Artificial Intelligence (IAE), dedicated to the use of intelligent technologies at the stage of enforcing criminal law sanctions. In this context, the research proposes its own conceptual vocabulary, developing the notions of the Artificial Intelligence-Based Sentence Enforcement System (SEP-AI), the Virtual Probation Service (SPV) and Standardized AI-Assisted Enforcement Systems (SSE-AI). These concepts are intended to distinguish the use of artificial intelligence at the enforcement stage from its applications during the criminal investigation or trial stages.

At the core of the proposed model is SEP-AI, conceived as an integrated and modular enforcement support system. Its architecture enables relevant information concerning the enforcement of sanctions to be used, within the limits of the powers established by law, in a differentiated manner according to the legal status and individual circumstances of the person concerned. The system includes, inter alia, modules relating to preventive measures, waiver and postponement of the application of punishment, suspension of sentence enforcement, custodial and non-custodial sanctions, hybrid enforcement regimes, community service, criminal fines, recidivism risk assessment, virtual probation and personal data protection.

The SEP-AI model is built upon the principle that artificial intelligence should assist, rather than replace, the competent authority. Algorithmic assessments may provide support for the individualization of enforcement, the monitoring of the convicted person's conduct, the assessment of his or her progress and the management of the resources of the enforcement system. However, any decision capable of producing legal effects on an individual's liberty or rights must remain subject to effective human oversight.

Particular attention is devoted to the dynamic individualization of the enforcement of sanctions. Unlike predominantly static enforcement models, the controlled use of artificial intelligence may allow for the continuous reassessment of a convicted person's conduct and the adaptation of enforcement interventions to his or her progress. In this respect, technology may contribute to identifying genuine reintegration needs, improving the efficiency of probation services and prison administrations, and ensuring a more rational use of institutional resources.

Another important objective is the identification of alternatives to traditional detention and of mechanisms capable of reducing prison overcrowding. The thesis examines the possibilities offered by intelligent electronic monitoring, the enforcement of sanctions within the community, hybrid regimes and other forms of individualized enforcement. In this area, artificial intelligence may contribute to dynamic risk assessment and to monitoring compliance with imposed obligations, without algorithmic outputs acquiring the status of autonomous judicial decisions.

The European dimension of the research is developed by reference to standards governing detention conditions, the case law of the European Court of Human Rights and the need to harmonize the use of artificial intelligence in sentence enforcement. The thesis argues for the development of a coherent European legal framework capable of establishing common standards regarding algorithmic transparency, traceability, data security, non-discrimination, institutional accountability and human oversight.

In this context, the thesis examines the requirements arising from the European Union's Artificial Intelligence Act (AI Act), particularly the legal regime applicable to high-risk artificial intelligence systems and the principle of human oversight. The application of artificial intelligence in the field of criminal enforcement may have direct effects on individual liberty and other fundamental rights. Such systems must therefore operate exclusively within clear, transparent and controllable legal boundaries. Personal data protection likewise constitutes a structural condition for the legitimacy of the

proposed systems, requiring limitations on access to data, traceability of operations, impact assessments, system audits, and compliance with the principles of necessity and proportionality.

At the same time, the research highlights the risks associated with the use of artificial intelligence, including algorithmic opacity, the reproduction of biases embedded in data, discrimination, interference with privacy, the transformation of predictive assessments into determinative criteria, and the erosion of human responsibility. For this reason, the use of artificial intelligence in the enforcement of criminal sanctions must be governed by the principle of effective human oversight, while the person concerned must be afforded the possibility of knowing, understanding and challenging the use of algorithmic outputs that affect his or her legal status.

The *de lege ferenda* proposals formulated in the thesis seek to adapt the legal framework governing the enforcement of criminal sanctions to technological developments, diversify the methods of sanction enforcement, develop alternatives to detention, regulate intelligent monitoring and establish a normative framework for the operation of artificial intelligence-assisted enforcement systems. These proposals are premised on the need to preserve human authority over legal decisions and to establish effective mechanisms of oversight, auditing and accountability.

In conclusion, the thesis argues that the integration of artificial intelligence into the enforcement of criminal law sanctions should not be regarded merely as the digitalization of existing mechanisms, but rather as an opportunity for the structural transformation of the criminal enforcement system. Artificial intelligence may contribute to the evolution from a predominantly static and standardized enforcement system towards a dynamic, individualized and adaptive model capable of making effective use of relevant information in order to achieve the purposes of punishment more efficiently.

The proposed model does not seek to establish a form of “algorithmic justice”, but rather to construct a system in which technology is placed at the service of law and the individual. Enforcement efficiency cannot constitute an autonomous objective; it must remain permanently reconciled with legality, proportionality, human dignity, the protection of privacy and the possibility of effective judicial review.

One of the essential original contributions of this research therefore lies in establishing the legal and conceptual foundations of Enforcement Artificial Intelligence and in developing a possible integrated model of artificial intelligence-assisted

enforcement of criminal sanctions, in which technology enhances the capabilities of public institutions without replacing human responsibility. From this perspective, artificial intelligence may become an instrument for a more coherent, individualized and effective enforcement of sanctions, provided that technological progress remains subordinate to the principles of the rule of law and to the effective protection of fundamental rights.