Robotik, Künstliche Intelligenz und Recht

Baran Kızılırmak

Criminal Liability in Offenses Involving Autonomous Systems Driven by Artificial Intelligence

Nomos

Robotik, Künstliche Intelligenz und Recht

Edited by

Prof. Dr. Dr. Eric Hilgendorf
Prof. Dr. Susanne Beck, LL.M.

Volume 38

Baran Kızılırmak

Criminal Liability in Offenses Involving Autonomous Systems Driven by Artificial Intelligence

Nomos

Printed and/or published with the support of the German Academic Exchange Service (DAAD).
The open access publication of this work was funded by the Open Access Funding Program of the University of Würzburg.

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.d-nb.de

a.t.: Würzburg, Univ., Diss., 2025

1st Edition 2025

Published by
Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3–5 | 76530 Baden-Baden
www.nomos.de

Production of the printed version:
Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3–5 | 76530 Baden-Baden

ISBN 978-3-7560-3487-1 (Print)
ISBN 978-3-7489-6518-3 (ePDF)

DOI https://doi.org/10.5771/9783748965183

Online Version
Nomos eLibrary

Dedicated to my mother and father...

Preface

This book constitutes the published version of the doctoral dissertation of the same title, prepared under the supervision of Prof. Dr. Dr. Eric HILGENDORF and awarded the distinction of *summa cum laude* by the Faculty of Law at the University of Würzburg.

Since antiquity, humanity has crafted narratives centred on the fear of losing control to non-human entities. Today, perhaps for the first time, we find ourselves on the threshold of witnessing the realisation of such narratives: we are no longer confronting mere puppets; instead, we are engaging with *Pinocchio*, who has transcended his strings.

This book engages with one of the most pressing challenges facing contemporary (and likely also future) criminal law: Who bears liability when an AI-driven autonomous system is involved in a criminal offence? It approaches this question from the perspective of German criminal law, with the aim of providing concrete answers, particularly in relation to the negligent liability of the person behind the machine. In this context, it further examines whether it is possible to classify the risky activities of such systems, which possess the potential to yield significant benefits for society, as permissible; thereby resulting in a situation where no one is held liable.

The research was mainly conducted between 2020 and 2025, a period marked by the rapid evolution of AI technologies. Consequently, the examples examined were repeatedly updated and revised. While the creation of avocado-shaped chairs by GPT was met with fascination, the production of films indistinguishable from reality has become almost ordinary. Nonetheless, the analysis offered here will remain relevant unless (or until) we witness a fundamental paradigm shift in which humans completely relinquish control, as at the heart of liability lies control. Accordingly, rather than focusing on a specific AI application, the study takes a step back to explore, within the framework of criminal law doctrine, how responsibility is affected when human control is partially or entirely assumed by autonomous systems. For this reason, the emphasis is placed not so much on AI itself, but on the concept of autonomy.

This work began with a question that first occurred to me in 2017. At the time, I had not yet completed my master's thesis, and as I lacked the necessary proficiency to address this topic within the framework of criminal law dogmatics, I needed to further develop my knowledge. Upon com-

mencing my doctoral studies at *Galatasaray University* (Turkey) in 2018, I started taking notes regarding the subject. Later, thanks to two scholarship programmes and a series of fortunate coincidences, life brought me to *Würzburg*, to work alongside the most distinguished scholars in the field, **Prof. Dr. Dr. Eric HILGENDORF**, renowned not only in Germany, but also across Europe and beyond for his work on AI and criminal law. I am truly grateful that it happened this way, as my time in Würzburg has been immensely enriching. I owe my deepest thanks to my *Doktorvater*, who, despite an exceptionally demanding schedule, always found the time to respond to my questions and played a vital role in the development of this dissertation. I am also sincerely grateful to the **University of Würzburg**, its academic and administrative staff, for their constant support and warm hospitality. Of course, I would also like to extend my deepest thanks to **Prof. Dr. Tobias REINBACHER**, who generously devoted time to reading my -admittedly lengthy- dissertation and kindly prepared a detailed *Gutachten*. Both *Gutachten* contributed significantly to the completion and eventual publication of this work.

One of the main difficulties I faced at the beginning was the absence of an established body of literature on the subject. Of the few existing works, some were heavily influenced by science fiction, relying on speculative arguments that lacked grounding in legal reality. Others, by contrast, dismissed the significance of the issue altogether, suggesting there was no legal problem worth analysing. As a legal scholar, understanding the technological aspects of the subject presented another significant challenge. I spent a considerable amount of time familiarising myself with the technical dimensions to identify where precisely the legal issues, particularly from the standpoint of criminal law exist. During this period, I also improved my German, which enabled me to engage more thoroughly with the relevant legal literature.

The book is written primarily from the perspective of German law. However, given the substantial overlap with Turkish law, it is of use within both legal systems. Moreover, as it is written in English, it may also serve as a valuable resource for readers from the Anglo-American legal tradition, who may be less familiar with the criminal law dogmatics prevalent in Continental Europe. Where relevant, the study also highlights points of convergence and divergence between these legal traditions.

Although being relatively lengthy for a doctoral thesis, the descriptive sections have been kept brief. However, certain foundational issues (such as negligence) are addressed in greater depth to engage readers from the

Anglo-American legal tradition. Theoretical discussions are not abstractly presented; rather, they are contextualised and illustrated with concrete examples closely linked to the subject matter.

This book was originally intended to be completed in 2023. However, various unforeseen difficulties delayed its finalisation. It is, after all, uncommon for a legal scholar studied in Turkey to pursue a doctorate in Germany under such circumstances. I owe an immense debt of gratitude to my family, who stood by me through every challenge encountered along this largely uncharted path. I have dedicated this book to them. Throughout my life, they have placed the highest value on my education and made every possible sacrifice to support. First and foremost, I am grateful to my mother for instilling in me a constant drive for self-improvement and a lasting curiosity to explore new horizons. If I possess a slight genuine passion for reading, research, and learning, it is undoubtedly due to her influence. I thank my father for teaching me the enduring virtues of honesty and integrity. I believe that even a single moment from the final stages of this project is enough to illustrate the principles he consistently upholds: during the exhausting final months, I worked no less than fourteen hours a day, every day. When the day came to submit the thesis, I worked through the night and printed the final draft using the printer in my university office, then had it bound and submitted. I called my father to share the news. He congratulated me warmly and, with characteristic sincerity, gently reminded me that it would be right to put back the paper I had used from the university supply - which, of course, I did. If I can live my life with even half the integrity he has shown, I will consider myself fortunate.

There are dozens of people to whom I owe thanks. First and foremost, I am deeply grateful to the **DAAD (German Academic Exchange Service)** for awarding me the scholarship that made it possible for me to pursue a doctorate in Germany. I am likewise thankful for the **Jean Monnet Scholarship**, among the most longstanding and prestigious scholarships in Turkey, which, through a fortunate series of events, opened a door for me to undertake my doctoral studies in *Würzburg*, the most suitable place for carrying out this research.

I am especially grateful to **Prof. Dr. Tuğrul KATOĞLU** and **Doç. Dr. Aysun ALTUNKAŞ**, whose unwavering support throughout this entire journey has been invaluable. I also extend my sincere thanks to all the dedicated academics at **Kadir Has University**, who continue to stand in solidarity despite increasingly difficult circumstances. I am truly lucky and proud to have been part of this university for many years. My sincere

thanks go to **Dr. Onur Çağdaş ARTANTAŞ**, who has always walked one step ahead of me, lighting the way down this path. I am equally grateful to **Lauren NORMAN**, who undertook the meticulous proofreading of this work with great care. I would also like to thank **Maximilian HELL** for proofreading the German summary, and for being not only one of the most talented individuals I have had the pleasure of knowing, but also a true friend. Also, I owe special thanks to **Dr. Dr. Leandro Dias**, whose guidance on the procedures and constant encouragement whenever he saw my work have been invaluable. Finally, I am also deeply grateful to all the friends and colleagues, who stood by me throughout the long and demanding process of preparing this thesis. Their constant support meant more than words can express. I am truly fortunate to have them.

I am also thankful to have been taught by many teachers throughout my life who upheld essential virtues and progressive values. While I cannot name each of them here, I sincerely thank all the teachers who have, in various ways, contributed to my learning journey. And of course, I would also like to express my sincere thanks to **Nomos Publishing**, **Dr. Marco GANZHORN** and **Miriam Moschner** for all their support.

Finally, I would like to extend my heartfelt thanks in advance to all readers who take the time to engage with this book. Undoubtedly, the study contains shortcomings, and I would be genuinely grateful for any feedback or criticism you may wish to share. You are always welcome to contact me at kizilirmak.baran+book@gmail.com.

With the hope of a peaceful world in which humans and artificial beings coexist in harmony!

Würzburg, August 2025 Baran KIZILIRMAK

Table of Contents

List of Abbreviations

AE	Alternative Entwurf
AGI	Artificial General Intelligence
AI	Artificial Intelligence
AILD	Artificial Intelligence Liability Directive
ALIC	Actio Libera In Causa
ANNs	Artificial Neural Networks
API	Application Programming Interface
Art.	Article
BASt	Bundesanstalt für Straßenwesen (Federal Highway Research Institute)
BGB	Bürgerliches Gesetzbuch (German Civil Code)
BGH	Bundesgerichtshof (Federal Court of Justice)
DAN	Do Anything Now
DIN	Deutsches Institut für Normung (German Institute for Standardization)
DNN	Deep Neural Networks
DOS	Denial of Service
DVGW	Deutscher Verein des Gas- und Wasserfaches (German Technical and Scientific Association for Gas and Water)
e.g.	Exempli gratia (for example)
Ed.	Editor
Eds.	Editors
EEC	European Economic Community
ESP	Electronic Stability Program
et al.	Et alii (and others)
etc.	Et cetera
EU	European Union
f.	Following page
FDR	Flight Data Recorder
ff.	Following pages
Fig.	Figure

fn.	Footnote
GDPR	General Data Protection Regulation
GenTG	Gentechnikgesetz (Genetic Engineering Act)
GG	Grundgesetz (Basic Law of Germany)
GPAI	General Purpose Artificial Intelligence
GPT	Generative Pre-trained Transformer
HLEG	High-Level Expert Group on Artificial Intelligence
I.	Issue
i.e.	Id est (that is)
ISO	International Organization for Standardization
JA	Juristische Arbeitsblätter
KI	Künstliche Intelligenz (Artificial Intelligence in German)
LIDAR	Light Detection and Ranging
LLM	Large Language Model
MIT	Massachusetts Institute of Technology
ML	Machine Learning
MRI	Magnetic Resonance Imaging
NHTSA	National Highway Traffic Safety Administration
NJW	Neue Juristische Wochenschrift
Nr.	Number
NStZ	Neue Zeitschrift für Strafrecht
NZV	Neue Zeitschrift für Verkehrsrecht
NZWiSt	Neuerscheinungen zum Wirtschaftsstrafrecht
OECD	Organisation for Economic Co-operation and Development
OLG	Oberlandesgericht (Higher Regional Court)
p.	Page
PCRC	Penal Code Review Committee
PLD	Product Liability Directive
pp.	Pages
ProdHaftG	Produkthaftungsgesetz (Product Liability Act)
RGSt	Reichsgericht in Strafsachen
Rn.	Randnummer (Margin number)
SAE	Society of Automotive Engineers

sci-fi	Science Fiction
StGB	Strafgesetzbuch (German Criminal Code)
StVG	Straßenverkehrsgesetz (Road Traffic Act)
StVO	Straßenverkehrs-Ordnung (Road Traffic Regulations)
TPC	Turkish Penal Code
TSE	Türk Standartları Enstitüsü (Turkish Standards Institute)
U.S.	United States
UK	United Kingdom
UN	United Nations
UNIDIR	United Nations Institute for Disarmament Research
USA	United States of America
V.	Volume
VDE	Verband der Elektrotechnik Elektronik Informationstechnik (Association for Electrical, Electronic, and Information Technologies)
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
xAI	Explainable Artificial Intelligence
ZIS	Zeitschrift für Internationale Strafrechtsdogmatik
ZStW	Zeitschrift für die gesamte Strafrechtswissenschaft