Recent advances in robotics and AI have paved the way to robots autonomously performing a wide variety of tasks in ethically and legally sensitive domains. Among them, a prominent place is occupied by robots endowed with the ability to deliver destructive force without human intervention, a.k.a. Autonomous Weapons Systems (or AWS), whose legality under international law is currently at the center of a heated academic and diplomatic debate. The AWS debate provides a uniquely representative sample of the (potentially) disruptive impact of new technologies on norms and principles of international law, in that it touches on key questions of international humanitarian law, international human rights law, international criminal law, and State responsibility. Against this backdrop, this book's primary aim is to explore the international legal implications of autonomy in weapons systems, by inquiring what existing international law has to say in this respect, to what extent the persisting validity of its principles and categories is challenged, and what could be a way forward for future international regulation on the matter. From a broader perspective, the research carried out on the issue of the legality of AWS under international law aspires to offer some more general insights on the normative aspects of the shared control relationship between human decision-makers and artificial agents.

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This book has been subject to a blind review process.
Daniele Amoroso

Autonomous Weapons Systems and International Law

A Study on Human-Machine Interactions in Ethically and Legally Sensitive Domains
Il volume è stato realizzato con il contributo del Dipartimento di Giurisprudenza dell’Università degli Studi di Cagliari.

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Ad Anna

e all’inizio della nostra vita «vera»
che ben fu il più crudele e il più di quanti mai furo al mondo ingegni empi e maligni, ch’imaginò si abomnosi ordigni

L. Ariosto, Orlando furioso, canto XI, ottava 27
Table of Contents

Acknowledgments XIII

Prologue 1

CHAPTER I

Introduction
1. A (Brief) History of the Debate on Autonomous Weapons Systems 5
   1.2. Questioning the “Dehumanization” of Warfare: From the Campaign to Stop Killer Robots to the Group of Governmental Experts on Lethal Autonomous Weapons Systems 11
   2.1. An Overview of Existing and Foreseeable Autonomous Weapons Systems 18
   2.2. Normative Implications of a Functional Approach to Autonomy in Weapons Systems 21
3. Mapping the Ethical and Legal Debate on Autonomous Weapons Systems 23
4. Research Goals and Structure of the Book 25
   4.1. Disclaimer: What this Book is not About 28

CHAPTER II

A Legality “Test” for Autonomous Weapons Systems
The (In)compatibility of Autonomous Targeting with International Humanitarian Law and International Human Rights Law
1. Introduction 31
2. Setting Up the “Parameters” of the Test 36
   2.1. The Law of Targeting 37
   2.2. The Right to Life under International Human Rights Law 40
3. The First Prong of the Test: Distinction 45
   3.1. The Principle of Distinction under International Humanitarian Law 46
      3.1.1. The Definition of Civilians and the Problem of Direct Participation in Hostilities 47
Table of Contents

5. Corporate Responsibility 150
   5.1. Tort Liability for International Crimes 150
   5.2. Product Liability 152
   5.3. No-Fault Liability 154
6. Conclusions: The Inevitability of Accountability Gaps and Its Implications for the Legality of Autonomous Weapons Systems 156

Chapter IV

Challenging Autonomous Weapons Systems as a Malum in Se
AWS, Human Dignity and the Martens Clause between Ethics and Law
1. Introduction 161
2. Entering Ethical Concerns in the International Legal Discourse: A Précis on Human Dignity and the Martens Clause 164
   2.1. Human Dignity 165
   2.2. The Martens Clause 172
   2.3. Wrap-up of the Discussion 178
3. The Ethical Arguments against Autonomy in Weapons Systems 179
   3.1. Autonomy in Weapons Systems as a Breach of the Human Dignity (and Humanity) of Targeted People 181
   3.2. Autonomy in Weapons Systems and the “Human Agency Removal” Problem 189
   4.2. b) International Organizations 201
   4.3. c) Global Civil Society and Private Sector 204
   4.4. d) Documents on AI not Directly Addressing the Issue of Autonomy in Weapons Systems 211
5. Conclusions 214

Chapter V

A Normative Model of Meaningful Human Control over Weapons Systems
1. Introduction 217
2. Human Control vs. Weapon Autonomy: Striking a Balance between Humanitarian and Military Considerations 220
3. The Debate on Meaningful Human Control (MHC) over Weapons Systems: A Sketch 224
   3.1. The Quality of Human Involvement 228
   3.2. Shared Control Policies 232
4. Shaping the Content of a Normative Model of Meaningful Human Control 240
   4.1. Primary Obligations: Control Privileges 241
   4.2. Ancillary Obligations: Training and Design 246
### Table of Contents

   5.1. An Overview of the Regulative Options in the AWS Debate 250
   5.2. Possible Elements of a Future Protocol/Treaty on Meaningful Human Control 256

**Epilogue** 261

**Bibliography** 267
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The merits of this book (if any) have to be shared with all the above. All mistakes and omissions are, of course, solely my own.

Cagliari, 16 April 2020

Daniele Amoroso
Recent advances in robotics and artificial intelligence (AI) have paved the way to robots autonomously performing a wide variety of tasks that may significantly affect individual and collective interests, which are worthy of protection from both ethical and legal perspectives. An exemplary case is the circulation of autonomous vehicles on public roads, but one may also think of increasingly autonomous surgical and care robots. To this list of robotic systems one may finally add the judicial use of AI software systems, notwithstanding the lack of their (direct) kinetic interaction with the physical world. Indeed, the use of AI in the Court is aimed at replacing or supporting the human judge in decision-making processes and tasks that, by their very definition, are supposed to have an impact on legal rights and duties.

These technological developments revamped longstanding discussions on Ethical, Legal and Socio-Economic (ELSE) implications of

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1 The term “Artificial Intelligence”, coined in 1956 by John McCarthy (S.L. Andersen, *John McCarthy: Father of AI*, IEEE Intelligent Systems, 2002, p. 84 f.), generally describes the capability of a computing machine to carry out tasks that are assumed to require human intelligence. This is done, in particular, by framing these tasks into mathematical models that machines can cope with.
2 A robotic system may be counted as “autonomous” at given tasks if, once activated, it is able to carry out those tasks without further human intervention.
robotics and AI, whose origins can be traced back at least to Norbert Wiener’s seminal reflections on the ethics of information technologies and robotics. Present debates about machine autonomy in ethically and legally sensitive domains have now gone well beyond academic and specialist circles, entering the political debate and receiving considerable media coverage.

Over and above the specificities of each technological application domain, there are a few overarching issues arising in connection with most artificial systems endowed with autonomy in the execution of tasks that are ethically and legally sensitive. First, there is the technical question concerning whether artificial agents are inherently unable to properly carry out certain functions governed by law (e.g. replace human judges in performing tasks involving discretionary reasoning and/or equitable evaluations), insofar as they would (allegedly) require uniquely human capabilities. Second, there is the (most strictly) legal problem of determining how to allocate responsibility if a machine happens to cause harm (think, for instance, of damages arising from surgical robots’ mishaps). Third, we have the philosophical debate on the moral desirability of machine autonomy between those that argue from the perspective of deontological ethics on one side and those that do so from a consequentialist perspective on the other. The former maintain that it would be morally unacceptable to remove human agency from decision-making processes that are likely to impinge on individual rights and duties, as well as on relationships that are ethical in character (such as that of nursing care). The latter affirm the moral and legal duty to replace human operators with autonomous machines, whenever machine performance ensure better protection of the interests at stake (e.g. by reducing the number of road accidents and fatalities).


8 Broadly speaking, deontological ethics identifies moral duties as guides for acting and judging the moral worth of choices.

9 Unlike deontological ethics, consequentialism focuses on criteria to distinguish between morally good and bad consequences of choices, and prescribes to judge the moral worth of choices in the light of consequences only.
All of these issues are emblematically encompassed in discussions on the legality, under international law, of autonomous robots endowed with the ability to deliver destructive force without human intervention, which are generally known as Autonomous Weapons Systems (or AWS). To begin with, it is indeed questioned whether it will ever be technically possible to program autonomous robots to faithfully comply with the norms governing the use of armed force in international law. Also, the problem has arisen as to how to ascribe responsibility whenever an autonomous weapons system takes a harmful course of action in breach of international legal prescriptions. Finally, one may detect a normative tension between consequentialist reasons favoring the use of these applications (e.g. the need to avoid targeting decisions tampered by typically-human biases) and the view, ultimately based on deontological ethics, whereby decisions encroaching upon fundamental human rights (first and foremost, the right to life) should never be entrusted to artificial agents.

Discussions on AWS have been contributed to by a multitude of academics, belonging to the most disparate of disciplinary fields (which include – in addition to international law – robotics, computer science, normative ethics, and military studies), by also involving governments, military bureaucracies, think-tanks, international organizations, and NGOs. This makes the AWS debate a privileged vantage point to carry out a study on human-machine interactions in domains, as the ones set out above, that are sensitive from both an ethical and legal perspective.10

At the same time, the legal problems raised by autonomy in weapons systems provide a uniquely representative sample, from both a theoretical and practical perspective, of the (potentially) disruptive impact of new technologies on norms and principles of international law.11 Critics have indeed characterized AWS as “shaking the foun-

10 For similar considerations, see C. HEYNs, Autonomous Weapons in Armed Conflict and the Right to a Dignified Life: an African Perspective, in South African J. on Human Rights, 2017, p. 46 f., p. 48 (“The way we respond to autonomous weapons is a pivotal test case for the role of science in the future. The stakes cannot be higher — they are literally life and death — and how we deal with autonomous weapons will be the tone for how we deal with computers in general”); and R. GIESS and H. LAHMANN, Autonomous Weapons Systems: A Paradigm Shift for the Law of Armed Conflict?, in J.D. OHLIN (ed.), Research Handbook on Remote Warfare, Cheltenham, 2017, p. 371 f., p. 374 (“The military aspect of this debate is only the tip of the iceberg. On a fundamental level, it needs to be asked how much ‘de-humanizing’ of societal mechanisms humankind can, or is willing to, afford to tolerate, before the social costs outweigh the benefits”).

11 The literature on this topic is vast and relentlessly growing. Among the most valuable and recent contributions, see E. CARPANELLI and N. LAZZERINI (eds), Use
dations” upon which international human rights law and international humanitarian law rest; but even those who are in favor of them are ready to admit that this technology prompts a serious reconsideration of well-established international legal regimes, including those governing State responsibility and individual criminal responsibility.

Against this backdrop, this volume’s primary aim is to explore the international legal implications of autonomy in weapons systems, by inquiring what existing international law has to say in this respect, to what extent the persisting validity of its principles and categories is challenged, and what could be a way forward for future international regulation on the matter. From a broader perspective, as will be seen in the Epilogue, the research carried out here on the issue of the legality of AWS under international law aspires to offer some more general insights on the normative aspects of the shared control relationship between human decision-makers and artificial agents.

12 Human Rights Watch (HRW) and the International Human Rights Clinic at Harvard Law School (IHRC), Shaking the Foundations. The Human Rights Implications of Killer Robots, 12 May 2014.