Joachim von Braun · Margaret S. Archer
Gregory M. Reichberg · Marcelo Sánchez Sorondo *Editors*

Robotics, AI, and Humanity

Science, Ethics, and Policy

OPEN ACCESS

Springer

Robotics, AI, and Humanity

Joachim von Braun • Margaret S. Archer
Gregory M. Reichberg • Marcelo Sánchez Sorondo
Editors

Robotics, AI, and Humanity

Science, Ethics, and Policy

Springer

Editors
Joachim von Braun
Bonn University
Bonn, Germany

Margaret S. Archer
University of Warwick
Coventry, UK

Gregory M. Reichberg
Peace Research Institute
Oslo, Norway

Marcelo Sánchez Sorondo
Pontifical Academy of Sciences
Vatican City, Vatican

ISBN 978-3-030-54172-9 ISBN 978-3-030-54173-6 (eBook)
https://doi.org/10.1007/978-3-030-54173-6

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Message from Pope Francis

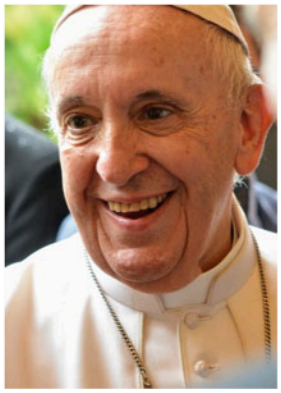

Photo credit: Gabriella C. Marino

Artificial intelligence is at the heart of the epochal change we are experiencing. Robotics can make a better world possible if it is joined to the common good. Indeed, if technological progress increases inequalities, it is not true progress. Future advances should be oriented towards respecting the dignity of the person and of Creation. Let us pray that the progress of robotics and artificial intelligence may always serve humankind . . . we could say, may it "be human".

Pope Francis, November Prayer Intention, 5 November 2020

Acknowledgements

This edited volume, including the suggestions for action, emerged from a Conference on "Robotics, AI and Humanity, Science, Ethics and Policy", organized jointly by the Pontifical Academy of Sciences (PAS) and the Pontifical Academy of Social Sciences (PASS), 16–17 May 2019, Casina Pio IV, Vatican City. Two related conferences had previously been held at Casina Pio IV, Vatican City: "Power and Limitations of Artificial Intelligence" (December 2016) and "Artificial Intelligence and Democracy" (March 2018). The presentations and discussions from these conferences are accessible on the website of the Pontifical Academy of Sciences www.pas.va/content/accademia/en.html. The contributions by all the participants in these conferences are gratefully acknowledged. This publication has been supported by the Center for Development Research (ZEF) at Bonn University and the Research Council of Norway.

Contents

AI, Robotics, and Humanity: Opportunities, Risks, and Implications for Ethics and Policy

Joachim von Braun, Margaret S. Archer, Gregory M. Reichberg, and Marcelo Sánchez Sorondo

Contents

Abstract

This introduction to the volume gives an overview of foundational issues in AI and robotics, looking into AI's computational basis, brain–AI comparisons, and conflicting positions on AI and consciousness. AI and robotics are changing the future of society in areas such as work, education, industry, farming, and mobility, as well as services like banking. Another important concern addressed in this volume are the impacts of AI and robotics on poor people and on inequality. These implications are being reviewed, including how to respond to challenges and how to build on the opportunities afforded by AI and robotics. An important area of new risks is robotics and AI implications for militarized conflicts. Throughout this introductory chapter and in the volume, AI/robot-human interactions, as well as the ethical and religious implications, are considered. Approaches for fruitfully managing the coexistence of humans and robots are evaluated. New forms of regulating AI and robotics are called

J. von Braun (✉)
Center for Development Research (ZEF) Bonn University, Bonn, Germany
e-mail: jvonbraun@uni-bonn.de

M. S. Archer
University of Warwick, Coventry, UK
e-mail: margaret.archer@warwick.ac.uk

G. M. Reichberg
Peace Research Institute Oslo (PRIO), Research School on Peace and Conflict | Political Science, University of Oslo, Grønland, Norway
e-mail: greg.reichberg@prio.org

M. Sánchez Sorondo
Pontifical Academy of Sciences, Vatican City, Vatican
e-mail: marcelosanchez@acdscience.va; pas@pas.va

J. von Braun et al. (eds.), *Robotics, AI, and Humanity*, https://doi.org/10.1007/978-3-030-54173-6_1

for which serve the public good but also ensure proper data protection and personal privacy.

Keywords

Artificial intelligence · Robotics · Consciousness · Labor markets · Services · Poverty · Agriculture · Militarized conflicts · Regulation

Introduction[1]

Advances in artificial intelligence (AI) and robotics are accelerating. They already significantly affect the functioning of societies and economies, and they have prompted widespread debate over the benefits and drawbacks for humanity. This fast-moving field of science and technology requires our careful attention. The emergent technologies have, for instance, implications for medicine and health care, employment, transport, manufacturing, agriculture, and armed conflict. Privacy rights and the intrusion of states into personal life is a major concern (Stanley 2019). While considerable attention has been devoted to AI/robotics applications in each of these domains, this volume aims to provide a fuller picture of their connections and the possible consequences for our shared humanity. In addition to examining the current research frontiers in AI/robotics, the contributors of this volume address the likely impacts on societal well-being, the risks for peace and sustainable development as well as the attendant ethical and religious dimensions of these technologies. Attention to ethics is called for, especially as there are also long-term scenarios in AI/robotics with consequences that may ultimately challenge the place of humans in society.

AI/robotics hold much potential to address some of our most intractable social, economic, and environmental problems, thereby helping to achieve the UN's Sustainable Development Goals (SDGs), including the reduction of climate change. However, the implications of AI/robotics for equity, for poor and marginalized people, are unclear. Of growing concern are risks of AI/robotics for peace due to their enabling new forms of warfare such as cyber-attacks or autonomous weapons, thus calling for new international security regulations. Ethical and legal aspects of AI/robotics need clarification in order to inform regulatory policies on applications and the future development of these technologies.

The volume is structured in the following four sections:

- *Foundational issues in AI and robotics*, looking into AI's computational basis, brain–AI comparisons as well as AI and consciousness.
- *AI and robotics potentially changing the future of society* in areas such as employment, education, industry, farming, mobility, and services like banking. This section also addresses the impacts of AI and robotics on poor people and inequality.
- *Robotics and AI implications for militarized conflicts* and related risks.
- *AI/robot–human interactions* and ethical and religious implications: Here approaches for managing the coexistence of humans and robots are evaluated, legal issues are addressed, and policies that can assure the regulation of AI/robotics for the good of humanity are discussed.

Foundational Issues in AI and Robotics

Overview on Perspectives

The field of AI has developed a rich variety of theoretical approaches and frameworks on the one hand, and increasingly impressive practical applications on the other. AI has the potential to bring about advances in every area of science and society. It may help us overcome some of our cognitive limitations and solve complex problems.

In health, for instance, combinations of AI/robotics with brain–computer interfaces already bring unique support to patients with sensory or motor deficits and facilitate caretaking of patients with disabilities. By providing novel tools for knowledge acquisition, AI may bring about dramatic changes in education and facilitate access to knowledge. There may also be synergies arising from robot-to-robot interaction and possible synergies of humans and robots jointly working on tasks.

While vast amounts of data present a challenge to human cognitive abilities, Big Data presents unprecedented opportunities for science and the humanities. The translational potential of Big Data is considerable, for instance in medicine, public health, education, and the management of complex systems in general (biosphere, geosphere, economy). However, the science based on Big Data as such remains empiricist and challenges us to discover the underlying causal mechanisms for generating patterns. Moreover, questions remain whether the emphasis on AI's supra-human capacities for computation and compilation mask manifold limitations

[1]The conclusions in this section partly draw on the Concluding Statement from a Conference on "Robotics, AI and Humanity, Science, Ethics and Policy", organized jointly by the Pontifical Academy of Sciences (PAS) and the Pontifical Academy of Social Sciences (PASS), 16–17 May 2019, Casina Pio IV, Vatican City. The statement is available at http://www.casinapioiv.va/content/accademia/en/events/2019/robotics/statementrobotics.html including a list of participants provided via the same link. Their contributions to the statement are acknowledged.