Algorithmic Decision-making and the Law

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Abstract: In the data driven digital era there has been rapid technological development in fields such as artificial intelligence and the use of big data, which has a huge impact on society. This poses many challenges for individuals, in particular related to privacy and personal data. There are also questions about accountability relating to algorithmic decision-making. Algorithms and artificial intelligence are key concepts at the core of the digital era, and have an impact on society. In this article the focus is on the need for a legal framework for algorithmic decision-making and the key features thereof. A good basis was laid in 2018 with the development of a set of ethical and legal principles, which includes the promotion of accountability, fairness and respect for human rights. This should be translated into international and national legal documents to support the further development of algorithmic decision-making.

Keywords: Algorithm, algorithmic decision-making, algorithmic accountability, artificial intelligence, legal framework

1. Introduction

The Fourth Industrial Revolution[1] is reshaping the world we know dramatically and is characterised by a close interaction between the biological, digital and physical spheres. Digital technologies are impacting all facets of our lives and create a series of new opportunities but also various challenges. In this data driven digital era there is rapid technological development in fields such as artificial intelligence, big data, robotics, Internet of Things, biotechnology and nanotechnology which has a huge impact on society. This poses many challenges for individuals, in particular related to privacy and personal data. At the same time governments and legislators are faced with questions about the impact on society and the need for regulation relating to these new technological developments. Etzioni suggested that there is a need to regulate artificial intelligence in order to steer its development and application, but is not as concerned as the technology entrepreneur Elon Musk, who referred to AI as an existential threat to humanity.'[2] In this digital era, the diverse nature and rapid pace of technological developments has meant that the development of the law relating to artificial

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[1] Davis, N. (2016) What is the Fourth Industrial Revolution?, from
www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/
[2] Etzioni, O. (2017) "How to Regulate Artificial Intelligence", New York Times, 2 Sept. 2017, p. A19(L). Gale Academic Onefile (accessed August 15, 2019).

intelligence and the use of algorithms has generally been slow and unable to match the pace and scope of technological developments.[3]   Questions such as who is responsible when a self-driving car causes an accident, or to what extent can the data my mobile phone collects about me be used by third parties, or how does algorithmic decision-making affect administrative decisions, are examples of important legal issues in this context. In this paper the focus is on a specific key aspect of digital technological development, namely algorithmic decision-making, in view of the important role it plays in various technological applications.

Algorithms form an integral part of artificial intelligence (AI) and can be defined as follows:

"An algorithm is a self-contained step-by-step set of operations that computers and other 'smart' devices carry out to perform calculations, data processing, and automated reasoning tasks."[4]   In its simplest form an algorithm is a prescribed set of steps to solve a (mathematical) problem by producing one numerical answer. Diakopolous defines an algorithm as "a series of steps undertaken in order to solve a particular problem or accomplish a defined outcome".[5]

In the context of public law there are many questions and challenges relating to individual rights for example the right to privacy, and regarding the role and responsibilities of government relating to policy development and regulation dealing with technological developments. Issues such as the impact of biotechnology on health services, use of big data in public governance, algorithmic decision-making and the use of algorithms that influence customer's shopping behaviour, are some of the examples that give rise to questions about the values, ethical standards and regulatory environment relating to the current digital era, also referred to as the Fourth Industrial Revolution. In its deliberations about the ethical framework that should underpin the Fourth Industrial Revolution, the World Economic Forum identified three universal values; namely human dignity, common good and stewardship.[6]   These values should help to shape the ethical framework, normative standards and a value-based governance model relating to the diverse range of technological developments in the digital era. This view suggests a quite wide range of issues that include a variety of technological fields. The scope of this paper is much narrower, and it aims to explore the need for regulation of algorithmic decision-making and to provide some recommendations for the development of an appropriate legal framework.

A short introduction to the public law context within which the discussion of algorithmic decision-making is presented in this paper, is provided here. The development and eventual adoption of the Universal Declaration of Human Rights by the United Nations in 1948 signified a commitment to develop a world in which human rights would be central and which should guide development

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[3] Schwab, K. (2016) The Fourth Industrial Revolution: what it means and how to respond, from www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

[4] ACM US Public Policy Council, (2017) Statement on Algorithmic Transparency and Accountability, www.acm.org/binaries/content/assets/public-policy/2017_joint_statement_algorithms.pdf ; Busch, C. (2018) Algorithmic Accountability, Abida Gutachten, www.abida.de

[5] Diakopolous, N. (2015) Algorithmic Accountability, Digital Journalism 3(3): p400.

[6] Sutcliffe, H. & Algrove, A-M. (2018) How do we build an ethical framework for the Fourth Industrial Revolution?, from www.weforum.org/agenda/2018/11/ethical-framework-fourth-industrial-revolution

around the globe.[7] For the first time fundamental human rights were recognised and it was agreed they must be protected. This is the global framework and it provides a normative framework for societies throughout the world. Various other international instruments, such as the European Convention of Human Rights,[8] as well as national bills of rights, were developed during the second half of the 19th century and form part of the constitutional architecture of many countries. These legal documents on human rights provide the value-base for the development of societies and have a human-centred focus.

The concept of a Rechtsstaat or a constitutional state, as it is described by the South African Constitutional Court, defines the nature of constitutional democracy in various countries. The Rechtsstaat, which is one of the pillars of the German constitutional system, is described by Klaus Stern as follows:

'the exercise of the power of the state on the basis of laws adopted according to the Constitution, with the purpose of guaranteeing freedom, justice and legal certainty'.[9]

The Rechtsstaat has both formal and substantive elements which define the character of the German constitutional order. The substantive Rechtsstaat means that the exercise of power must not only be formally in accordance with the law, but it must also ensure justice, according to Von Munch.[10] It is clear that the Rechtsstaat is both a normative feature of the German constitutional system as well as a substantive one, namely that adherence to the social and democratic values with a focus on social justice is also very important.

Other constitutional democracies have followed the German example and also adopted the concept of the Rechtsstaat as a cornerstone of their constitutional system for example in South Africa in 1994. The South African Constitutional Court referred to these foundational values as follows:

"In reaction to our past, the concept and values of the constitutional state, of the "regstaat", and the constitutional right to equality before the law are deeply foundational to the creation of the "new order" referred to in the preamble."[11]

The Rechtsstaat or constitutional state, due to its supreme legal character, indeed provides a guiding foundation and stimulus for further development of the law. Included in the concept of the Rechtsstaat or the constitutional state is the recognition and protection of fundamental human rights, which strengthens a human-centred approach to development, and which is also relevant in this digital era. It is argued that such a legal framework, that acknowledges a human-centred focus,

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[7] United Nations, Universal Declaration of Human Rights, 1948, www.un.org/en/universal-declaration-human-rights/

[8] Council of Europe, (1950) European Convention on Human Rights, from www.echr.coe.int/Documents/Convention

[9] Stern, K. (1984) Das Staatsrecht -der Bundesrepublik Deutschland, vol 1, 2d ed, Beck Verlag, München, 1984, 781; Art. 20, 28 German Basic Law, 1948.

[10] Von Münch, I. (1993) Staatsrecht, Band I, 133-134.

[11] S v Makwanyane and Another [1995] ZACC 3; 1995 (6) BCLR 665; 1995 (3) SA 391, at para. 156; Venter, F. 'South Africa, a Diceyan Rechtsstaat?', 57 McGill L. J. 2011-2012, 721 743; sec. 1, 2 Constitution of South Africa, 1996.

could provide guidance on shaping the appropriate legal framework for the further development and application of algorithmic decision-making and artificial intelligence in society.

The key question to be answered in this article is: what is the need for a legal framework for algorithmic decision-making and what should be the key features of such a legal framework? The structure of this paper consists of an introductory section that provides the context for the article. An overview of the use of algorithms and algorithmic decision-making is then provided, followed by a discussion of algorithmic accountability, as well as human rights implications, from a public law perspective. This is followed by an analysis (in the form of a desktop study) of key current international legal developments relating to artificial intelligence and algorithmic decision-making. The paper concludes with some recommendations for an appropriate legal framework that could guide the further development and use of algorithmic decision-making.

2. Algorithmic Decision-making

Artificial intelligence, big data, machine learning and algorithmic decision-making are key concepts well-known to computer scientists and are central to current technological developments. It is, however, judicious that some clarity about these concepts and how they are used should be provided here, in order to reflect on the ethical and legal implications for society.

A comprehensive dictionary definition of artificial intelligence (AI) is 'the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.'[12] Mitrou argues that the development of AI is driven by social and economic demands and is a key driver of the Fourth Industrial Revolution.[13] Since the pioneering work by Alan Turing in 1950, the concept of artificial intelligence has grown into a multi-faceted concept that is applied in various ways in our daily lives. AI can perform various human intelligence functions such as speech recognition, problem solving, data analysis, perception and learning,[14] and it can do it much faster than the individual human brain can. Search engines, self-driving cars and language translation software are some of the applications of AI.

It is in the field of computer science and in particular artificial intelligence where algorithms, which are developed as computer code, play a key role. In machine learning it is not only human-designed algorithms that are used, but computers can also create algorithms, so-called self-learning algorithms. There is a growing range of applications where machine learning is used; e.g., in search engines (Google), social media (personalised news), health services (predictive medication) and online shopping (suggested products). The use of algorithms in these cases is aimed at providing

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[12] https://en.oxforddictionaries.com/definition/artificial_intelligence

[13] Mitrou, L. (2019) 'Data Protection, Artificial Intelligence and Cognitive Services: Is the General Data Protection Regulation (GDPR) Artificial Intelligence-Proof? (April 2019), https://ssrn.com/abstract=3386914

[14] Mitrou supra 10; Ishii, K. (2019) Comparative legal study on privacy and personal data protection for robots equipped with artificial intelligence: looking at functional and technological aspects, AI & Soc, (2019) 34:509–533 (online publication).

interpreted information or analysed data on which the user of the particular service can base a decision, whether it is to buy a specific product or service, or simply to get answers from an internet search. Mitrou described this use of algorithms as 'narrow AI' that supports human decision-making by probabilistic reasoning.[15] Artificial intelligence in its wider definition includes machine learning, analysis of big data (large sets of data), predictive modelling and it exhibits more cognitive features normally associated with human decision-making.

Machine learning can be defined as the science of getting computers to learn and act like humans do, by using algorithms and learning from this, and by having the ability to learn without being explicitly programmed.[16] In machine learning, computers learn from data and create solutions to complex problems, including predictions based on the knowledge gained. Such algorithms analyse data, apply a systematic process to produce results and could also define and adapt the decision-making rules. Algorithms can be categorised according to their nature as deterministic algorithms, which are those conventional algorithms designed by humans and commonly used in a variety of applications, or probabilistic algorithms. A deterministic algorithm is linear in nature and will always produce the same output given the same input. Probabilistic algorithms, in contrast, include an element of probability and could produce a variety of results.[17] This last category is what is used in machine learning, where the results and the way in which they are produced depend on probabilities of statistics. The Declaration on Ethics and Data Protection in Artificial Intelligence acknowledges the rapid development of artificial intelligence, including machine learning,

> 'in particular with the development of deep learning technologies, allowing algorithms to solve complex operations leading to potential decisions, making however, such processes more opaque.'[18]

The use of algorithms in artificial intelligence is essentially about automated decision-making, which can and does influence human decision-making. The different functions that algorithms perform are prioritisation, classification, association and filtering.[19] Prioritisation of information through algorithms provides some form of ranking based on the design criteria of the algorithm. This is commonly used in search engines such as Google and travel websites such as TripAdvisor and Airbnb. Classification of data is not concerned about prioritising the data, but rather about grouping data in classes which could be pre-determined or determined by the algorithm.[20] This is, for example, used by financial institutions to determine the risk class of a client. When an algorithm is used for association, the focus is on linking data by finding the relationship between various elements, for example the use of predictive text in mobile phone messaging software. The algorithm identifies possible links or associations with the input data and provides the user with suggested decisions, e.g. predictive text. Filtering is an important function of algorithms and is used to either include or exclude certain data. This is commonly used in e-mail programs to limit junk mail. In all

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[15] Mitrou supra 10.

[16] Mitrou supra 12; World Wide Web Foundation Algorithmic Accountability, (July 2017) 7.

[17] https://www.techopedia.com/definition/18830/deterministic-algorithm

[18] 40th International Conference of Data Protection and Privacy Commissioners Declaration on Ethics and Data Protection in Artificial Intelligence (23 October 2018), Brussels.

[19] Busch 17; Diakopoulos, N. (2016) Accountability in Algorithmic Decision-making, Communications of the ACM 59 (2): 56-62 (2016).

[20] Busch 18.

the functions of algorithms there is some form of human influence, whether it is in the design criteria, selection of data sets, the semantics of categories or in other ways.

Algorithmic decision-making is concerned with decisions produced by algorithms or based on algorithms. Examples of decisions produced by algorithms are programming for self-driving cars, credit scoring software and spam filters in e-mail systems. The required result is determined by the algorithm, which has a set of design criteria for the specific application. In most cases where algorithms are used, results are produced to be used for a specific purpose and to aid human decision-making. So, the decision is still made by a person, but it is based on information produced by an algorithm. This category covers a wide spectrum and includes the following examples:[21]

Predictive policing software	Police determine where high crime areas are and how to prioritise the use of resources
Medical apps for diagnosis and treatment of specific diseases	Doctors use it for earlier and better diagnosis of cancer
Ranking of holiday accommodation	Businesses such as Airbnb use it to provide suggested accommodation to clients who can then make a better-informed decision
Online trading software	Algorithms produce suggested products for clients based on their user profiles

Considering the example of predictive policing software, the algorithmic decision-making works as follows: an algorithm is developed based on a set of design criteria and applied to a huge amount of data about crime in a town. The algorithm would then produce information about where the highest likelihood of particular crimes would be. This algorithmic decision then enables the police to make a better-informed decision about when and where they must use their human and other resources and what the scope of such deployment should be. The decision is thus still a human decision, but it is based on an algorithmic process. The goal in this case is more effective policing.

However, there could be questions about the application and impact of a particular algorithmic decision; for example, if the predictive policing algorithm leads to a biased profiling of a specific community.[22]

Algorithms are designed and applied in a specific context where the human interaction with the algorithm in providing the design criteria, as well as the data on which the algorithm will be applied, play an important role. The design criteria or the applicable data or both could include a bias that might be discriminatory, or as Mittelstadt described, an algorithm as essentially value-laden.[23]

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[21] Busch p12 – 17.
[22] Council of Europe, (2018) Algorithms and Human Rights 11.
[23] Mittelstadt, B. (2016) The ethics of algorithms 1.

When the legal implications of algorithmic decision-making is then considered, the human influence in this process is very relevant.

3. Algorithmic Accountability

The fact that algorithms are used to analyse huge amounts of data to produce specific outcomes, that might cause damage or could be discriminatory against individuals or groups of people due to an algorithmic bias, raises questions about accountability. The concept of accountability is well-known in constitutional law and in public governance. It often forms part of the constitutional design of a country, for example in South Africa, where it is part of the checks and balances in the system to ensure that people are held to account for their actions. In the context of constitutional law it means inter alia that members of the executive must report to the legislature on how they fulfill their mandates, and they must be accountable to the citizens. They must account for the budgets and policy implementation within their field of responsibility.   But how can accountability be applied to an algorithm?

There is not yet a commonly accepted definition of algorithmic accountability. Transparency, which is a well-known concept in constitutional and administrative law, or openness, is often used in conjunction with accountability in discussions on good governance. Citizens want to see and understand the decisions of public officials in order to keep the officials and the government accountable.[24]   Transparency of administrative decisions supports accountability and adherence to the rule of law. It also contributes to fighting corruption and maladministration. There are, however, limits to applying transparency to algorithmic decision-making. Ananny and Crawford have analysed the possible use of transparency to understand and govern algorithms and have concluded that transparency is of very limited help to explain and understand complex systems such as algorithms.[25] One of the limitations relating to transparency of computer code is the time dimension, for example, is it continuous visibility, an ad hoc image of the source code or an ex post facto view of the algorithm and its training data that should be visible? This is complicated by algorithms in adaptive systems which learn and change over time. Due to the nature and complexity of most algorithms, in particular in the context of machine learning, it makes looking into that black box of computer code not very useful for citizens and consumers seeking to establish some form of algorithmic accountability.[26] In linking transparency to accountability in this context it means that 'making one part of an algorithmic system visible—such as the algorithm, or even the underlying data—is not the same as holding the assemblage accountable.'[27] If it is not possible to see and understand

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[24] See Finck, M. (2019) Automated Decision-Making and Administrative Law, Max Planck Institute for Innovation and Competition Research Paper No. 19-10, for a discussion on transparency in automated decision-making.

[25] Ananny, M. & Crawford, K. (2016) 'Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability', New Media and Society, 1-12.

[26] Mittelstadt supra 6.

[27] Ananny & Crawford supra 12; Zerilli, J. et al. (2018) Transparency in Algorithmic and Human Decision-Making: Is There a Double Standard?, 3–5; World Wide Web Foundation Algorithmic Accountability, (July 2017), 11 – 12.

the reasoning behind an algorithmic decision, the basis for establishing accountability is in question. Therefore, new approaches to accountability in this context will have to be considered. The fact that algorithmic decision-making is opaque and could in fact be very complex, for example in the case of machine learning, which includes predictive modelling, means that looking into the system should rather be replaced by looking across the system in order to get a holistic view. The limitation or lack of transparency regarding algorithmic decision-making may prevent aggrieved citizens from obtaining an effective legal remedy.[28]

Algorithmic accountability is about a focus on the design and implementation of algorithmic systems in publicly accountable ways to mitigate harm or negative impacts on consumers and society.[29] Various experts in computer science have approached this complex matter by describing a set of principles that should apply to the design and use of algorithms in order to support public accountability. A group that calls itself the Fairness, Accountability and Transparency in Machine Learning community (FATML) propose five principles for algorithmic accountability, namely fairness, explainability, auditability, responsibility and accuracy, which is described in the following table:

Principle	Description
Fairness	"Ensure that algorithmic decisions do not create discriminatory or unjust impacts when comparing across different demographics"
Explainability	"Ensure that algorithmic decisions as well as any data driving those decisions can be explained to end-users and other stakeholders in non-technical terms."
Auditability	"Enable interested third parties to probe, understand, and review the behaviour of the algorithm through disclosure of information that enables monitoring, checking, or criticism, including through provision of detailed documentation, technically suitable APIs, and permissive terms of use."
Responsibility	"Make available externally visible avenues of redress for adverse individual or societal effects of an algorithmic decision system and designate an internal role for the person who is responsible for the timely remedy of such issues."
Accuracy	"Identify, log, and articulate sources of error and uncertainty throughout the algorithm and its data sources so that expected and worst case implications can be understood and inform mitigation procedures."

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[28] Finck supra 12.

[29] World Wide Web Foundation Algorithmic Accountability, July 2017, 11; Diakopoulos, N. et al. www.fatml.org/resources/principles-for-accountable-algorithms; Mittelstadt et al 2.

[Source: Diakopoulos, N. et al. (2016) Principles for Accountable Algorithms and a Social Impact Statement for Algorithms, from Fairness, Accountability, and Transparency in Machine Learning (FATML), www.fatml.org/resources/principles-for-accountable-algorithms]

This is a helpful guide but does not provide all the answers to issues relating to algorithmic accountability and further research is thus needed. The World Wide Web Foundation argues that improving algorithmic accountability should be a systemic approach that involves a whole range of stakeholders, such as algorithmic designers, regulators, consumers and interest groups, and further stated 'Making algorithms more accountable means ensuring that harms can be assessed, controlled and redressed. Ensuring algorithmic justice implies finding the right remedies and identifying the responsible parties to take action.'[30] Such an approach which contextualises the concept of accountability is in line with the general understanding and application of accountability in the Rechtsstaat.

4. Human Rights Implications of the Use of Algorithms

While algorithmic accountability is an important legal issue relating to algorithmic decision-making, there are also some human rights issues that should be considered. Individual freedom is in the spotlight today, not only where authoritarian regimes infringe the rights of citizens, but also in the context of many technological developments that span geographical borders. Social media is a good example of how people can express themselves online, but also how freedom of expression and the right to privacy and protection of personal data might be threatened. The use of algorithms and artificial intelligence in so many fields of human activity raises various human rights questions. What is the impact of algorithms on freedom of speech, the right to a fair trial, the right to equality, human dignity, and the right to privacy and protection of personal data? How can society safeguard human rights and freedom in this high-tech environment? Who will be accountable when harm is caused by the application of algorithmic decision-making? This section casts a spotlight on only some of the human rights implications of the use of algorithms and artificial intelligence.

In order to determine the existence and scope of possible human rights implications in algorithmic decision-making, a focus on the specific algorithm in isolation is not useful. It is necessary to consider the application of the algorithm, the character of the input data which might cause harm to individuals or categories of people, as well as the context within which the specific algorithmic decision-making takes place. Face recognition software, for example, is based on algorithms (performing a classification function) which are applied to large datasets of personal data. The algorithm is then applied to new input data such as the passport photos of flight passengers to prevent known terrorists from entering a country through a commercial airport. So, in this context, although the algorithm is biased against persons on such a list of unwanted visitors, it is justified since the protection of society is of primary importance. In a different scenario the use of algorithms to predict the likelihood of academic success in a particular society or school can be helpful to indicate trends and the potential for success, which can assist teachers in identifying needs for academic support. It can, however, be prejudicial to individual learners due to the fact that subjective factors such as

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[30] World Wide Web Foundation supra 16.

the learning environment and how individual leaners respond to academic support to improve their performance, are not taken into account in the datasets on which the algorithm is applied.

An important human rights issue that is frequently discussed in the context of the use of algorithms and artificial intelligence is the prohibition against discrimination on a variety of grounds, for example on race, gender or age. Algorithms often have a built-in bias; for example, when used in search engines which rank the results of a search in a particular way such as relevance in relation to the search term. Social inequality and prejudices in society related to factors such as race or gender could be influenced by the use of algorithms, but it might not necessarily be an algorithmic design issue. The algorithm could learn from data collected from humans and by implication also adopt the biases of humans attached to that data, for example shopping preferences of people living in a specific area might display some racial or gender profiles.[31] Care should thus be taken in the design and application of algorithms to prevent unlawful discrimination. If an unlawful bias in algorithmic decision-making can be identified, software could potentially be designed to detect and act on it, but this complex matter warrants further research.

The rights to privacy and to protection of personal data have taken centre stage during the last couple of years and still do. This is perhaps due to the right of consumers and citizens to protect their interests, but also because so many applications over a wide spectrum of algorithmic decision-making use personal data, for example search engines, social media platforms and citizen registration software. Through the use of algorithms, large amounts of personal data can be collected, stored, analysed and used and this potentially has a significant impact on the right to privacy and the right to protection of personal data. An algorithm could, for example, be used to form a profile of a consumer by collecting and analysing the online buying activities of that person, which is then used to market specific products or services to them. A study by an expert group of the Council of Europe titled 'Study on The Human Rights Dimensions of Automated Data Processing Techniques (in Particular Algorithms) and Possible Regulatory Implications' indicated the difficulty in ensuring the protection of personal data in cases where algorithms connect different sets of data to produce new data.[32]

In the only international treaty so far, which regulates the protection of individuals regarding automated processing of personal data, a multilateral legal framework is provided for the protection of personal data while ensuring a smooth flow of data between countries. The Protocol amending the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data was approved by 21 countries in October 2018.[33] Processing of personal data must, according to Article 5 of the protocol, be done lawfully and in a fair and accurate manner and with the explicit and free consent of the data subject (individual person). Provision is also made for further legal measures to provide protection for a data subject against infringement of individual rights and

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[31] See, for instance, Devlin, H. (2017) AI programs exhibit racial and gender biases, research reveals from www.theguardian.com/technology/2017/apr/13/ai-programs-exhibit-racist-and-sexist-biases-research-reveals [accessed on 29 August 2019]; Busch supra 46; Zerilli et al 11-14.
[32] Council of Europe, (2018) Algorithms and Human Rights, 17.
[33] www.coe.int/en/web/conventions/full-list/-/conventions/treaty/223.

freedoms by the use of algorithmic decision-making.[34] A fairly comprehensive legal framework for the European Union came into operation in May 2018, namely the General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data), which inter alia established standards for the use of algorithms in data collection and processing. The GDPR contains a list of rights relating to the protection of personal data. As far as the use of algorithms in data processing is concerned, a data subject (person) has the right to request that decisions based on automated processing, including profiling, concerning him or her or significantly affecting him or her and based on their personal data are made by natural persons, not only by computers.[35]

The right to privacy and the right to protection of personal data are multi-faceted rights in view of the diverse and often complex use of algorithms in AI and machine learning. The situation is even more complex when one considers that personal data could be gathered automatically through the interaction of different devices such as mobile phones from different users. Profiling is another technique which uses algorithms to compare personal information to patterns in collected data to determine if a person fits a specific pre-determined profile, and this could also be used to predict future behaviour based on that profile.[36]   Such profiling often occurs without the explicit consent of the person and could infringe the right to protection of personal information, including to control information about yourself.[37]   These examples raise the question about suitable and adequate protection of the right to privacy and the right to protection of personal data.

There are many more human rights questions relating to the use of algorithms and artificial intelligence, which fall beyond the scope of this article. In view of the scope of algorithmic decision-making in all spheres of life, a review of the notion of human rights protection against interference by the state should perhaps be done. The Council of Europe study on Algorithms and Human Rights states in this respect:

> *'The traditional asymmetry of power and information between state structures and human beings is shifting towards an asymmetry of power and information between operators of algorithms (who may be public or private) and those who are acted upon and governed.'[38]*

5. Designing an Appropriate Ethical and Legal Framework

In view of the impact of the use of algorithms in many facets of our daily lives as indicated in the discussion above, it is necessary to explore what legal framework should underpin the further development and use of algorithmic decision-making. Parts of such a legal framework already exist and as the use of algorithmic decision-making further evolves, adapting the rules or developing new rules should obviously be considered.

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[34] Council of Europe, Algorithms and Human Rights, (2018) 18.
[35] Art. 22 GDPR.
[36] Mitrou supra 21-23.
[37] Council of Europe Algorithms and Human Rights 19.
[38] Council of Europe Algorithms and Human Rights 37.

It is evident that various human rights issues relating to algorithmic decision-making warrant regulation, and some international and national rules have been developed already. Some recent examples are discussed in this section, which concludes with a set of guiding principles for legal frameworks to be developed in the future.

The focus of the European Union's GDPR[39] is the protection of personal data and it includes a range of measures dealing with the rights of data subjects (individual persons), namely:

the right to:
- information about the processing of your personal data, which must take place in a lawful, fair and transparent manner (Art. 5,13, 15);
- an explanation (meaningful information) about the logic involved in the processing of your personal data (Art. 14 (2));
- obtain access to the personal data held about you (Art. 15);
- ask for incorrect, inaccurate or incomplete personal data to be corrected (Art. 16);
- request that personal data be erased when it is no longer needed or if processing it is unlawful (right to be forgotten) (Art. 17);
- object to the processing of your personal data for marketing purposes or on grounds relating to your particular situation (Art.18, 21);
- request the restriction of the processing of your personal data in specific cases (Art. 18);
- receive your personal data in a machine-readable format and to send it to another controller ('data portability') (Art. 20);
- request that decisions based on automated processing concerning you or significantly affecting you and based on your personal data are made by natural persons, not only by computers. You also have the right in this case to express your point of view and to contest the decision (Art. 22).

Some of the measures dealing with the protection of personal data in the GDPR also provide some response to the search for more accountability relating to algorithmic decision-making; for example, the right to an explanation about the logic involved in the processing of personal data as described in Article 14.[40] Accountability of data controllers regarding the processing of personal data is also stipulated in Art.5. Mitrou argues that

> '*accountability and transparency are mere tools to support the protection of values and principles while developing and using AI technologies.*'[41]

The 2018 Protocol amending the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data contains a range of provisions that strengthen the protection of personal data and which are similar to those contained in the GDPR, for example:

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[39] General Data Protection Regulation, effective from 25 May 2018. See also Mitrou 27–28 regarding the GDPR and use of algorithms in processing personal data.
[40] Mitrou 71.
[41] Mitrou 78.

- the right of an individual not to be subject to a decision which significantly affects him or her based only on automated processing of data, without taking his or her views into consideration; and

- the right to a meaningful explanation about the logic applied to data processing where the results of that process are applied to him or her.[42]

The GDPR applies to the processing of data wholly or partly by automated means (Art. 2) in 'the context of the activities of an establishment of a controller or a processor in the Union, regardless of whether the processing takes place in the Union or not' (Art. 3). This means that the GDPR is also relevant outside the EU; for example, in the case of processing of personal data in the context of online trading of goods and services.

There are also examples of national legislation dealing with the protection of personal data, for example the Data Protection Act 2018 in the United Kingdom, and the Protection of Personal Information Act (POPI) (Act 4 of 2013) in South Africa, which is aimed at the protection of personal information by both public and private bodies. While the focus of these national laws is the protection of personal data, the issue of automated decision-making is often included in such legislation in view of the interrelatedness of the rights of individual data subjects (persons) and algorithmic decision-making.

Some legal frameworks, such as the GDPR in the European Union, contain both appropriate legal principles as well as detailed protection measures to safeguard the right to privacy and the right to personal data protection in general, but also in the context of algorithmic decision-making and artificial intelligence. Such provisions do, however, not cover the complete field of algorithmic decision-making, since it is not their primary focus. It should nevertheless be acknowledged that the right to privacy and the right to personal data protection are key issues when regulation of algorithmic decision-making is concerned. National laws and international regulations such as the GDPR should also be treated as part of an evolutionary process that warrants further research and adaptation or the development of new legal provisions as the use of algorithms in artificial intelligence, machine learning, Internet of Things and big data is evolving. The digital revolution requires a continuous consideration of appropriate legal arrangements.

Algorithmic decision-making clearly has a range of potential legal implications, as is evident from the discussion above. It is therefore appropriate to consider dedicated legal frameworks that focus only on algorithmic or automated decision-making. A recent example of specific rules dealing with algorithmic decision-making is the 'Canadian Directive on Automated Decision-making' issued in 2019. It aims to ensure more efficient, accurate, consistent and interpretable decisions in automated decision-making processes. It also links algorithmic decision-making with the core administrative law principles such as transparency, accountability, legality and procedural fairness. [43]

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[42] Art. 9(1) of the Convention.

[43] Art 4 of the Directive on Automated Decision-making from www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32592.

The development of appropriate legal frameworks, both in domestic law as well as internationally, should have an ethical basis that includes key principles such as accountability and the respect for fundamental human rights. Buttarelli said, with reference to the need for an ethical approach, that

> *'there is a shift in the respect for privacy. This shift is towards establishing a sustainable ethics for a digitised society.'*[44]

In 2018 The focus of the 40th International Conference of Data Protection and Privacy Commissioners was on ethics in the digital and data driven economy. The conference published a 'Declaration on Ethics and Data Protection in Artificial Intelligence', which provides a comprehensive ethical basis for the recognition of human rights in the further development of artificial intelligence. The Declaration inter alia states:

> *'The 40th International Conference of Data Protection and Privacy Commissioners considers that any creation, development and use of artificial intelligence systems shall fully respect human rights, particularly the rights to the protection of personal data and to privacy, as well as human dignity, non-discrimination and fundamental values, and shall provide solutions to allow individuals to maintain control and understanding of artificial intelligence systems.'*

The Conference further endorsed the following principles:
- Artificial intelligence and machine learning technologies should be designed, developed and used with respect of fundamental human rights and in accordance with the fairness principle.[45]
- Continued attention and vigilance, as well as accountability, for the potential effects and consequences of, artificial intelligence systems should be ensured.
- Artificial intelligence systems' transparency and intelligibility should be improved, with the objective of effective implementation.
- As part of an overall "ethics by design" approach, artificial intelligence systems should be designed and developed responsibly, by applying the principles of privacy by default and privacy by design.
- Empowerment of every individual should be promoted, and the exercise of individuals' rights should be encouraged, as well as the creation of opportunities for public engagement.
- Unlawful biases or discriminations that may result from the use of data in artificial intelligence should be reduced and mitigated.

These principles adopted by a prominent group of Data Protection and Privacy Commissioners from EU Member States and a range of other countries fit well within the context of the Rechtsstaat or constitutional state. In 2019 the Council of Europe Commissioner for Human Rights published recommendations to deal with artificial intelligence and human rights in line with these principles, which include the following statements:

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[44] 'Choose Humanity: Putting Dignity back into Digital', Opening Speech of Debating Ethics Public Session of the 40th Edition of the International Conference of Data Protection Commissioners, 24 October 2018.
[45] See with respect to 'fairness' Mitrou supra 42.

> *'The use of an AI system in any decision-making process that has a meaningful impact on a person's human rights needs to be identifiable.*
> *Oversight over an entire AI system must also be enabled by transparency requirements.*
> *In all circumstances, discrimination risks must be prevented and mitigated with special attention for groups that have an increased risk of their rights being disproportionately impacted by AI.'[46]*

Respect for fundamental human rights and acknowledgement of key principles of accountability and explainability or interpretability (adapted transparency) should clearly be the ethical basis for any legal framework dealing with algorithmic decision-making.[47]

6. Conclusion

In the data-driven economy of the 21st century the pace and scope of technological developments that impact humanity requires the development of appropriate legal frameworks to reflect and accommodate the needs of society, in particular relating to the recognition of fundamental human rights. Artificial intelligence is for many people something alien, despite the fact that it is already applied in many daily activities around the world. In response to the research question posed, this article shows the need for and importance of relevant and appropriate legal frameworks that can guide the design and application of algorithms in artificial intelligence, not for the sake of regulating the use of technology, but in order to create appropriate frameworks for human and technological interaction that will satisfy the needs of society. The development of relevant and appropriate legal frameworks relating to algorithmic decision-making is a journey which warrants regular reflection and adaptation in view of the continuous advancement of technology.

What is important to establish on a global scale, since artificial intelligence does not know national borders, is a broad set of ethical and legal principles that can guide the development of international and national legal frameworks that regulate algorithmic decision-making. Such a set of ethical and legal principles was adopted at the end of 2018 by the 40th Conference of Data Protection and Privacy Commissioners and provides a very good basis. This should be translated into international and national legal documents to support the further development of algorithmic decision-making.

In the debates about the regulation of algorithmic decision-making, some scientists argue that giving algorithms a separate legal personality should be considered, so that they can be sued in case of unfair or harmful application.[48] The increased use of multi-algorithmic systems might well warrant such a development, but this is not yet clear and more research needs to be done on this issue. In view of the discussion in this article, it is suggested that possible areas for future research include:
- The scope of algorithmic accountability;
- The possibility of creating a separate legal personality for an algorithm; and

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[46] Council of Europe, (2019) Unboxing Artificial Intelligence: 10 steps to protect human rights, from https://www.coe.int/en/web/commissioner/-/unboxing-artificial-intelligence-10-steps-to-protect-human-rights.

[47] Busch 60-62.

[48] Treleaven, P. et al (2019), 'Algorithms: Law and Regulation', Computer, 22 March 2019, 40.

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A sound ethical basis that includes respect for human rights should be the key guiding approach for any future developments.

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