Initiative D21

cooperation partner: KPMG

Working Group Monitoring of Algorithms | Translation: 27 January 2020
Original German version published on 13 November 2019

DENKIMPULS DIGITALE ETHIK:
Responsibility for algorithmic systems

AUTHORS Corinna Balkow (Initiative D21 e.V.); Dr. Irina Eckardt (Initiative D21 e.V./ KPMG)

COLLABORATORS Dr. Aljoscha Burchardt (German Research Center for Artificial Intelligence - DFKI); Dr. Christine Danziger (Lawyer); Lena-Sophie Müller (Initiative D21 e.V.); Claudia Otto (Lawyer); Ann Cathrin Riedel (Load e.V.); Isabelle K. Schlegel (Deloitte); Prof. Barbara Schwarze (Competence Center Technology-Diversity-Chancengleichheit and employees of KPMG and KPMG Law)

- **It must be ensured that algorithmic systems are designed for the common good. Only in this way can the rights of all actors be secured in the public interest.**
- **It is important to define responsibilities. This requires an interdisciplinary approach and a precise division of responsibilities.**
- **Existing legal regulations are sufficient in many cases. However, these must be adapted to specific sectors in certain areas.**
- **Suitable requirements and regulations must be publicly discussed. Thus, societal actors are required to independently acquire and continuously expand their digital competencies.**

I. Introduction

This paper was developed within the framework of the working group Monitoring of Algorithms set up by Initiative D21 with the participation of interdisciplinary experts. It complements the already published papers on bias in algorithmic systems as well as on the transparency and explainability of algorithmic systems. Like these publications, this paper should also contribute to a differentiated debate and initiate a broader discussion.

A vast number of actors with diverse socio-economic and cultural heterogeneity are involved in the conception, development or deployment of algorithmic systems or encounter them daily. Identifying responsibility and anticipating ethically questionable or legally unclear scenarios is therefore a complicated task. In addition, it is often the complexity of the algorithmic systems themselves that complicates the allocation of responsibility. The following section examines the extent to which certain actors can be required to assume responsibility in a complex environment. Relevant questions are identified and analyzed from a socio-economic, technological and ethical-legal point of view.

Explanations of concepts and basic ideas on responsibility

When determining where to assign responsibility, it is important to record who is responsible, for what, and when. The concept of responsibility is multi-faceted and can be interpreted differently depending on the situation: Is it about formal tasks and instructions not to deviate from the specifications? Is it about practical responsibility to take care of another person? Or is it about a moral responsibility

to act in an ethical way?[1] Responsibility – also in terms of its legal interpretation – includes actions as well as a lack of actions that knowingly and intentionally or negligently do not comply with the applicable legal regulations. It should be noted that moral responsibility does not necessarily mean legal responsibility.

The transfer of existing decision-making processes into algorithmic systems seems to go hand in hand with a transfer of responsibility from humans to machines.[2] This notion is also taken into account in the provisions of Article 22 of the European General Data Protection Regulation (GDPR) and information is given on how to deal with the issue of responsibility. For example, it is explained that in the case of so-called profiling, the responsible parties include both those who create the profiles and those who generate an automated decision (or have it generated) using these profiles. The latter therefore also bear the legal responsibility.

With growing automation of processes, however, the issue of civil liability becomes more complex. For example, it is difficult to determine who is responsible in the event of an accident caused by an autonomously driving car: Is it the programmers of the learning algorithm? Or the manufacturer of the vehicle software because the training data used for image recognition were insufficient? The owners of the vehicle brand, because they are responsible for the entire product, from the tires to the system? The sellers or lessors because they have put an unsafe product into circulation? Or the people behind the wheel who did not look at the road and therefore could not use the emergency brake and avoid an accident? Who do the injured parties have to turn to?

The same could apply to those personally affected by erroneous or discriminatory automated decisions that are not flagged by quality control. According to current legal opinion, those affected can only be compensated for wrong decisions if a duty has been violated. Whoever is responsible for a breach of duty owes compensation for the resulting damage. This is primarily a question of causality and attribution.

It turns out that due to the complexity of the algorithmic systems and the large number of actors involved in the commissioning, development and use of algorithmic systems, tracing the origins of erroneous decisions and identifying those responsible is currently an extremely difficult task. A more transparent design of algorithmic systems forms the basis for achieving comprehensive traceability of all factors that have led to a criticized result.[3]

There are already many approaches to ethical standards in the conception and development of algorithmic systems,[4] but so far these have been voluntary. It is not verifiable whether corresponding standards are used effectively. In order to be able to impose sanctions if these standards are violated, however, a clear allocation of responsibilities is necessary. The legislator must continuously weigh up the necessary innovations against the protection needs of citizens, for example under the buzzwords of data economy and privacy.[5] At the same time, certain laws result in an obligation to use new technologies,[6] especially in areas where the state is responsible for providing information and services for citizens and companies. At best, the legislative process has been preceded by a debate in society in order to ensure broad participation. This now needs to be done in relation to the issue of responsibility for algorithmic systems.

1 Schües, Christina (2010): Verantwortung und Gebürtlichkeit. Eine ethische Perspektive mit Hannah Arendt; online: https://www.imgwf.uni-luebeck.de/fileadmin/oeffentlich/Publikationen/Schues/Schues_%20Verantwortung%20und%20Geb%C3%BCrtlichkeit%202011.pdf (Last accessed: 12.07.2019)

2 Horn, Nikolai (2017): Grundlagen der digitalen Ethik – Eine normative Orientierung in der vernetzten Welt; in: Denkimpuls zur Digitalen Ethik, online: https://initiatived21.de/app/uploads/2017/08/01_denkimpulse_ag-ethik_grundlagen-der-digitalen-ethik.pdf (Last accessed: 12.07.2019)

3 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Transparency and Explainability of algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/ (Last accessed: 30.01.2020)

4 Algorithmwatch (2019): AI Ethics Guidelines Global Inventory; online: https://algorithmwatch.org/project/ai-ethics-guidelines-global-inventory/(Last accessed: 15.10.2019)

5 Bär, Dorothee (2016): Digitale Souveränität besteht aus Verantwortung und Vertrauen, S. 159, in Digitale Souveränität. Springer VS.

6 Djeffal, Christian (2018): Normative Leitlinien für künstliche Intelligenz in Regierung und öffentlicher Verwaltung, S.503 in (Un) berechenbar? Algorithmen und Automatisierung in Staat und Gesellschaft; online: https://cdn0.scrvt.com/fokus/d64a7af83f755f0d/becd411918c0/-Un-berechenbar---Algorithmen-und-Automatisierung-in-Staat-und-Gesellschaft.pdf (Last accessed: 16.07.2019)

Areas of responsibility of different actors

In this paper, algorithmic systems not only refer to the program code, but also to the processes of awarding contracts, data selection and evaluation, statistical modeling, design decisions on surface design and access options for people interacting with the system. This includes checking the output generated by a system, which can range from simple spell checks to automated braking-systems in autonomous vehicles.

Due to this complexity of algorithmic systems, their broad field of application and their economic and social impacts, responsibility can be attributed to many actors in different phases of development and use (see figure 1). Decision-makers, designers, users and auditors were identified and clustered together as groups of actors. Excluded from this responsibility are indirectly affected persons who encounter algorithmic systems without any influence on their part. In the following, the different actors and their areas of responsibility are presented.

Decision-makers

Decision-makers are legally, technically or politically responsible persons who determine which algorithmic systems are commissioned, which context they are used in and which purpose they are tested for. They are responsible for the design of the processes. In order to make balanced decisions and develop guidelines, regulations and in particular laws for the design of algorithmic systems, they require an interdisciplinary exchange of knowledge as well as the integration of different cultural backgrounds and other aspects of diversity to make informed decisions.[7] Conscious decision-making includes questions on meaning-ful use, specifications on the intended operation, deciding on suitable subcontractors (if applicable), regular review of
further use, and regulations on the transfer of responsibility.

Persons in charge of procurement must be familiar with requirements of designers and external auditors. It is important to examine the respective contract from an ethical and legal perspective and to ensure that corrections and changes are possible. Contractors should be held responsible in the event of a foreseeable negative impact.

Designers

At the level of the designers are persons who develop, test and/or distribute an algorithmic system. Designers of algorithmic systems bear the practical responsibility. They must ensure that data is processed lawfully and that the rights of the data subjects, the secure processing and the controllability of the algorithmic system are always observed. They must prevent manipulation by third parties and ensure that information is not passed on to third parties without consent.[8] The large number of actors involved in the various phases of the specific design of an algorithmic system makes the assignment of these responsibilities a complex task. Nevertheless, different areas of responsibility can be attributed to different phases in the design of algorithmic systems. For example, design engineers in the concept phase of an algorithmic system have the responsibility to observe legal requirements right from the start and to incorporate them into their concept. In the data collection phase, responsibility includes decisions on how to plan data-saving or data-intensive algorithmic systems, how to collect verified data and how to ensure legal processing of this data.[9] By following ethical guidelines and professional ethics, the design teams assume responsibility in the development of algorithmic systems.

7 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Bias in Algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed: 30.01.2020)

8 Heinrich Böll Stiftung (2018): Künstliche Intelligenz: Wer trägt die Verantwortung?; online: https://www.boell.de/de/2019/01/18/kuenstliche-intelligenz-wer-traegt-die-verantwortung (Last accessed: 15.10.2019)

9 This also includes ensuring compliance with the principles governing the processing of personal data, e.g. data minimisation (Art. 5 para. 1 lit. c DSGVO) and accuracy (Art. 5 para. 1 lit. d DSGVO).

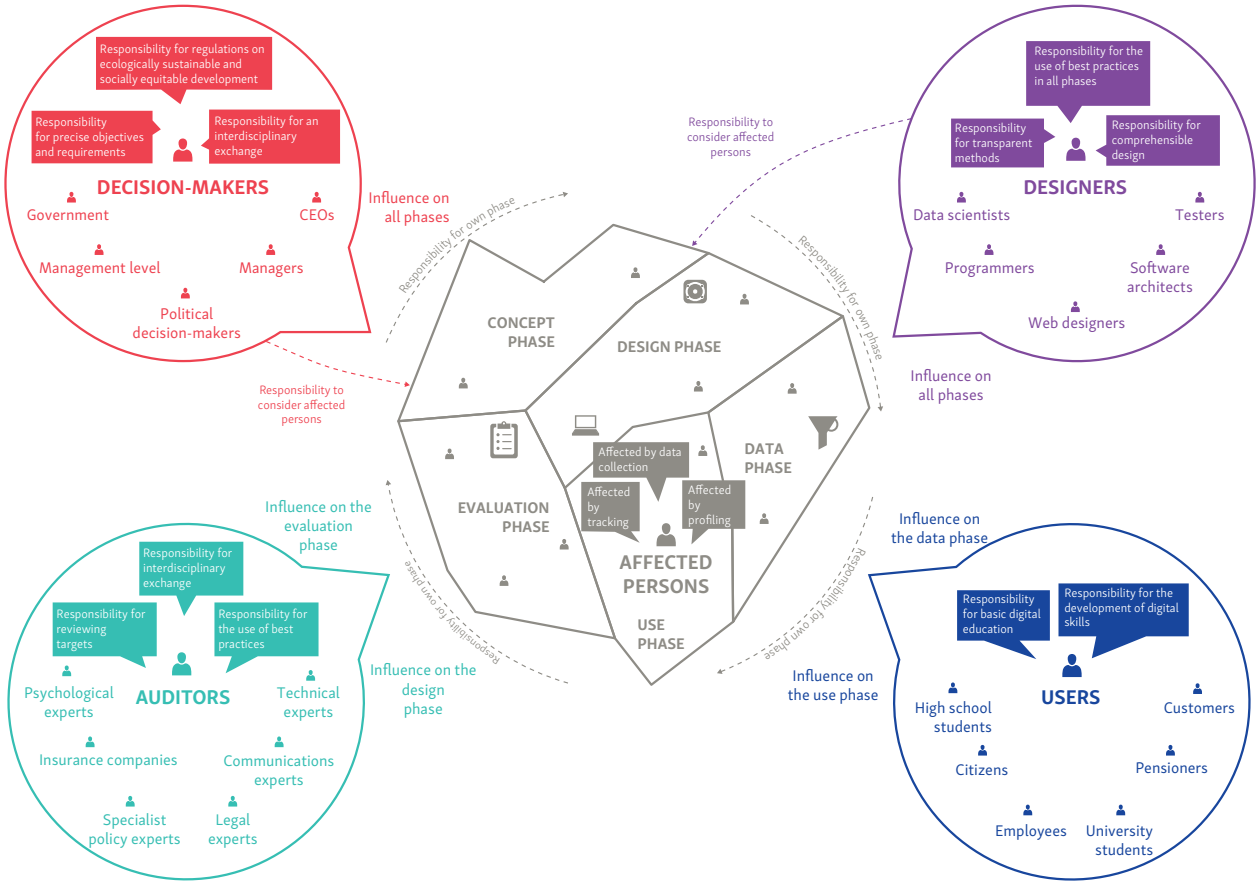

Figure 1: Distribution of areas of influence and responsibility

Users

Users have made a conscious (purchasing) decision and know data is generated and collected. However, they are often not aware of all the consequences of using algorithmic systems. However, users are expected to consider their opportunities and risks before using algorithmic systems. Yet in order to do this they require basic digital competencies or, if desired, advanced training. This will help them to understand what happens to personal data, such as how their personal data is linked to their itineraries, their financial options and home ownership, and how they can gain more control over the use of their data by third parties.

Auditors

External auditors must consider a variety of factors.External means here that the persons who audit the algorithmic system are not part of the design team, but rather check it externally as third parties. Relevant data, algorithms, models and processes should be disclosed for a comprehensive examination so that possible wrong decisions, biases and discrimination can be uncovered. External auditors are responsible for testing algorithmic systems fairly and impartially, with the best knowledge and conscience.

Affected persons

This group includes persons who do not use an algorithmic system themselves. For example, they supply anonymous general movement data from mobile devices to display the current traffic density in a navigation software. Further examples include data collection from photos published for other purposes or the use of general facial recognition software in public spaces. The possibilities of simply posting

on social media make it possible, for example, to know and use the locations and contact data of people who do not use the corresponding algorithmic systems themselves.

As in the two other papers on the topics „Bias in algorithmic systems" and „Transparency and explainability", we look at the topic of responsibility from a technological, socio-economic and ethical-legal perspective. The technological perspective refers to the practical feasibility of Monitoring of Algorithms and deals with the conditions, problems and possibilities this entails. The socio-economic perspective determines which social and economic opportunities and challenges arise through the application of algorithms and, if necessary, how to counteract the challenges this poses. The ethical-legal perspective deals with the development of a legal framework to ensure the regulation of algorithms.

II. Technological perspective on responsibility for algorithmic systems

In the technological section, the consequences of technical actions, which include questions of technical explainability, are examined. Many technical solutions or products have an impact on people's lives. From a technological perspective, the responsibility of designers for algorithmic systems is also a forward-looking quality measure.
Evaluating the consequences of individuals' actions is a complex mission in a distributed system of work tasks. The complexity of algorithmic systems means that usually no single person can be found responsible for the entirety of the system. Consequently, distinct areas of responsibility must be defined. These should allow examination of whether principles of equal treatment have been observed and interactions with other systems have been tested. Responsibility also includes establishing processes that determine whether a program is ready to be used professionally to the best of the actor's knowledge. If undesirable biases or discrimination occur at a later point, the program must be corrected of even terminated in an orderly manner, even if the algorithmic system is no longer in the designers' possession. Decision-makers (CEO or management level) must use appropriate guidelines to ensure that these processes are defined and established transparently in order to be able to avert damage in good time (compliance). The technological context must not be viewed separately from possible abuse or social consequences. Traineeships, degree courses and further education in the technical field require the integration of these aspects when teaching digital skills.[10] Compliance with ethical standards at work has long been a requirement of the German Society for Information Technology, which was renewed in 2018.[11] Other specialist organizations also see people who design algorithmic systems as having a responsibility for reflection.[12] Some companies have already begun to define specific compliance regulations in the form of Corporate Digital Responsibility (CDR), which is intended to regulate this responsibility beyond the existing legal framework.

Argument: Responsibilities must be clearly defined among the involved actors.

Description: Due to the complexity of algorithmic systems and the division of tasks, the areas of responsibility must be clearly defined and communicated.

Decision-makers should consider the involvement of different interest groups. At the same time, people who create requirements for algorithmic systems must ensure that different opportunities for participation, differentiated access, sustainable use of resources and non-discriminatory designs are provided. This could be done within the framework of formulating a CDR strategy for the respective company. This also includes the creation of quality criteria, awareness of undesirable biases, the avoidance of discrimination and the

10 Diethelm, Ira (2018): Stellungnahme zum Thema „Digitalisierung in Schule, Ausbildung und Hochschule"; online https://www.bundestag.de/resource/blob/573972/37590b970d6d530bcce7825efe39160e/Diethelm_Stellungnahme_37g-data.pdf (Last accessed: 14.10.2019)
11 Gesellschaft für Informatik (2018): Ethische Leitlinien; online: https://gi.de/ueber-uns/organisation/unsere-ethischen-leitlinien (Last accessed: 14.10.2019)
12 IEEE (2018): Global Initiative on Ethics of Autonomous and Intelligent Systems; online: https://standards.ieee.org/industry-connections/ec/autonomous-systems.html (Last accessed: 14.10.2019)

facilitation of transparency and explainability within companies.[13]

For *designers*, this includes communicating with other people involved in the development process in order to understand how their area of responsibility fits into the complexity of the system.

Auditors may, in addition to the usual quality assurance processes, which mainly relate to testing the functionality of the software products, provide screening based on CDR guidelines.

For *users*, an official seal of approval or a quality label may be helpful. Similar to the labeling of food or technical equipment, awards for data thriftiness, low resource consumption or good working conditions throughout the supply chain could provide better information in the technological field. However, it should be noted that quality labels should not be used to delegate responsibility. After all, users have no direct influence on the design of algorithmic systems. They can only be integrated through acceptance tests, accessibility tests or market studies. Usually, users can only decide between using or not using an algorithmic system.

The requirements of *affected persons* must be taken into consideration by the other actors who have influence on the development and use of algorithmic systems.

Handling: All actors that are involved in the development of an algorithmic system need distinct and binding guidelines for the allocation of responsibility throughout all phases of development in order to assume responsibility for their areas of work. An intermediate step is the certification of individual components, which can then be reused as trustworthy components in further development steps. It should be noted that smaller companies are often unable to bear the costs of such procedures, and that certifications are also usually issued on a static basis. For dynamic software development, newly adapted procedures must therefore be developed.
Designers who participate in the data phase must focus on good preparatory work. If, for example, persons from data research provide data in a specific case and there are problems with transparency, e.g. with regard to the provision of data, it is the data providers who should be held responsible in this case. With certified data sources (balanced databases), data processors could achieve more balanced results. For research in Europe an open database is an option worth investigating.[14]

Before each order is placed, decision-makers must consider whether the use of an algorithmic system is justified at that point in time for the anticipated purpose. Auditors can determine whether algorithmic systems meet the legal requirements or the compliance regulations. This includes developing continuous and iterative quality assurance processes. These guidelines should distinguish between the roles of auditors and designers. In agile teams, these roles can alternate between developers and testers, so they take mutual responsibility for their work. In order to clearly assign responsibility in agile procedures, documentation plays an important role. Documentation ensures that changes remain traceable. Indications of positive action can be confirmed both by internal tests carried out at certain time intervals and by reactions to customer reviews/ comments.

Example: The division of responsibilities in the area of algorithmic systems can be based on regulations on the division of responsibility in other areas, such as plant engineering. According to existing regulations, auditing obligations can be transferred to other persons. In addition, there is a specific obligation to transfer audits to suitable persons.[15]

Argument: An error management culture and a discussion of values across hierarchies must be established.

13 Dreyer, Stephan; Schulz, Wolfgang (2019): The General Data Protection Regulation and Automated Decision-making: Will it deliver? Discussion Paper Ethics of Algorithms #5, Bertelsmann Stiftung; online: https://www.leibniz-hbi.de/de/publikationen/the-general-data-protection-regulation-and-automated-decision-making-will-it-deliver (Last accessed: 06.08.2019)

14 European Commission (2019): European Open Science Cloud (EOSC) Strategic Implementation Plan; online: https://ec.europa.eu/info/publications/european-open-science-cloud-eosc-strategic-implementation-plan_en (Last accessed: 30.07.2019)

15 Euler, Steffen; Hardt, Hartmut (2018): Organisationsverantwortung im Unternehmen; online: https://expertennetzwerk-elektrotechnik.de/wp-content/uploads/2018/10/Fachbeitrag_Stefan_Euler_Organisationsverantwortung_im_Unternehmen.pdf (Last accessed: 14.10.2019)

Description: Within large companies, more transparency is needed between individual departments so that employees can know what the products of their subdivisions are used for. An error management culture is regarded as a strategy for successful learning and improvement.[16] However, assuming only individuals are responsible for ethical behavior can lead to personal losses such as job loss or further financial damage.[17] At the same time, it is part of the political design framework to provide legally secure opportunities for employees to question problematic technological developments and still be protected.[18]

Handling: If individual employees or even entire teams take on responsibility, they need protection under employment law if they are expected to identify problematic technological developments and do not want to be involved in them. It is also important to clarify to whom questionable practices can be reported anonymously or even outside of the company itself. For example, it would be conceivable to expand the competencies of existing authorities such as the Federal Office for Information Security.

Ethical conflicts around the objectives of new technological developments are becoming apparent. Is it necessary to prohibit the use of facial recognition software on the general public[19], or is it sufficient to design a facial recognition software for public spaces in such a way that it recognizes all people equally well?[20] Is the existence of scientific evidence for negative environmental and health effects the only grounds for regulatory interventions in economic activity? Is the associated risk of possible consequential damage, of regulatory delay, ethically justifiable? Or should the marketing of such materials and the products containing them only be permitted once their harmlessness has been scientifically proven („precautionary principle")?[21]

Example: Currently more employees are committed to present their moral claims about algorithmic systems to their employers. For example, after employees of large US companies became aware of collaboration between these companies and the defense industry, they declared that they did not want to develop this type of product.[22] Collaboration between research institutions and the military may offer the possibility of discussing ethical questions in the context of the university research community.[23]

Argument: The development of yet another codex for persons involved in the design of algorithmic systems is not needed.

Description: Professional ethics codices (for example the Hippocratic Oath taken by medical personnel) developed from historical traditions as well as from personal concerns and represent what is technically justifiable and morally necessary within a given profession. They are generally recognized within and outside the profession and are the subject of exchange and discussion. Professional associations institutionalize, control and, if necessary, sanction members.[24] For these to be practically effective, individuals must identify strongly with their profession. The need for

16 Vorpahl, Annette (2018): Ich war's: wie Betriebe mit Fehlern umgehen; online: https://faktor-a.arbeitsagentur.de/richtig-fuehren/ich-wars-wie-betriebe-mit-fehlern-umgehen/(Last accessed: 29.07.2019)

17 Waters, Richard (2019): Google activist Meredith Whittaker leaves company; online: https://www.ft.com/content/349bbb84-a7e9-11e9-984c-fac8325aaa04 (Last accessed: 18.07.2019)

18 EU Commission (2019): Europäische Kommission begrüßt vorläufige Einigung für besseren Schutz von Hinweisgebern in der EU; online: http://europa.eu/rapid/press-release_IP-19-1604_de.htm (Last accessed: 18.07.2019)

19 Zeit Online (2019): San Francisco verbietet Gesichtserkennung durch Behörden; online: https://www.zeit.de/politik/ausland/2019-05/ueberwachung-gesichtserkennung-san-francisco-usa-verbot (Last accessed: 15.10.2019)

20 Spirina, Katrine (2019): Ethics of Facial Recognition: How to Make Business Uses Fair and Transparent; online: https://towardsdatascience.com/ethics-of-facial-recognition-how-to-make-business-uses-fair-and-transparent-98e3878db08d (Last accessed: 30.07.2019)

21 Maring, Matthias (Hrsg.) (2011): Fallstudien zur Ethik in Wissenschaft, Wirtschaft, Technik und Gesellschaft; online: http://www.itas.kit.edu/pub/v/2011/mari11a.pdf (Last accessed: 30.07.2019)

22 Bünte, Oliver (2018): Militär-Projekt Maven: Hunderte Wissenschaftler unterstützen protestierende Google-Mitarbeiter; online: https://www.heise.de/newsticker/meldung/Militaer-Projekt-Maven-Hunderte-Wissenschaftler-unterstuetzen-protestierende-Google-Mitarbeiter-4050834.html (Last accessed: 18.07.2019) CNET News Team (2019): Microsoft workers call for end to HoloLens contract with US Army; online: https://www.cnet.com/news/microsoft-workers-call-for-end-to-hololens-contract-with-us-army/ (Last accessed: 18.07.2019)

23 Niemann, Sonja (2016): Hochschule will mit Bundeswehr zusammen arbeiten; online: https://weserreport.de/2016/04/bremen/sued/hochschule-will-mit-bundeswehr-zusammen-arbeiten/(Last accessed: 30.07.2019)

24 Müller-Eiselt, Ralph/Rohde, Noëlle (2018): Ethik für Algorithmiker. Was wir von erfolgreichen Professionsethiken lernen können. Arbeitspapier; online: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/Ethik_fuer_Algorithmiker._Was_wir_von_erfolgreichen_Professionsethiken_lernen_koennen._Final..pdf (Last accessed: 16.07.2019)

a professional ethics codex usually arises from a special relationship between the practitioner and the recipient of the profession. In the case of doctors, the need for a professional ethics codex results from the relationship of dependence between the doctor and the patient receiving treatment.

In the context of algorithmic systems, a necessity for professional ethics appears to arise from the advantage in terms of knowledge of the persons who create the system over those who decide to commission it or those who use it. Due to the large number of actors involved, ranging from the commissioning to the development, up to the use of algorithmic systems, however, there is no clear identification with a specific job description.
It is therefore necessary to go beyond the approach of a professional ethics codex and conduct interdisciplinary dialogues on guidelines for the ethical management of algorithmic systems.[25] Time pressure, lack of resources, non-diverse teams and lack of requirements are named as the greatest problems in the implementation of ethical guidelines.[26]

Handling: In vocational training and during university studies, awareness of practical problems can be raised and ethical questions can be discussed. An overview of possible occupational fields and corresponding approaches to professional ethics can be integrated.

Requirements are adapted through scientific reflection and further development. The focus should be on the implementation of processes and the establishment of standards for all those involved. Special guidelines can then be developed for specific groups.

Example: There are already many initiatives for the education and training of digital literacy in combination with ethical aspects, some of which are listed on the „Information Ethics“ website.[27] Research into explainable algorithmic systems is being conducted in interdisciplinary research projects.[28]

In addition to many possible new certifications based on ethical compliance[29], the inclusion of ethical evaluation criteria in existing certifications for testers has also been called for by international professional associations.[30]

25 Algorithmwatch (2019): AI Ethics Guidelines Global Inventory; online: https://algorithmwatch.org/en/project/ai-ethics-guidelines-global-inventory/(Last accessed: 29.08.2019)
26 Capgemini (2019): Why addressing ethical questions in AI will benefit organizations; online: https://www.capgemini.com/wp-content/uploads/2019/07/CRI-AI-in-Ethics_web-1.pdf (Last accessed: 29.07.2019)
27 Oliver Bendel (2019): Informationsethik; online: http://www.informationsethik.net/?page_id=32 (Last accessed: 11.11.2019)
28 Universität Saarland (2019): Explainable Intelligent Systems; online: https://explainable-intelligent.systems/(Last accessed: 11.11.2019)
29 TU Kaiserslautern: Der Zertifikatsstudiengang Technoethik; online: https://www.zfuw.uni-kl.de/fernstudiengaenge/science-engineering/technoethik/(Last accessed: 11.11.2019)
30 ISTQB: Code of Ethics for test professionals; online: https://www.istqb.org/about-as/istqb%C2%AE-code-of-ethics-for-test-professionals.html (Last accessed: 15.10.2019)

III. Socio-economic perspective on responsibility for algorithmic systems

The socio-economic section addresses the ethical and poli-tical aspects of responsibility. In this perspective, the aim is to clarify how responsibility can be shared fairly among the various actors involved with algorithmic systems and how to avoid transferring all responsibility solely to the users.

Argument: State, companies and civil society share the responsibility for socially and ecologically sustainable development and application of algorithmic systems.

Description: Due to the rapid progress in the development of algorithmic systems, the effects of this development on working conditions, also on the environment and climate, are becoming increasingly dire. For example, it is expected that the power consumption for the development and provision of digital products will double between 2016 and 2021.[31]

Another example is whether the working conditions are socially acceptable. Specified and labeled data must be avail-able for the development of algorithmic systems. Labeling is the marking of specific data, such as text components or images that are later used as input for algorithmic systems. Since this can currently only be achieved through very costly manual work, industries generally use low-wage workers, so-called click workers, to label data for digital products.[32]

Handling: In addition to minimum legal standards such as the minimum wage, which is intended to ensure fair payment, further legal frameworks are conceivable, for instance for the environmentally friendly development and provision of digital products. Users could be made aware of social and ecological sustainability in the creation and operation of algorithmic systems through clear labeling. Existing certifications could be adopted and thus a sustainable and responsible use of work and environmental resources could be marked accordingly.

In addition to legislative initiatives, some companies already have Corporate Social Responsibility initiatives in many areas[33]. However, as digital changes are taking place, companies should manage their actions in the digitalized world within a Corporate Digital Responsibility framework. This should include their products and services as well as the resulting (social) changes and define binding guidelines. These efforts should be published in order to ensure greater transparency. Such initiatives would be comparable to human rights due diligence[34] and corresponding voluntary commitments made by large companies. CDR initiatives would also help to ensure that responsibilities for the deve-lopment process of algorithmic systems are more clearly defined. Responsibility for all important quality aspects, such as awareness of bias, freedom from discrimination, transparency, traceability, etc., should be integrated into it.

Example: Various studies have shown that data centers used for the provision of algorithmic systems, e.g. for streaming services, are now responsible for about two percent of global greenhouse gas emissions.[35] The energy requirements of data centers today are roughly equivalent to those of the United Kingdom. The demand for the production and operation of digital technology is now incre-

31 Andrae, Anders (2019): Comparison of Several Simplistic High-Level Approaches for Estimating the Global Energy and Electricity Use of ICT Networks and Data Centers; online: https://www.researchgate.net/publication/336284632_Comparison_of_Several_Simplistic_High-Level_Approaches_for_Estimating_the_Global_Energy_and_Electricity_Use_of_ICT_Networks_and_Data_Centers (Last accessed: 24.10.2019)

32 Maier, Michael F.; Viete, Steffen Viete; Ody, Margard Ody (2017): Plattformbasierte Erwerbsarbeit: Stand der empirischen Forschung; online: https://www.bmas.de/SharedDocs/Downloads/DE/PDF-Publikationen/Forschungsberichte/fb498-plattformbasierte-erwerbsarbeit-stand-der-empirischen-forschung.pdf?__blob=publicationFile&v=4 (Last accessed: 14.10.2019)

33 Bundesministerium für Arbeit und Soziales: Nachhaltigkeit und CSR; online: https://www.csr-in-deutschland.de/DE/Was-ist-CSR/Grundlagen/Nachhaltigkeit-und-CSR/nachhaltigkeit-und-csr.html (Last accessed: 31.07.2019)

34 Auer, Carmen (2018): Die Wahrung von Menschenrechten in der Unternehmenskultur verankern; online: https://klardenker.kpmg.de/die-wahrung-von-menschenrechten-in-der-unternehmenskultur-verankern/(Last accessed: 21.10.2019)

35 The Shift Project (2019): Climate Crisis: The unsustainable use of online video; online: https://theshiftproject.org/wp-content/uploads/2019/07/2019-02.pdf (Last accessed: 30.07.2019)

asing by about nine percent annually.[36] The energy consumption and emissions of digital applications can be displayed through the installation of additional programs such as a browser add-on for websites.[37] However, great reductions can also be achieved by algorithmic systems. For example, Google was able to achieve an energy saving of 40 percent by automatically optimizing the cooling of its data centers.[38]

Argument: All actors bear the responsibility to achieve a minimum standard of digital education. Groups of people who cannot (sufficiently) achieve this alone, need the support of political bodies, companies and associations for quality-oriented and low-threshold options.

Description: Many active users, but also decision-makers, are unsettled by digital technologies and the rapid change brought about by digitalization. Among other things, this uncertainty is based on a lack of understanding and the overwhelming amount of available information. Designers often only have expertise in their specific domain. Those indirectly affected are not aware of their options to object to the use of their data.

Not everyone involved in the process has equal chances and opportunities to obtain a basic digital education due to differences in educational background, employment relationship or previous knowledge. The principle of the welfare stated anchored in Germany's constitution also includes the possibility of government intervention when groups of the population are disadvantaged. Informed participation in shaping a digital society is part of creating equal opportunities and should therefore be supported by appropriate steering instruments.

The D21 Digital Index shows concrete indications of similarities but also differences in access, use, openness and especially digital literacy. Targeted measures to help citizens acquire digital skills could be taken here.[39]

For 2018/2019, for example, it shows further growth in digital access. Almost 100 percent of 14- to 59-year-olds are now online. However, there are sometimes striking differences in usage behavior and competence, which are particularly evident in the context of socio-demographics and social characteristics. According to the survey, 33 percent of those surveyed say that the dynamics and complexity of digitalization overwhelm them, and 38 percent often reach their limits when it comes to the use and application of digital offerings.[40] Further training in digital topics is nowadays fundamental in order to be able to move confidently, safely and with a focus on opportunities in a digitized world, and also an essential component for social participation. It is necessary to provide solutions that are particularly suitable for rural areas and take into account the heterogeneous (educational) conditions in the population.

Handling: Companies and organizations should set up appropriate measures and projects within the framework of their social and digital responsibility. They should offer further training opportunities to promote the use and understanding of digital technology and confidence in an ethically-oriented digital transformation.[41] However, it is apparent that almost 40 percent of the population has little or no interest in expanding their digital skills.[42]

There is therefore an urgent need for incentives for comprehensive, institutionalized and, where necessary, compulsory

36 The Shift Project (2019): „Lean ICT: Towards digital society": Our new report on the environmental impact of ICT; online: https://theshiftproject.org/en/article/lean-ict-our-new-report (Last accessed: 29.08.2019)
37 The Shift Project (2019): Carbonalyser: Analyse Internet usage carbon footprint; online: https://addons.mozilla.org/fr/firefox/addon/carbonalyser/(Last accessed: 15.10.2019)
38 Deepmind (2016): DeepMind AI Reduces Google Data Centre Cooling Bill by 40%; online: https://deepmind.com/blog/article/deepmind-ai-reduces-google-data-centre-cooling-bill-40 (Last accessed: 29.08.2019)
39 Initiative D21 (2019): D21-Digital Index 2018/2019; online: https://initiatived21.de/publikationen/d21-digital-index-2018-2019/ (Last accessed: 14.10.2019)
40 Initiative D21 (2019): D21-Digital-Index 2018/2019; online: https://initiatived21.de/app/uploads/2019/01/d21_index2018_2019.pdf (Last accessed: 14.10.2019)
41 Datenethikkommission (2019): Gutachten der Datenethikkommission der Bundesregierung; online: https://www.bmjv.de/SharedDocs/Downloads/DE/Themen/Fokusthemen/Gutachten_DEK_DE.pdf;jsessionid=26C39CC4E2D0879C08588AC33EBBE1BC.1_cid334?__blob=publicationFile&v=2 (Last accessed: 24.10.2019)
42 Initiative D21 (2019): D21-Digital-Index 2017/2018; online: https://initiatived21.de/app/uploads/2018/01/d21-digital-index_2017_2018.pdf (Last accessed: 24.10.2019)

education and training of digital skills that is flexible throughout individuals' lives.

Teaching digital literacy, as well as the very nature of lifelong learning, can begin as early as the context of school. Technical understanding and the use of digital media should be a basic building block of education. In addition to the provision of technical equipment, this requires above all investment in the training of teachers and their education. In addition to general training, specific training for specific staff such as administrative staff, lawyers and legal experts is also necessary, so that they can advise those affected in the event of complaints or appeals.

A Federal Centre for Digital Education could be set up to provide a social education strategy with more differentiated approaches.[43] The Federal Office for Information Security offers a wide range of information on the „BSI for Citizens" website. Public facilities such as libraries or adult education centers can be used to ensure unhindered access. Appropriately trained staff must also be planned in to help with the search for suitable options. For an easy starting point and gateway, the University of Helsinki offers English speakers a free online introductory course in the design of algorithmic systems.[44] Voluntary organizations also provide guidelines and practical courses. Good practice is offered, for example, by the Federal Association of Senior Citizens' Associations (BAGSO) with its service center Digitization and Education for Older People, which provides tips and materials on digitalization in old age via the internet platform „wissensdurstig.de".[45]

Example: A further development of legal education in order to achieve a basic understanding of the methods and effects of algorithmic systems is offered, for example, at the Faculty of Law at the University of Düsseldorf in the form of a supplementary course of study[46] or in the Master's program in Information Technology and Law at Saarland University[47]. In the USA, members of the American Bar Association (ABA) work within the framework of one of the largest associations of lawyers, judges and law students on ethical guidelines for the use of machine learning in the professional legal environment. Their demand is that attorneys and lawyers must understand the opportunities and risks of technology in order to be able to act for the benefit of their clients in relevant legal cases. This applies accordingly to the use of Legal Tech systems, where they have the responsibility to ensure that the use of technical services is in line with their professional duties.[48]

Argument: By developing algorithmic systems, companies can and should generate a positive benefit for society.

Description: With the ability to process and connect many different types of data, the possibility of establishing tech-nologies that can generate medium- and long-term added value for society and the environment increases. Corporate Digital Responsibility then means not only defining guidelines but also naming specific people who are responsible for the topic of digitalization and its effects in the company.

Handling: If new technologies are developed, they should be checked for sustainability before being used. Structures must be created which allow the responsible release of a technology, e.g. by setting up departments in companies that are responsible for a review and impact assessment of algorithmic systems in terms of their aims, benefits for society and sustainability cost.

Example: By using algorithmic systems to collect and consider data, the risks of systems/models can be better assessed, e.g. for the improvement of public transport. In the Netherlands, there is a Smart City-style pilot project, which is developing a special traffic light system for disabled citizens to enable longer traffic light systems for

43 Riedel, Ann Cathrin (2019): Mehr digitale Bildung; online: https://www.freiheit.org/mehr-digitale-bildung (Last accessed: 29.08.2019)
44 University of Helsinki; Reaktor (2018): A free online introduction to artificial intelligence; online: https://www.elementsofai.com/ (Last accessed: 15.10.2019)
45 Die BAGSO: Servicestelle „Digitalisierung und Bildung für ältere Menschen"; online: https://www.bagso.de/aktuelle-projekte/servicestelle-digitalisierung-und-bildung-fuer-aeltere-menschen.html (Last accessed: 25.07.2019)
46 Juristischen Fakultät der HHU (2019): Begleitstudium zu Rechtsfragen Künstlicher Intelligenz; online: http://www.jura.hhu.de/studium/begleitstudium/begleitstudium-zu-rechtsfragen-der-kuenstlichen-intelligenz.html (Last accessed: 21.10.2019)
47 Universität des Saarlandes (2019): Master-Studiengang „Informationstechnologie und Recht" startet an der Universität des Saarlandes. Pressseinformation vom 06.08.2019; online: https://www.uni-saarland.de/nc/universitaet/aktuell/artikel/nr/21093.html (Last accessed: 21.10.2019)
48 Holt, Diane; Reyes, Carla L. et al (2019): Examining Technology Bias: Do Algorithms Introduce Ethical & Legal Challenges?; online: businesslawtoday.org/2019/03/examining-technology-bias-algorithms-introduce-ethical-legal-challenges (Last accessed: 20.09.2019)

them.[49] Algorithmic systems can also contribute to the field of environmental protection. For example, the energy demand within a region can be predicted, which can lead to a better supply and distribution of renewable energy. This in turn leads to better integration and more sustainable energy management. The development of algorithmic systems in the field of agriculture allows early detection and control of risks from pest infestation and means that the use of fertilizers can be optimized and water can be used more economically.[50]

IV. Ethical and legal perspective on responsibility for algorithmic systems

The ethical-legal context is primarily devoted to the moral, legal and contractual aspects of responsibility. Laws are the consequence of a moral constitution and thus reflect the moral compass of a society.[51] In the ethical-legal context, it is a matter of recording and evaluating the ethical requirements in relation to legal responsibilities, as these can be determined, for example, within the framework of a contract or within the framework of new or existing laws. In addition, it is a matter of ensuring that persons have the option to demand and obtain redress, e.g. by means of compensation, in the event of infringement of their rights through the use of algorithmic systems.

At the beginning of the ethical-legal debate about responsibility in algorithmic systems, the question arises whether existing legislation sufficiently covers ethical demands or whether it needs to be changed or extended. In general, three legal complexes can be highlighted that need to be addressed in relation to responsibility: contract law, intellectual property law and liability law.[52] With regard to liability law, the discussion is over who is liable for damages relating to algorithmic systems.[53] Civil liability can arise from breaches of contract, but also from acts of infringement that are not related to a contract. This is because isolated errors are unavoidable in the numerous applications of algorithmic systems.[54] In the area of contract law, it should be noted that algorithmic systems cannot make a declaration of intent of their own,[55] as they lack the will to act that is essential for a declaration of intent. In the field of intellectual property law, the question of the imputability of the performance of algorithmic systems is also being discussed: Who is the originator of the data and results generated by algorithmic systems and can therefore be held responsible in this sense?[56] Who is the inventor of a new drug that is discovered through the evaluation of medical data by an algorithmic system for a certain pathology? Who is considered the creator of a painting or piece of music generated by an algorithmic system? It is important to clarify this question of attribution because it is

49 Schwan, Ben (2017): Ampel-App hilft Fußgängern; online: https://www.heise.de/tr/artikel/Ampel-App-hilft-Fussgaengern-3786287.html (Last accessed 31.07.2019)

50 Herweijer, Celine (2018): 8 ways AI can help save the planet; online: https://www.weforum.org/agenda/2018/01/8-ways-ai-can-help-save-the-planet/(Last accessed: 29.07.2019)

51 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Bias in algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed 30.01.2020)

52 Heinrich Boell Stiftung (2019): Künstliche Intelligenz: Wer trägt die Verantwortung?; online: https://www.boell.de/de/2019/01/18/kuenstliche-intelligenz-wer-traegt-die-verantwortung (Last accessed: 15.10.2019)

53 Borges, Georg (2018): Rechtliche Rahmenbedingungen für autonome Systeme, NJW 2018, S. 977 ff.; Denga, Michael (2018), Deliktische Haftung für künstliche Intelligenz, CR 2018, S. 69 ff.; Spiecker gen. Döhmann, Indra (2016), Zur Zukunft systemischer Digitalisierung – Erste Gedanken zur Haftungs- und Verantwortungszuschreibung bei informationstechnischen Systemen, CR 2016, S. 698 ff.

54 Maas, Matthijs (2018): Regulating for „normal AI accidents", online: http://www.aies-conference.com/wp-content/papers/main/AIES_2018_paper_118.pdf (Last accessed: 08.08.2019)

55 Borges, Georg (2018): Rechtliche Rahmenbedingungen für autonome Systeme, NJW 2018, S. 977 (979); Pieper, Fritz-Ulli (2018), Künstliche Intelligenz: Im Spannungsfeld von Recht und Technik, InTeR 2018, S. 9 ff.; Specht, Louisa/Herold, Sophie (2018): Roboter als Vertragspartner? Gedanken zu Vertragsabschlüssen unter Einbeziehung automatisiert und autonom agierender Systeme, MMR 2018, S. 40 ff.

56 Hetmank, Sven/Lauber-Rönsberg, Anne (2018): Künstliche Intelligenz – Herausforderungen für das Immaterialgüterrecht, GRUR 2018, S. 574 ff.; Lewke, Christian (2017): „...aber das kann ich nicht tun!": Künstliche Intelligenz und ihre Beteiligung am öffentlichen Diskurs. Medien- und urheberrechtliche Implikationen, InTeR 2017, S. 207 ff.; Schaub, Renate (2017): Interaktion von Mensch und Maschine. Haftungs- und immaterialgüterrechtliche Fragen bei eigenständigen Weiterentwicklungen autonomer Systeme, JZ 2017, S. 342 ff.

traditionally linked to the allocation of an exclusive right such as a copyright or patent.

Argument: Liability law must be revised in terms of the distribution of the burden of proof.

Description: German tort law has many liability norms - from liability for proven or presumed fault to strict liability regardless of fault. On this basis, a large part of the liability issues can also be resolved in the realm of algorithmic systems.[57] Although many individual questions are still open, it is to be expected that these will successively be clarified by the courts and legal professionals in the coming years. Occasionally, however, current law also has its limits. In these areas, an amendment of liability law seems to make sense.

However, the problem will often be the establishment of the facts for a given case. Due to the large number of actors involved from the conception and development to the deployment of an algorithmic system, as well as the networking of different systems and system landscapes, a certain complexity and unpredictability arises which makes it very difficult to assign responsibility in the event of wrong decisions or malfunctions.[58] Questions of the distribution of the burden of proof are particularly important in this context.

The necessary assumptions, which must be made in investigations or in the development of learning algorithms, as well as the algorithms already in use, in order to be able to generalize observations, are called inductive biases.[59] They represent the basis of many algorithmic systems. In this sense, errors in the development of algorithmic systems are unavoidable. This circumstance is not adequately considered in current liability law.

Handling: In order to counteract the lack of clarity, a clearer distribution of the burden of proof would be desirable. This could be clarified by law, for example by an amendment of product liability law. Although product liability law contains a finely balanced framework of burden of proof regulations, it is not applicable to pure software products. It is also conceivable that courts could develop practicable solutions by means of further legal training, as they have done, for example, in the area of producer liability.

The legislator will have to respond to the fact that some errors in the field of machine learning are unavoidable. As a possible solution, the European Parliament has proposed strict liability with an insurance solution.[60] However, this solution has also been widely criticized.[61] It would cover a variety of systems for which an insurance obligation would obviously be disproportionate. Such a solution would appear to make sense at most for a clearly defined group of systems that involve a particular liability risk (e.g. autonomous vehicles).

Criminal law is based on the principle of fault, whereas in civil law it is the requirement of representation. Provided that the operators of a system use and maintain it properly, no liability for damages can be derived from this.[62] Due to the fact that the allocation and delimitation of competences and responsibilities must be regulated more transparently and unambiguously, there is thus a need to readjust the legal system to these. In this context, consideration is being given, among other things, to adapting product liability law or transferring the regulations on the liability of livestock farmers by analogy. In order to satisfy the need for clarification of facts and liability, a legal obligation to make it comprehensible could be created. For this purpose, the creation of a documentation obligation – in actors' own interest – could suffice.[63] Designers, decision-makers and auditors divide their areas of responsibility clearly among themselves and document all relevant processes. Development steps, errors and how they are dealt with are also comprehensively documented. If, in the event of damage, the company is held liable for damages, it is in a position to indemnify itself. For claims based on ethical

57 Denga, Michael (2018): Deliktische Haftung für künstliche Intelligenz, CR 2018, S. 69 (77 f.)
58 BMWi (2019): Künstliche Intelligenz und Recht im Kontext von Industrie 4.0; online: https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/kuenstliche-intelligenz-und-recht.pdf?__blob=publicationFile&v=4 (Last accessed: 31.07.2019)
59 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Bias in algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed: 30.01.2020)
60 Europäisches Parlament (2017): Bericht mit Empfehlungen an die Kommission zu zivilrechtlichen Regelungen im Bereich Robotik; online: http://www.europarl.europa.eu/doceo/document/A-8-2017-0005_DE.html (Last accessed: 30.07.2019)
61 Denga, Michael (2018): Deliktische Haftung für künstliche Intelligenz, CR 2018, S. 69 (76 ff.)
62 Schnor, Pauline (2018): Wer haftet, wenn Künstliche Intelligenz Mist baut?; online: https://www.welt.de/wirtschaft/webwelt/article181494476/Wer-haftet-wenn-eine-kuenstliche-Intelligenz-Mist-baut.html (Last accessed: 31.07.2019)
63 Otto, Claudia (2018): Die größte Verwundbarkeit ist die Unwissenheit: Über eine gesetzliche Pflicht der Schaffung von Nachvollziehbarkeit künstlich intelligenter Entscheidungen, Ri 2018, 136 (142).

guidelines, a strict liability with insurance solution could then be established.

Example: A company uses an algorithmic system in application management. Although attempts have been made at all stages of the design to prevent discriminatory behavior, rejected persons submit complaints. It is found that some people were disadvantaged by a certain configuration. Under current law, liability can be excluded for various reasons. In the case of strict liability with an insurance solution, the company and the designers would be liable regardless of fault (depending on the configuration), with an insurance company ultimately settling the claim. This would supplement the current law, according to which the operators of an algorithmic system are not liable if they use
and maintain it properly. For the area of personnel manage-ment, a further discussion on responsible use is emerging.[64]

Argument: The introduction of an e-person is not sensible.

Description: For some time now, there have been discussions about introducing a separate legal entity for certain algorithms (so-called e-person). At the beginning of 2017 the European Parliament helped the idea to gain a certain degree of publicity, but did not expressly support it.[65] Instead, it called on the European Commission to investigate whether the creation of an e-person makes sense in the long term. This would allow injured parties to turn to electronic persons with their own liability if the injuring parties themselves are not legally accessible.[66]

The debate surrounding the creation of an e-person for algorithmic systems triggered much resistance. In an open letter to the Commission, 285 experts from the worlds of research, teaching and business expressed their legal and ethical objections to the introduction of an e-person.[67] The legal construct of an e-person is neither necessary nor appropriate.[68] On the other hand, there are ethical concerns that the legal status of an electronic person cannot be derived from the existing model of the natural person. Algorithmic systems have no capacity for sentience and suffering, nor any awareness that could alert them to their responsibilities.

Handling: The idea should not be pursued further for the time being. Instead, the focus should be on civil liability and public law regulation. A study commissioned by the European Parliament also rejects the concept.[69] In order to find more appropriate solutions, other proposals are needed, such as adapting product liability law or transferring the provisions on the liability of livestock farmers by analogy. The production of algorithmic systems and the provision of services based on algorithmic systems must not serve to withdraw or even conceal responsibility, which the creation of an e-person would allow as a result.[70]

Example: If an autonomous vehicle which has its own legal personality touches another car, liability could step in to pay for the damage, regardless of the actual cause of the fault. Although this would solve the legal question of liability very quickly, the real cause of the fault would not be pursued further.

Argument: Regulation of algorithmic systems should be sector specific.

Description: Algorithmic systems are used in an increasing number of sectors and are performing ever more advanced tasks. It can be assumed that more malfunctions will be a natural consequence. Their use is therefore always

64 EthikbeiratHRTech (2019): Richtlinien für den verantwortungsvollen Einsatz von Künstlicher Intelligenz und weiteren digitalen Techno logien in der Personalarbeit; online: https://www.ethikbeirat-hrtech.de/wp-content/uploads/2019/09/Ethikbeirat_und_Richtlinien_Konsultationsfassung_final.pdf (Last accessed: 15.10.2019)

65 Europäisches Parlament (2017): Bericht mit Empfehlungen an die Kommission zu zivilrechtlichen Regelungen im Bereich Robotik; online: http://www.europarl.europa.eu/doceo/document/A-8-2017-0005_DE.html (Last accessed: 30.07.2019)

66 Jandl, Franziska (2018): E-Person – Rechtspersönlichkeit für Roboter?; online: https://legal-technology.net/rechtspersoenlichkeit-e-person/(Last accessed: 31.07.2019)

67 Robotics Openletter (2018): Open letter to the European Commision – artificial intelligence and robotics; online: http://www.robotics-openletter.eu/(Last accessed: 31.07.2019)

68 Denga, Michael (2018): Deliktische Haftung für künstliche Intelligenz, CR 2018, S. 69 (77); Spiecker gen. Döhmann, Indra (2016), Zur Zukunft systemischer Digitalisierung – Erste Gedanken zur Haftungs- und Verantwortungszuschreibung bei informationstechnischen Systemen, CR 2016, S. 698 (702).

69 Nevejans, Nathalie (2016): European civil law rules in robotics; online: http://www.europarl.europa.eu/RegData/etudes/STUD/2016/571379/IPOL_STU(2016)571379_EN.pdf (Last accessed: 09.08.2019), S. 14

70 Otto, Claudia (2018): Die größte Verwundbarkeit ist die Unwissenheit: Über eine gesetzliche Pflicht der Schaffung von Nachvollziehbarkeit künstlich intelligenter Entscheidungen, Ri 2018, 136 (136).

associated with certain risks. In the field of machine learning, for example, certain algorithms involve foreseeable risks of discrimination.[71]

In some cases, damages can be compensated retrospectively through civil liability. In many areas, however, it seems to make sense that public law rules ensure that damages do not occur in the first place. This is particularly necessary if the risk is particularly high or if a particularly large number of people are affected. Relevant sectors here include health care, the financial sector and the mobility industry. It seems sensible to respond to the specific risk profiles of these industries with sector-specific regulations. It is still unclear which specific risks should be addressed as a matter of priority, which regulatory instruments should be considered and how such regulation can be enforced at all.

Handling: Legislators should not aim for a cross-sectoral law for algorithmic systems. Rather, they should consider whether sector-specific laws need to be supplemented by new regulations that take account of these new risks.

A localization of causes, even in the case of complex algorithmic systems, would be possible in principle, but only if the circumstances that make localization possible are taken into account. Coupled with strong economic pressure to bring innovations to market quickly, safety is often regarded as the second priority. In order to ensure that algorithmic systems pursue given goals without negatively influencing their environment, new public law regulations are therefore being discussed. State regulation should contribute to less discrimination and greater security, transparency and traceability in dealing with algorithmic systems. However, it would have to be examined in detail what effect individual regulatory proposals would have, what an implementation could look like, and which institutions could supervise this implementation.

Example: The dangers of increasing automation in road traffic have already been considered by an amendment to the Road Traffic Act (StVG). Here special rules were created for highly and fully automated driving.[72]

V. Outlook

Many people are not yet familiar with the terms and effects of algorithmic systems.[73] Nevertheless, more and more areas of life and work are being shaped by these systems. Demands for informed consent and digital participation can only be met if decision-makers, users and those affected are aware of the consequences. It is the responsibility of the designers, decision-makers and testers of algorithmic systems to provide information. Users and those affected should bear the responsibility to acquire digital competencies.

In addition to the focus on the topic of „Responsibility for algorithmic systems“ presented here, there are supplementary considerations on the topic of „Bias in algorithmic systems„[74] and „Transparency and explainability“[75]. Finally, overarching ethical guidelines for monitoring algorithmic systems were developed.[76]

71 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Bias in algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed: 30.01.2020)
72 Wissenschaftliche Dienste Bundestag (2018): Autonomes und automatisiertes Fahren auf der Straße – rechtlicher Rahmen; online: https://www.bundestag.de/resource/blob/562790/c12af1873384bcd1f8604334f97ee4b9/wd-7-111-18-pdf-data.pdf (Last accessed: 14.10.2019)
73 Initiative D21 e. V. (2019): D21 Digital Index 2018/2019; online: https://initiatived21.de/publikationen/d21-digital-index-2018-2019/ (Last accessed: 08.05.2019)
74 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Bias in algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed: 30.01.2020)
75 Balkow, Corinna; Eckardt, Irina (2019): Denkimpuls Digitale Ethik: Transparency and Explainability online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/(Last accessed: 30.01.2020)
76 Guidelines for monitoring algorithmic systems; online: https://initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik/ (Last accessed: 30.01.2020)

Initiative D21

cooperation partner:

KPMG

Working Group Monitoring of Algorithms at Initiative D21

Algorithmic systems have immense potential, particularly with regard to their growing importance in technological developments and social participation. At the same time, algorithmic systems are becoming increasingly complex and their development often lacks transparency. This creates challenges and raises various questions. In light of this, at the beginning of 2018 the Initiative D21 founded a working group to deal with issues relating to the topic of „monitoring algorithmic systems".
In the Working Group Monitoring of Algorithms at Initiative D21 relevant issues were discussed by interdisciplinary experts from three perspectives: technological, socio-economic and ethical-legal. The technological perspective refers to the practical feasibility of Monitoring of Algorithms and deals with the conditions, problems and possibilities. The socio-economic perspective determines the social and economic opportunities and challenges posed by the application of algorithmic systems and how risks can be counteracted. The ethical and legal perspective deals with the development of a legal base to ensure the fair regulation of algorithmic systems.

Theses were derived from the discussions and published in three Essays on Digital Ethics: „Bias in algorithmic systems", „Transparency and Explainability of algorithmic systems" and „Responsibility for algorithmic systems". As a summary, 9 guidelines for monitoring algorithmic systems have been developed. These recommendations contain suggestions as to which regulations of algorithmic systems might be ethically necessary, how these affect society and the economy, and how they could be implemented technologically. They include basic questions for further discussion and serve as a call to action for continuous review and further development in this area.

MONITORING OF ALGORITHMS

IMPRINT

Initiative D21 e.V.
Reinhardtstraße 38
10117 Berlin
Germany
www.InitiativeD21.de

Phone: 0049 30 5268722-50
kontakt@initiatived21.de

Download
initiatived21.de/publikationen/denkimpulse-zur-digitalen-ethik