



**SCENARIOS**

**ETHICAL CONSIDERATIONS**

**RECOMMENDATIONS**

**SIRIKommissionen**

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## INTRODUCTION & EXECUTIVE SUMMARY

Artificial intelligence, AI, is a popular digitisation topic. A future scenario, in which everything and everyone are connected via intelligent machines and networks that constantly exchange data which decides our options and defines and guides us, is no longer science fiction; it is very close to reality. Everything from cars to lamp posts to coffee machines are becoming 'intelligent', and our bodies are increasingly being directly linked to intelligent networks.

AI is developing rapidly in all types of innovation, and it attracts some of the largest private and public investments. AI has also become a global field of competition between countries and regions.

The SIRI commission think tank was established in the summer of 2016 by Ida Auken, MP for the Danish Social-Liberal Party, and Thomas Damkjær Petersen, the President of IDA. The objective of the SIRI commission think tank is to stimulate debate on artificial intelligence and its importance to Danish society in terms of growth, the labour market staff conditions, competence requirements and ethical challenges. During the past two years, the SIRI commission think tank has dealt with artificial intelligence in more depth within the three sectors; transport, health and finance. However, we have found it relevant to examine in more detail the ethical dilemmas and challenges that have emerged during our work. This is the objective of this report.

AI is based on the idea of predicting patterns and risks, streamlining processes and then guiding us. The potentials are enormous within health, transport and finance. However, ethical dilemmas are emerging in the wake of high-speed development, where legislation and norms are lagging behind. We as humans are being challenged, our rights, norms and rules are taking on new significance, and new societal challenges are emerging all the time.

This report introduces future scenarios within the three focus areas. The report points at ethical implications and dilemmas for each focus area, but also on cross-cutting principles and not least recommendations for future action.

### WE SHOULD

- ensure that we as citizens are fully equipped to live in a world that is constantly influenced by AI,
- not develop AI to replace humans, but ensure that AI always complements humans and 'only' serves as a cobot; a robot that collaborates with humans,
- ensure that humans always have the final say, and that humans always know whether they are talking to a machine or a person,
- always integrate privacy risks and data-ethical implications for the individual into design and development from the very beginning,
- ensure Danes the right to anonymity – in the same way as they have the right to have a secret address,
- develop a standard for how to explain an algorithm,
- as businesses, organisations and authorities develop our own data ethics principles that go beyond the requirements of data legislation,
- require targeted work to reduce problematic bias in data,
- integrate equality into the development and design of AI services and systems to benefit vulnerable people as well.

# CROSS-CUTTING PRINCIPLES

The principles below are based on existing discussions (see list of literature), but build on the specific ethical dilemmas in the scenarios within the three focus areas; transport, health and the financial sector.

## THE HUMAN BEING AT THE CENTRE

An AI service has a certain degree of autonomy. Its analyses, predictions and decisions help us understand complex situations based on large datasets that a single person would never be able to comprehend. However, we also increasingly need to have enough knowledge and information about how AI works in order to retain control and understand the impacts to which we are exposed. How can we ensure that human interests will always prevail over institutional and commercial interests? That the human being is at the centre and has the primary benefit of data processing? And how can we ensure that the population is fully equipped to live in a world that is constantly influenced by algorithms?

## INDIVIDUAL DATA CONTROL

Data profiles composed of many different types of personal data are often a prerequisite for the proper functioning of intelligent personalised technology. Privacy risks and data-ethical implications for the individual should therefore be integrated into the design and development at the very beginning of a development process, where privacy-by-design principles are the point of departure and an innate part of the design.<sup>1</sup> It is important always to ensure that consumers and citizens have control of their own data. For example, an insurance company or a loan provider may be interested in access to detailed data profiles built-up via the new AI services to determine an insurance premium or the price of a loan. But where do we draw the line? And how can we ensure that the customer has made an informed decision? How can we ensure individual data control, capacity to act and priority for self-determination?

## TRANSPARENCY

AI-driven processes and decisions should be explained so that people understand the social, ethical and societal risks and consequences.<sup>2</sup> It is not enough to simply provide basic information about data processing, for example. How a given algorithmic decision has been made should be documented and explained, as well as which criteria and parameters form the basis for a credit assessment, an insurance premium or allocation of social benefits, for example. How can we ensure that humans are in charge of AI-driven processes?

## ACCOUNTABILITY

Accountability covers a number of possible data ethical-initiatives based on the GDPR, such as anonymisation, minimal or no use of metadata, zero-knowledge (erasure of data, even though storing it is allowed), no sale or sharing of identifiable data to third parties, responsible organisational anchoring, and auditing. The big question is who is accountable for these new AI-based decision makers? Is it the human surgeon or the robot surgeon? The human driver or the manufacturer of the self-driving car?

A data-ethical business or organisation assumes responsibility for its products and services and ensures that partners and subcontractors live up to the same data-ethical principles as we have. And the business or organisation has a person or a unit to ensure ethical data processing. The question is whether AI-based machines should be responsible in the same way as a lawyer? Should they have legal status with a new legal framework?

## EQUALITY

Digital development has created growing digital divides between population groups. AI development has given us new possibilities, and can help eliminate inequalities. However, AI can just as well create new divides if equality is not incorporated into the design and the set of rules from the very beginning. In a new and relatively unregulated AI market, vulnerable people in particular have to pay with their data and are exposed to intensive data profiling. On the financial markets, those with the strongest computer power can process the fastest and best transactions. In addition, consumer protection and the capacity of the new AI services are often related to the ability to pay for the services. Algorithms are objective mathematical formulas. Nevertheless, when we feed self-learning algorithms with data, the classifications that they make are not necessarily objective, but can reproduce or create unequal distributions of power in society. A dataset can contain bias, which is why an AI-driven decision can be discriminatory. Bias may also occur in the design of an algorithm that can categorise and label people in a way that discriminates between, for example, population groups. How can we ensure equality in AI?

# HEALTH



## HEALTH

### SCENARIO 1

#### PRECISION MEDICINE

You consult your general practitioner (GP), who has your health record via the sundhed.dk health portal and the information that you yourself have provided. You have undergone full DNA profiling to which you have granted your GP access. For several years, you have used a pedometer from the pharmacy, and you have also transferred the data from your pedometer to your GP. Similarly, your GP can retrieve location data from your mobile phone and see your social resilience by assessing your social network via Facebook and other social media. With this data, your GP can assess what risks you have of developing diseases before you get any symptoms, and what medicine and personal behaviour will best prevent disease.

This is the dream scenario of precision medicine. Precision medicine holds great potential for much better healthcare treatment, as AI-driven solutions can – with a certain likelihood – predict patterns in patient data and make risk assessments based on complex data profiles. For example, physicians have had great success in clinical precision medicine by using existing cancer treatment in completely new ways based on DNA profiles<sup>3</sup>. And this offers substantial opportunities to change our health services to focus more on prevention than on cure. However, there are just as many ethical implications:

1. **There may be differences in interests in the AI-driven solutions:** Do the patient's wishes always rank above the wishes of the physician, system or other stakeholders?
2. **It is important to be aware of possible bias** in data used in precision medicine. The Fairness in Precision Medicine (Ferryman, Pitcan, 2018)<sup>4</sup> report highlights five areas that should be analysed for possible bias:
  - a) **genetic data**, as companies selling DNA tests may classify differently
  - b) **electronic health records**, which can lack data, be classified differently or be hard to interpret

- c) **diversity in participants and data types**, where findings in narrow populations may not be generalisable to all types of patients, and population data categories may be oversimplified
  - d) **historical bias** can be embedded in previous studies in which recruitment was too narrow and studies were not representative because a population group had been forgotten, for example, and finally
  - e) **analytical bias** may arise because the researchers' bias can shine through.
3. **Inequality.** Less resourceful patients may not benefit from precision medicine in the same way as patients who are resourceful and have the strength to take an interest in their own health. Therefore, precision medicine may mostly benefit highly educated, tech-savvy, self-directed, information-seeking, Danish-speaking individuals.
  4. **Privacy.** There is a risk that some individuals could resist recommendations in precision medicine if they feel that they are too specific to them, they feel that they are being spied on and their privacy is being threatened. Even if they have given their consent. There is also a risk that data can get into the hands of unauthorised parties such as insurance companies.
  5. **Individual focus or structural focus.** From a socio-economic point of view, there is a risk that precision medicine could focus too much on the individual rather than on the structural challenges that shape our healthcare sector. And that this will put a lot of responsibility on the individual.
  6. **Data control and transparency.** It is important to give patients control of their own data. Even though there is a concern that individual responsibility would marginalise more people, there are more benefits from granting patients access to their own data, as long as such data is interpretable and actionable.

## HEALTH

### SCENARIO 2

#### WHEN ROBOTS DIAGNOSE & PERFORM SURGERY

After being scanned immediately (because AI lowers the prices and costs of scans, waiting lists are shorter), you're diagnosed with breast cancer. The accuracy of the scan has been increased from 85% to 99.5% using AI<sup>5</sup>. You're also screened for neurological problems, your voice is analysed, and the system predicts whether there are signs of Parkinson's disease. There are no signs. However, you need surgery, which is performed by a robot that assists the human surgeon with the stitching.

In addition to the problems in scenario 1, the following ethical considerations should be taken into account:

1. **Overdiagnosing.** There is a risk that AI-based systems are over-cautious, thereby increasing the need for unnecessary tests and treatments. The opposite may also be the case.
2. **Transparency in AI diagnoses.** Is it humanly possible – as suggested by the GDPR – to understand the logic involved in the AI-proposed treatment?
3. **Responsibility.** Who is responsible for injuries caused by AI diagnoses and AI-based treatment?
4. **Access to a human.** Should a patient always be entitled to have access to a human? Or to get a second opinion from a human, as the machine is not always right<sup>6</sup>? And should a human always make the final decision<sup>7</sup>?
5. **Trust-mistrust.** In some cases, AI-based systems will be developed and implemented by commercial enterprises. This can lead to mistrust in the healthcare sector.
6. Healthcare professionals may feel that **their authority is being threatened** if AI-based systems take over. On the other hand, this may mean that healthcare professionals are released from automated tasks, so they can instead focus on other important tasks. However, it may also lead to employment of fewer people and with fewer competences. And what happens if technology fails and there are no human competences to take over?

## HEALTH

## SCENARIO 3

## IMPLANTED MONITORING &amp; ANDROIDS

A Bluetooth- and Wi-Fi-connected chip is implanted in your son's brain to report on symptoms of brain cancer, because he's in the high-risk group. As your child is still a pre-teen and often gets lost, you consent to inserting a GPS in the chip, so that you can see where he is. As an adult, he leaves the chip in his brain, so he can always be found if anything happens to him. It is easy to add new functions to the chip, so that he can use it as an ID and a payment card. At some point, he also gets a robotic arm following an accident when he was a soldier. He also takes pills that make him more alert and raise his heart rhythm. Finally, he designs his own child together with his wife, as gene-editing has been permitted. When he dies at the age of 105 years, his wife brings him back to life as a cloned android.

Today, research is being conducted in several of the scenarios above. In addition to the issues emerging from scenarios 1 and 2, the following lists a few more:

1. **Tracking implants.** Is it ethically justifiable to allow tracking of children (or elderly with dementia or legally incompetent people for that matter) and is their consent – if possible – enough?
2. **Gene-editing.** In 2018, gene-editing<sup>8</sup> is already beginning to become more accepted – where should we draw the line for this technology?
3. **Definition of a human.** What is a human, and where do we draw the line between human and robot? Will we – as some people, like Yuval Harari, claim<sup>9</sup> – within a century or two experience a new species of superhuman that is as different as man is today from gorillas?

4. **Android ethics & robot rights**

Japan in particular is producing human-like robots – androids. Sometimes they are a basic clone of oneself like Henrik Schärfe's robot<sup>10</sup>. In science fiction films, people are brought back to life as androids using all the data generated while they were alive. This calls for answers to a large number of ethical dilemmas:

- a) **Is it okay to produce human-like robots?**
- b) **Is it okay to produce copies of people** and go beyond looks to reproduce brain and personality? And do we have the right to say no to others making a robot copy of ourselves?
- c) **Should we decide for ourselves** before we die whether the data we generate can be used for other purposes after we are dead?
- d) **Do androids have human rights** and the right to receive a citizenship like Sofia did<sup>11</sup>?
- e) **Who is responsible for androids' actions?**  
The company that produced them, or should they have a legal status of their own?

5. **How we talk about AI**

The way we talk about AI and the role of robots affect the development of AI. Some people talk about AI as an uncontrollable free agent and about people as outdated software<sup>12</sup>. Only rarely do we think about the philosophical human and technological understanding that forms the basis for our AI discourse. AI transparency is also about the language we use when designing and creating policies and using AI.<sup>13</sup>

## FINANCE

## FINANCE

### SCENARIO 1

#### AI FINTECH ASSISTANTS

*You manage your personal finances through an AI-driven personal assistant, which helps manage your income and expenses, map your financial situation, as well as invest for the future in your pension schemes. This is a complex process, in which your consumption patterns are mapped, and you're guided towards a specific goal set by you yourself, for example to live in a house in a wealthy area or retire at the age of 60. You get help with your grocery shopping and to choose a pension fund, and the assistant will notify you if you are about to make a risky purchase. The assistant will also work as your personal algo trader which, on your behalf, trades in the global stock market.*

Personalised AI assistants can guide and provide users with better insight into complex decisions regarding their personal finances, and allow them to take part in otherwise closed, complex macro-economic dynamics. This is an area that is already undergoing strong development.<sup>14</sup> However, it requires regulation, and a number of ethical considerations should be included from the beginning:

1. **Interests and individual control.** Who develops the services? FinTech AI assistants will be developed by traditional banks, by central governments, start-ups and some large private providers. Banks are traditionally strictly regulated, but what about a relatively under-regulated startup environment? How can we secure consumer interests? An insurance company or a loan provider may also be interested in access to consumers' detailed data profiles to determine an insurance premium or the price of a loan. How can we ensure that the objectives on the basis of which personal AI services guide the consumers represent consumer interests? What legal rules should AI services comply with? Is there a need to develop new legislation in the FinTech area?

2. **Privacy.** For a personal AI service to function optimally, it must be composed of all types of data – not only financial data, but also data about shopping, location, wants and needs, job, education and political affiliation, for example. This also includes psychological profiling. AI is increasingly being used to predict patterns in data and for risk assessment by banks, for example.
3. **Explainability.** How can we ensure that as individuals we follow and understand criteria, objectives, and decisions, and that we generally have control of our AI assistance? Or is it okay that people do not understand AI decisions?
4. **Inequality and new digital divides.** The personalised AI FinTech services will differ. Some will be developed by idealistic startups or regulated banks with consumer rights in mind. But others will not have the same point of departure. Personalised AI services therefore risk creating digital divides.
5. **Responsibility.** With whom or where does responsibility lie, if a personalised AI assistant is wrong or makes a bad investment on behalf of the consumer? The developer? The consumer? Or do AI assistants have their own rights – and are therefore also responsible themselves? Are they responsible in the same way as a financial adviser? Should an AI assistant – with a power of attorney – be able to enter into contracts on behalf of the consumer?
6. **Kill switch.** Should an AI service that has taken an autonomous sidetrack or simply no longer acts in accordance with its original purpose be shut down?

## FINANCE

### SCENARIO 2

#### NEW METHODS OF PAYMENT

*At the supermarket, you can choose to pay in several different ways. You can pay in cash, but you can also choose to pay with an alternative digital currency that has its own value, such as bitcoin, you can pay with personal data or with reviews that you write on the supermarket's online forum. AI is a natural part of alternative payment systems and is used for risk analyses and predictions regarding your behaviour; it is used when you pay with data, and by banks and central governments to combat crime.*

Today, we primarily pay with a currency, the value of which is regulated by a central government, and transactions and movements are managed by banks. However, we are increasingly seeing new currencies with alternative values set by companies. One example is social media where we 'pay with' our personal data. Digital management systems (such as PayPal) or crypto currency (such as Bitcoin) are other examples. Payment systems have also been developed, where you pay an insurance premium according to how you behave; pay-as-you-behave. In this context,<sup>15</sup> AI is used to analyse consumer data – risk assessments and predictions according to which consumers' prices or services are determined. In any case, alternative payment systems have an advantage; i.e. services are 'free'. This enables more vulnerable people to get a bank account or obtain credit. These AI-driven payment systems hold a number of ethical issues:

1. **Fraud, crime, identity theft.** The development of alternative methods of payment is being threatened by services set up by criminal hackers to steal identities and money. The development of AI systems would be able to identify and to some extent eliminate tax fraud and crime. But whose interests do these systems favour? And how will the anonymous crypto market affect the western banking system and central governments' possibilities to collect taxes?
2. **Transparency.** Do consumers understand the value of alternative currencies? One example is the personal data with which we pay social media. How much is a date of birth worth? A chronic disease? A sexual orientation? This is a method of payment which is not regulated like the Euro, for example, where information about the rate of exchange is available. Via the EU Competition Commissioner, Margrethe Vestager, the European Commission has advocated for making the new currencies more transparent for consumers<sup>16</sup>. But how can we ensure transparency in the valuation of the new types of currency?
3. **Digital divides.** Obtaining a loan, for example, is not so easy for vulnerable people. Not in Denmark, and even less in India and the US. For this reason, vulnerable people will also be the first to choose an alternative payment system which is not regulated and does not provide the same consumer protection. This makes them more exposed to methods of payment based on data profiling and data analysis.

## FINANCE

### SCENARIO 3

#### AIGO TRADERS CONTROL THE FINANCIAL MARKETS

*There are no longer any humans on the international stock markets. All transactions are carried out by algo traders, i.e. AI software that analyses the market and makes transactions. Traditional traders use algo traders, but ordinary people have their own personal algo traders too.*

A few years ago, the majority of transactions on international stock markets were carried out by humans. Today, the percentage of transactions carried out by machines (algo traders) is on the rise. AI-driven software analyses the market, for example through social media data and news, and makes decisions and transactions on the basis of data.

1. **Computer versus human.** The global economy is changing from being based on decisions taken by humans to decisions taken by machines. These decision processes are faster than human perception and actions. Algo traders are developed to maximise profit. Where do ethical and social considerations come into play? Does an algo trader have lower moral standards than a human? Is it possible to develop a moral algo trading market? And does a person always have the right to know that they are being advised by a machine and not a person?
2. **Manipulation and autonomous decisions.** A market can crash if incorrect or misleading information creeps into the data analysed by the algo trader. How can we protect ourselves against manipulation aiming to cause a market to crash? Can and should we always ensure human control? Or should we allow computers to take autonomous decisions? What will be the consequences of this? Financial, social and human?

# TRANSPORT

## TRANSPORT

### SCENARIO 1

#### SMART CITY

*Like almost everyone else, you don't have a driving licence, but you use electric driverless cars, busses and trains that are managed as public transport by the authorities (private alternatives exist, but only few people can afford them). The vehicles are fitted with cameras with facial recognition and sensors that monitor the passengers' weight and heat release, the smell of their food, the size of their luggage, whether they are alone or whether they are holding someone's hand. You are on long-term sick leave from your work and are receiving public benefits. This means that the municipality will combine your data with data from other public registers – including data from the police and data collected via sensors from lamp posts and other public places – to check whether you are still entitled to benefits, as well as to predict whether you are at risk of committing public order offences and when you are ready to return to work.*

The citizen's role in this version of a smart city is limited to being a recipient of a possibly efficient and cohesive service, where attempts to cheat the system have been more or less eliminated due to efficient data monitoring and surveillance. A systematic surveillance system like the one above is an incredibly effective tool, which is currently being tested in China<sup>17</sup>, for example, to administer public benefits. However, such a system also severely invades the citizen's personal integrity and privacy. If we want to prevent smart cities from being used to determine public benefits, for example, the following challenges need to be addressed:

1. **Interests.** Ambitions for efficient public services may not take priority over citizens' privacy and control of their own data.
2. **Is there proportionality in the surveillance?** How can we balance catching those who abuse the system against mass surveillance of all recipients of public benefits (an extremely relevant problem in relation to municipalities being allowed to surveil citizens to combat social fraud)? Is data processing that reduces road deaths so valuable that it is acceptable to compromise the privacy of all drivers by scanning all licence plates at motorway junctions?
3. **Bias.** It is important to be aware of possible bias in the data used when combining public databases.
4. **Privacy.** There is a risk that some people feel that their privacy is being invaded. Even if they have given their consent. The distrustful would perhaps withhold data about themselves, and turn off their Wi-Fi and Bluetooth that gather important data, or they may lie about data to avoid the surveillance.
5. **Data control and transparency.** It is important to give citizens control of their own data: They must be able to understand their data and not least question their data. Should a citizen be allowed to delete their own health data – where do we draw the line? Should you be allowed to delete all traces that you have had cancer, for example?
6. **Explainability.** If algorithms are used to analyse data and predict patterns, is it then possible to explain them in a manner that people understand?
7. **Free zones.** Is 'smart' always the best solution? Or are technological free zones in the public space necessary?<sup>18</sup>

## TRANSPORT

### SCENARIO 2

#### DRIVERLESS CARS

*You're going to buy a car. You choose a good German car<sup>19</sup>, which advertises that if your algorithm-controlled car is about to be involved in a road accident, and has to choose between killing you or a bystander, it will always save the passenger's life rather than the bystander's. What you do not know is that 'LDS Services'<sup>20</sup> supplies the GPS system for the car and LDS Services also sells anonymised location data to, for example, the police (in order to better place automated speed checks) and private players interested in location patterns. However, it is very easy to re-identify users based on location data<sup>21</sup>, if the data has not been sufficiently anonymised. Therefore, your location has been mapped over the past two years and sold to numerous businesses in the Ad Tech sector, so that every time you drive into the carpark at a shopping centre, you will be 'served' with personalised advertisements.*

The use of driverless cars can undoubtedly bring major benefits for society. Fewer accidents, no problems with driving under the influence of alcohol, better environment due to transport optimisation, etc. However, driverless cars come with a number of ethical dilemmas:

1. **Inequality and privacy.** The first designs of driverless cars incorporate 16 video cameras and more than 20 different sensors.<sup>22</sup> Will only the most wealthy people be able to afford private driverless cars where they themselves have control of data – and will manufacturers protect their customers' privacy? Or should this be regulated? And will public driverless means of transport ensure that everyone has the right to control their own data?
2. **Car production.** Should car manufacturers be allowed to market themselves as manufacturers that will always protect their customers' lives over the lives of others? In this context, the Moral Machine<sup>23</sup> project suggests in a simplified manner who a driverless car should kill in an accident, if a machine has to make a split-second moral decision: Two elderly men or a boy and a man? An overweight woman or an athletic woman? A dog or a cat? A homeless person or a doctor? And so on.
3. **Responsibility.** Who is responsible in the event of an accident in driverless cars? The car manufacturer, the car owner, the car user?
4. **From owning to sharing.** According to experts, owning a car is a strong tradition<sup>24</sup> that gives a sense of control and freedom. Will it be possible to make Danes give up this control to make driverless cars as safe and sustainable as possible?
5. Is it okay to scan a licence plate at the entrance of a shopping centre to **personalise ads** for those who enter the centre?



## RECOMMENDATIONS

### HUMAN BEING AT THE CENTRE

- We should not develop AI to replace humans, but we should ensure that AI always complements humans<sup>25</sup> and 'only' serves as a cobot; a robot that collaborates with humans<sup>26</sup>.
- Any service and any (IoT) product should have a kill switch; the possibility for humans to switch off a system if an AI service gets out of control or does not act in accordance with its original purpose. The service/product should always be able to function manually.
- We should ensure that humans always have the final say, and that humans always know whether they are talking to a machine or a person.
- We should define smart cities in a way that is not only about figures and calculations, but also about smart people who address their own life-long learning, about diversity and transparency, see the Austrian calculation model<sup>27</sup>.
- Privacy risks and data-ethical implications for the individual should always be incorporated into the design and development of, for example, personal AI assistants, from the very beginning. Privacy-by-design principles and individual data control should be mandatory as suggested by the GDPR.

### INDIVIDUAL DATA CONTROL

- We should establish personal data stores<sup>28</sup>. An extended 'my page' or personal cloud where citizens have control of their own data. Citizens should be able to add more data, for example in return of more services, or delete data (that is not to be stored according to legislation – this also applies if a citizen has survived cancer and wants to delete the data), update data and download data to take with them (principle of data portability).
- We should ensure Danes the right to anonymity – in the same way as they have a secret address. Personal data, including DNA data, which is becoming increasingly valuable, should be stored under strong encryption and only be accessible with a court order. Anonymity also entails that we are entitled to communicate and act anonymously.

### TRANSPARENCY

- We should develop a standard for how to explain an algorithm. This could be based on a questionnaire framework to ensure that all aspects are addressed like that DataEthics.eu has with data ethics principles<sup>29</sup>. This questionnaire could be based on the Technical University of Denmark's Safe AI principles<sup>30</sup>, as we could seek inspiration from the Finnish AI company Silo.ai, which has developed a SHAP standard that explains a complex algorithm.
- It is not enough to simply provide basic information about data processing, when an algorithm is explained. How a given algorithmic decision has been made should be documented and explained, as well as which criteria and parameters form the basis for granting or rejecting a public benefit, a credit score or the size of a fine.

### ACCOUNTABILITY

- In addition to a comprehensible privacy policy as required by the GDPR, businesses, organisations and authorities should develop their own data ethics principles that go beyond compliance with data legislation and explain in detail what they do with metadata and anonymisation, for example. The development of such principles should be based on standards on ethics of AI<sup>32</sup> as well as other ethics principles and guidelines under development<sup>33</sup>.
- AI ethical and social impact assessments should be mandatory in the same way as the current data protection impact assessment<sup>34</sup>.
- We should support European and global labelling systems and AI audits by independent third parties in the same way as in the environment and food areas. It should be possible for independent bodies to review AI design.

### EQUALITY

- There should be a requirement – for example in a labelling system – to work on reducing bias by manual sorting and cleanup of data. Bias can be reduced by making sure that data can always be explained and is open to audit.
- In personal services, such as precision medicine, it is important to address the big structural questions.
- Equality should be integrated into the development and design of AI services and systems to benefit vulnerable people as well.

### AI AS A SHARED GOOD IN SOCIETY

- The development of AI began as experimental silo projects. Today, AI technologies have decisive influence on our shared economic, cultural, social and political processes. However, AI technologies are still being developed in silos; in research communities – although all university research is accessible to the public – or as trade secrets in businesses. It is time to define AI as a shared good in society and not as the property of a single institution or company, just like we once decided that everyone should have access to electricity.<sup>35</sup>
- Ethical technology design is a broad term, and therefore standards for AI are currently being developed at global level. The ISO organisation for standardisation has focus on standards for AI.<sup>36</sup> So has the IEEE which is in the process of developing global ethical standards for the development of AI in a number of projects on standards (P700s). These standards will be developed by experts from all over the world within different sectors and will therefore be based on many different interests.<sup>37</sup> We recommend keeping up with and participating in the development of these standards.
- AI is a global field of competition between regions. The European Commission AI strategy launched in May 2018 with support from 25 Member States includes the development of policy and ethical guidelines as well as larger investments in the field. This means that there is now a basis for a European perspective on the development of AI, with special focus on ethical and human dilemmas. One of our primary recommendations is to keep up with the European ethical approach to AI, which should be regarded as an ethical alternative and therefore also a competitive advantage on the global market.

## DEFINITIONS

### ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is systems that display intelligent behaviour by analysing their environment and taking actions with some degree of autonomy to achieve specific goals.

Source: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0237&from=en>

### BIAS

Bias is an imbalance built into the data and the algorithm. In some situations, it will cause an ethical problem, for example if it means that women are excluded from a position. In this report, bias is mentioned when it is ethically problematic and entails built-in prejudices and negative stereotyping. Bias may occur in training data, i.e. the historical data used to develop a self-learning algorithm. Bias may also occur in the design of an algorithm that can categorise and label people in a way that discriminates between, for example population groups. This can be reduced by, among other things, manual sorting and cleanup of data. It can also be reduced by making sure that data can always be explained and is open to audit.

Source: <https://dataethics.eu/dataetiske-principper/>

### DEEP LEARNING

A machine learning technique in which data is analysed through self-adjusting mathematical networks ("neural networks") inspired by neurons in the human brain. When training data is processed in the network, the different parts of the network adjust, and this strengthens the network's ability to make predictions on data.

Source: <https://www.wired.com/story/guide-artificial-intelligence/>

### MACHINE LEARNING

Using data or experience to refine how computers make predictions or perform a task. The aim is to make the computer able to calculate or analyse automatically at a very high speed using large quantities of data and rapidly changing data.

Source: <https://www.wired.com/story/guide-artificial-intelligence/> <https://www.bernardmarr.com/default.asp?contentID=1272>

**PRECISION MEDICINE** means to collect, integrate and analyse multiple sources of data in order to develop individualised insights and recommendations about health and disease. Source: <https://datasociety.net/output/fairness-in-precision-medicine/>

### HEALTH DATA

Every time you are in contact with the healthcare system, whether it be a visit to the pharmacy or treatment in hospital, health data is generated. However, health data can also be gathered from apps, wearables and insidables, for example. Health data can be stored physically or in electronic medical records. Both the information used at individual level and the information used at national level is health data.

Source: [https://danskdesigncenter.dk/sites/default/files/pdf/sundhed\\_og\\_det\\_gode\\_liv\\_data\\_og\\_kunstig\\_intelligens\\_siri-kommissionen\\_januar\\_2018.pdf](https://danskdesigncenter.dk/sites/default/files/pdf/sundhed_og_det_gode_liv_data_og_kunstig_intelligens_siri-kommissionen_januar_2018.pdf)

More definitions: <https://dataethics.eu/en/faq-principles-of-data-ethics/>

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