

Algo . Rules

Rules for the Design of
Algorithmic Systems

Preamble

Algorithmic systems are being implemented in a growing number of areas and are being used to make decisions that have a profound impact on our lives. They involve opportunities as well as risks. It is up to us to ensure that algorithmic systems are designed for the benefit of society. The individual and collective freedoms and rights that comprise human rights should be strengthened, not undermined, by algorithmic systems. Regulations designed to protect these norms must remain enforceable. To achieve this objective, we've developed the following Algo.Rules together with a variety of experts and the interested public.

What are Algo.Rules?

The Algo.Rules are a catalogue of formal criteria for enabling the socially beneficial design and oversight of algorithmic systems. They provide the basis for ethical considerations as well as the implementation and enforcement of legal frameworks. These criteria should be integrated from the start in the development of any system and therefore be implemented by design. Given their interdependence on each other, the Algo.Rules should be treated as a composite unit. Interested stakeholders and experts are invited to join us in developing the Algo.Rules further and to adopt them, adapt them, expand them and, above all, explore opportunities to apply them in practice. Dynamic by design, the Algo.Rules should be fine-tuned, particularly in terms of their practical implementation.

Who do the Algo.Rules target?

The Algo.Rules address everyone with a significant impact on the creation, development, programming, implementation or the effects of an algorithmic system as well as everyone who has commissioned their development or integration. This includes in particular (but is not limited to) the following:

- People who research the development and use of algorithmic systems;
- People who collect, collate, categorize, bundle and curate data;
- People who make decisions regarding the use and objective of an algorithmic system;
- People in management at institutions or businesses that use or develop algorithmic systems;
- People who program algorithmic systems;
- People who test, develop and adapt algorithmic systems;
- People who design how users are presented with the results of an algorithmic process (user experience design);
- People who use algorithmic systems in their daily work to make decisions or determine how they will be applied.

What is an „algorithmic system“?

The term “algorithm” refers to a set of precise instructions or rules regarding actions to be taken in solving a predefined problem. An algorithmic system is a system comprised of one or more algorithms used in a software to collect and analyze data as well as draw conclusions as part of a process designed to solve a pre-defined problem. The system can involve machine learning or follow pre-programmed decision-making rules. Drawing on Algo.Rules to evaluate an algorithmic system includes taking into consideration the broader socio-technical context in which the software is embedded. This involves, for example, considering how results are interpreted and how this informs the user of a system’s decisions. The Algo.Rules apply to the entire process of algorithmic system development as well as their embeddedness within a social context.

The Algo.Rules focus on those algorithmic systems that have a significant impact on society or individual lives, regardless of whether this involves direct or indirect effects. It is therefore not a question of establishing a set of design rules for all algorithmic systems but, rather, for those that are socially relevant. In order to determine whether an algorithmic system is socially relevant, an impact assessment should be conducted before it is designed. The stronger the potential influence of an algorithmic system on society or people’s lives, the more carefully it should comply with the Algo.Rules.

1 Strengthen competency

The function and potential effects of an algorithmic system must be understood.

Those who develop, operate and/or make decisions regarding the use of algorithmic systems must have the necessary expertise and appropriate-to-scale understanding of how the technology functions and its potential effects. Sharing individual and institutional knowledge as well as promoting interdisciplinary exchange across task areas are just as crucial as ensuring appropriate skills development. These approaches should be integrated into the education, training and onboarding of new employees. In addition, interdisciplinary exchange should be an ongoing endeavor that remains open to those who are interested and/or affected.

2 Define responsibilities

A natural or legal person must always be held responsible for the effects involved with the use of an algorithmic system.

Accountability must be clearly assigned. The accountable person must be aware of the responsibilities associated with their tasks. This also applies to responsibilities that are shared by several people or organizations. The allocation of responsibility must be fully documented and transparent for internal and external parties. Responsibility may not be transferred to the algorithmic system itself, users or people who are affected by the system.

3 Document goals and anticipated impact

The objectives and expected impact of the use of an algorithmic system must be documented and assessed prior to implementation.

The objectives of an algorithmic system must be clearly defined and information regarding its use must be documented. This includes the underlying data and calculation models. Before an algorithmic system is put to use, an impact assessment should be conducted and documented. Particularly in the case of machine-learning systems and in dynamic areas of application that are subject to frequent change, an impact assessment should be repeated at regular intervals. The risk of discrimination and other consequences affecting individuals and the common good must be taken into consideration. The objectives considered, their underlying values and the use of algorithmic systems must be documented.

4 Guarantee security

The security of an algorithmic system must be tested before and during its implementation.

The reliability and robustness of an algorithmic system as well as its underlying data with respect to attacks, access and manipulation must be guaranteed. Security must be built into the architecture of the algorithmic system (security by design). The system must be tested in a protected environment prior to implementation. Security precautions must be documented.

5 Provide labeling

The use of an algorithmic system must be identified as such.

People interacting with algorithmic systems must be able to identify that a decision or prediction is based on an algorithm. This is particularly important in cases where the system imitates a human being in how it interacts (e.g., through language or appearance).

6 Ensure intelligibility

The decision-making processes within an algorithmic system must always be comprehensible.

In order to question and review decisions resulting from an algorithmic system, people must be able to understand both direct and indirect effects of the system as well as how decisions are reached. Information about the data and models on which the system is based, its architecture and potential effects must be published in easily understood terms. In addition, it is important to check whether an objective can be achieved without a significant loss in quality through the use of a less complex algorithmic system that involves an easier to understand mode of operation.

7 Safeguard manageability

An algorithmic system must be manageable throughout the lifetime of its use.

In order for an algorithmic system to remain adaptable, everyone involved in its development and implementation must maintain joint control over the system. This involves ensuring broad oversight of the entire system, even when tasks are distributed across various departments within an organization and among several individuals. The complexity of a system's operations must never exceed the capacity of human oversight and a person's capacity to make changes to the system. This applies in particular to machine-learning systems. If this manageability cannot be guaranteed, the algorithmic system in question should not be used.

8 Monitor impact

The effects of an algorithmic system must be reviewed on a regular basis.

An algorithmic system must be subject to active monitoring in order to determine whether the targeted objectives are actually achieved, and the use of the system does not violate existing legislation. Taking the appropriate technological precautions, external bodies should be able to conduct an independent, comprehensive and effective audit of an algorithmic system without compromising legitimate concerns regarding business confidentiality. Should a negative impact be determined, the cause must be identified and the algorithmic system adapted accordingly.

9 Establish complaint mechanisms

If an algorithmic system results in a questionable decision or a decision that affects an individual's rights, it must be possible to request an explanation and file a complaint.

The person or organization using an algorithmic system must provide an easily accessible means of contact. First, those affected must be able to request appropriate and detailed information regarding a specific decision and the considerations that have fed into it. This should be an option also for organizations acting in their legitimate interest and for situations in which an organization acts on the behalf of an individual. Second, there must be an easily accessible and effective way to lodge a complaint. Complaints and actions taken must also be documented.