

# Algorithm Auditing

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What is algorithm  
auditing?

# Definition(s)

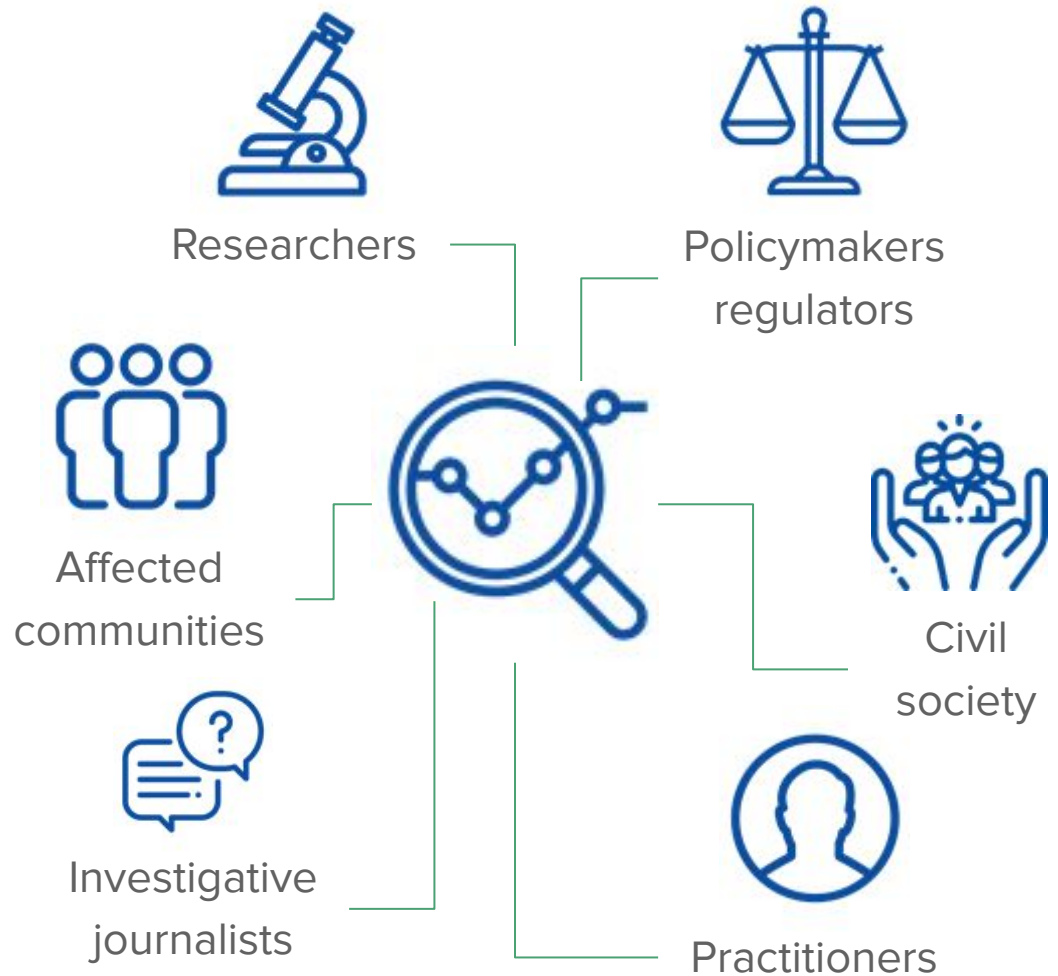
(many and varied)

*Algorithm auditing* encompasses a wide range of practices aimed at evaluating and addressing the harms emerging from algorithmic systems.

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# Algorithm auditing ecosystem

- Many stakeholders
- Many perspectives
- Many methodologies



# Which algorithmic systems?

In the context of the DSA, any algorithmic system of VLOPs and VLOSEs, in particular:



Recommender systems

Advertisement systems



Content moderation systems

These systems are **socio-technical** in nature, and when evaluating their impact on **systemic risks**, it is essential to conduct audits that encompass both their social and technical dimensions.

# Where algorithm audits **might** be useful in the context of the DSA

## Risk assessment



Analysis of  
algorithmic  
risk factors

VLOPs and VLOSEs have to assess the systemic risks stemming from the design, functioning and use of their algorithmic systems (Art. 34).

## Independent audit



Test of  
algorithmic  
systems

Independent audits to assess compliance with DSA obligations (Art. 27). Not all compliance audits require an algorithm audit, those are two distinct type of audit.

# Where algorithm audits **might** be useful in the context of the DSA

## Vetted researchers



Study of  
systemic risks

Data access for vetted researchers to conduct “*research that contributes to the detection, identification and understanding of systemic risks in the Union*” (Art. 40).

# Algorithm auditing in academic research





- **New emerging field**, one of the first use of this terminology can be found in Sandvig et al. (2014)\* and was focused on detecting algorithmic discrimination.
- **Many good insights from scientific literature** on how to conduct an algorithm audit.
- Most of current academic research have an **external access** to the algorithmic systems under study.

\* Sandvig, C., Hamilton, K., Karahalios, K., & Langbort, C. (2014). Auditing algorithms: Research methods for detecting discrimination on internet platforms. *Data and discrimination: converting critical concerns into productive inquiry*, 22(2014), 4349-4357.

# Objectives

the two main objectives of  
algorithm auditing in academic  
research

- **Reverse-engineering the algorithm:** how does the algorithm work?
  - **Study of an algorithmic risk factor:** what is the role of the algorithm in the emergence of the systemic risk?
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## **Reverse engineering:**

- Identification: what are the main parameters influencing the algorithm behaviour?
- Understanding: how each parameter influences algorithm behaviour?

An example

## **Risk-oriented audit:**

- What is the impact of the main parameters of the algorithmic system on the emergence of the systemic risk?

# Three phases in algorithm auditing



## Experimental design

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- Definition of scope of the experiment and hypothesis.
- Careful planning of variables, controls, and procedures to ensure reliable and valid results.

## Data collection

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- Virtual agents (sock-puppets).
- Web Scraping.
- API (Application Programming Interface).
- Crowdsourcing.

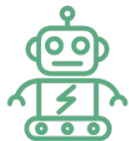
## Data analysis

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- Processing raw data: data cleaning, organizing and annotation.
- Statistical testing.

Data collection,  
typical external  
access  
methodologies

# Sock puppets



## What it is

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Sock puppets are **automated accounts** that **simulate real users behaviour** in live online environment. They can interact with the platform exhibiting complex behaviours.

## Pros

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- **Precise control** over experimental conditions.
- **Cost-effective and scalable** as the simulations can be run multiple times and on a large scale.

## Cons

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The sock-puppets interact with platforms in a scripted, robotic manner, which is sufficient to gather data but **may not accurately reflect authentic human behaviour**.

# Web scraping



## What it is

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The scraping approach to algorithm audit typically involves writing code to automatically process the platform **end-user interface** HTML/CSS code to extract the data of interest.

## Pros

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Provide an **unfiltered view of the platform's end-user experience**, without requiring any input from the platform itself.

## Cons

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The **volatility of HTML layouts** is an issue as they are frequently changing, making it difficult to create a long-lasting scraping tools.

# API audit



## What it is

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An API audit involves programmatically interacting with an interface that allows external researchers to write computer programs to **send and receive information from a platform.**

## Pros

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- API can provide a **direct and precise access** to the platform's data
- APIs are often more **stable and reliable** than scraping the HTML layout of a platform.

## Cons

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The platform being audited may **limit the information that can be accessed** through the API, which can impact the scope and depth of the audit.



# Crowdsourcing



## What it is

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Crowd-sourced approach relies on **collecting data from real users** who gave permission to do so (**browser extensions** or **automated scripts** collecting information from users' devices).

## Pros

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The data collected is often more **representative of real-world** usage patterns than other approaches

## Cons

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- Recruiting human participants can be a **lengthy and costly** process.
- Crowdsourced auditing may be subject to **sampling bias**.

# In conclusion

- Algorithm auditing is a new emerging field.
- Many good insights on how to conduct a proper auditing from scientific literature.
- Many workarounds, black box approach, limited data access.
- Many external data collection methodologies.
- Art. 40 of the DSA will tackle many challenges related to external access for vetted researchers.

# Thank you

Questions?