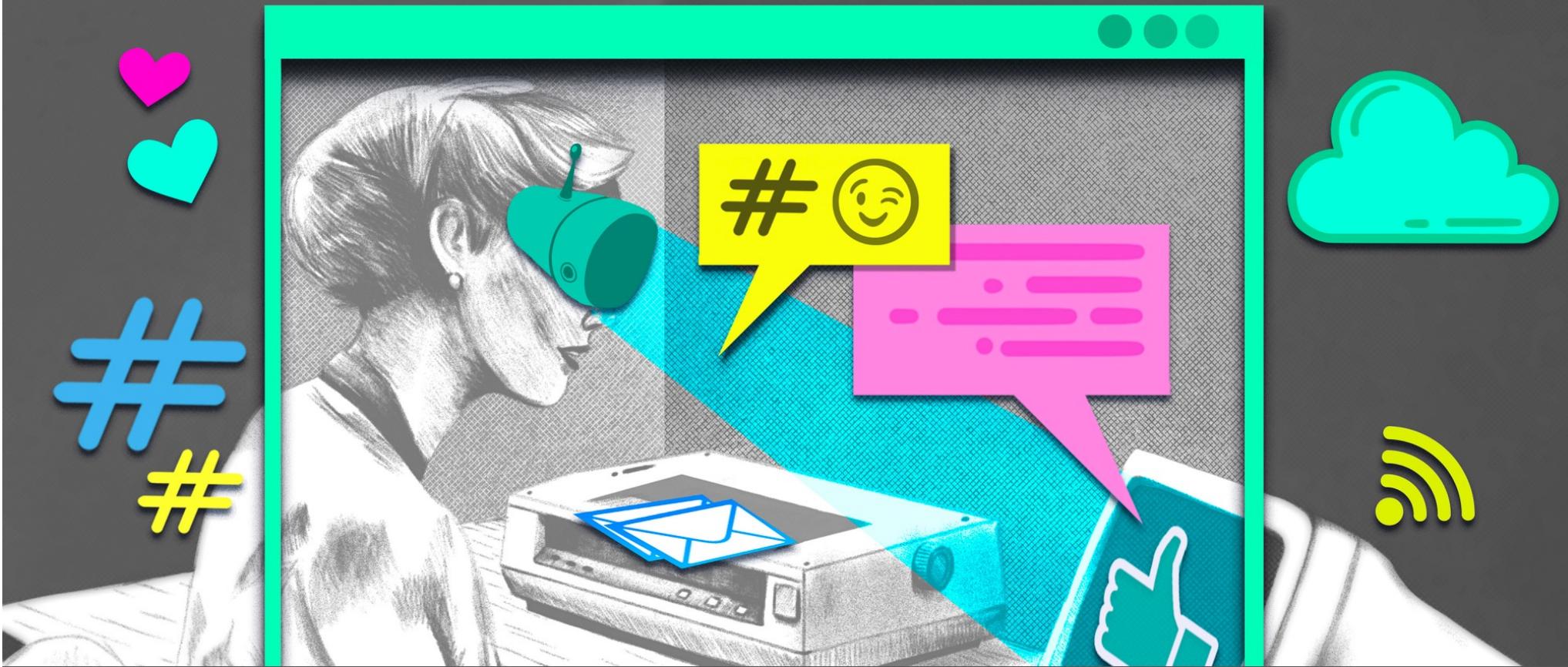


# DIGITALER WANDEL

FRÜHJAHSSEMESTER 2022



# Algorithms and Democracy

Algorithmic Newsfeeds and Electoral Democracy in  
the Swiss COVID-19 Referendum Vote

Dr Andrea De Angelis

[andrea.deangelis@unilu.ch](mailto:andrea.deangelis@unilu.ch)

<https://deangelisa.github.io/>

# Outline

1. What is an **algorithm**?
2. Do Algorithms impact **our lives**?
3. Do Algorithms impact **democracy**?
4. **Algorithmic Newsfeeds in the Swiss 2021 referendum vote**

# Instant poll !



# What is an algorithm?



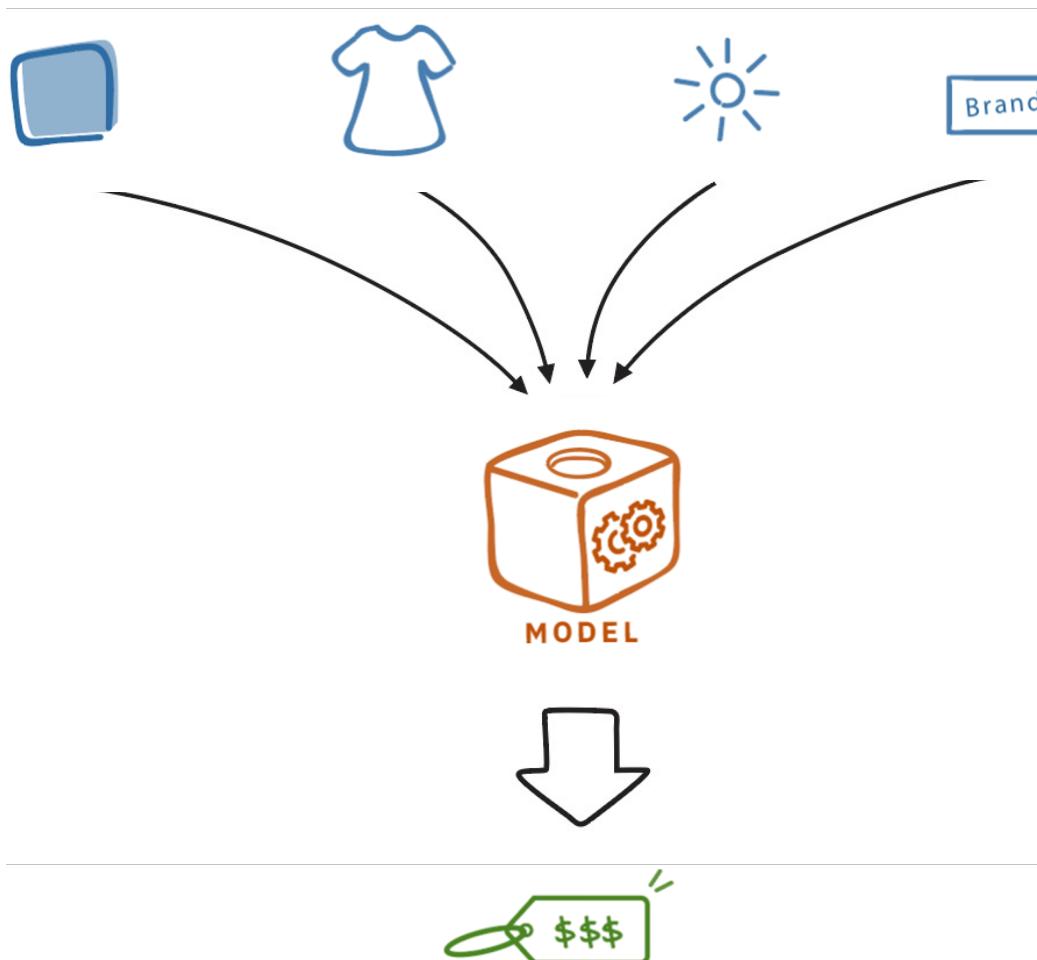
A large, semi-transparent question mark icon is centered over a dark background filled with binary code. The code is written in C++ and includes various print statements and variable declarations. The question mark obscures a significant portion of the text, particularly the right side.

# Algorithm

**Mathematical procedure using a data input  
to find a solution to a problem**

```
find_solution = function(input) {  
    if(input == a)  
        do this  
    else if (input == b)  
        do that  
}  
  
solution = find_solution(input == a)
```

# Algorithms & predictive analytics



## Data input

Behavioral data  
Digital traces  
Social media  
Digital payments

## Algorithm

AI: statistics, ML & DL

## Prediction

Uncertainty  
Train, test, validate  
Feedback loop

# The Google Maps algorithm



## Problem

How to reach  
Kapellbrücke?

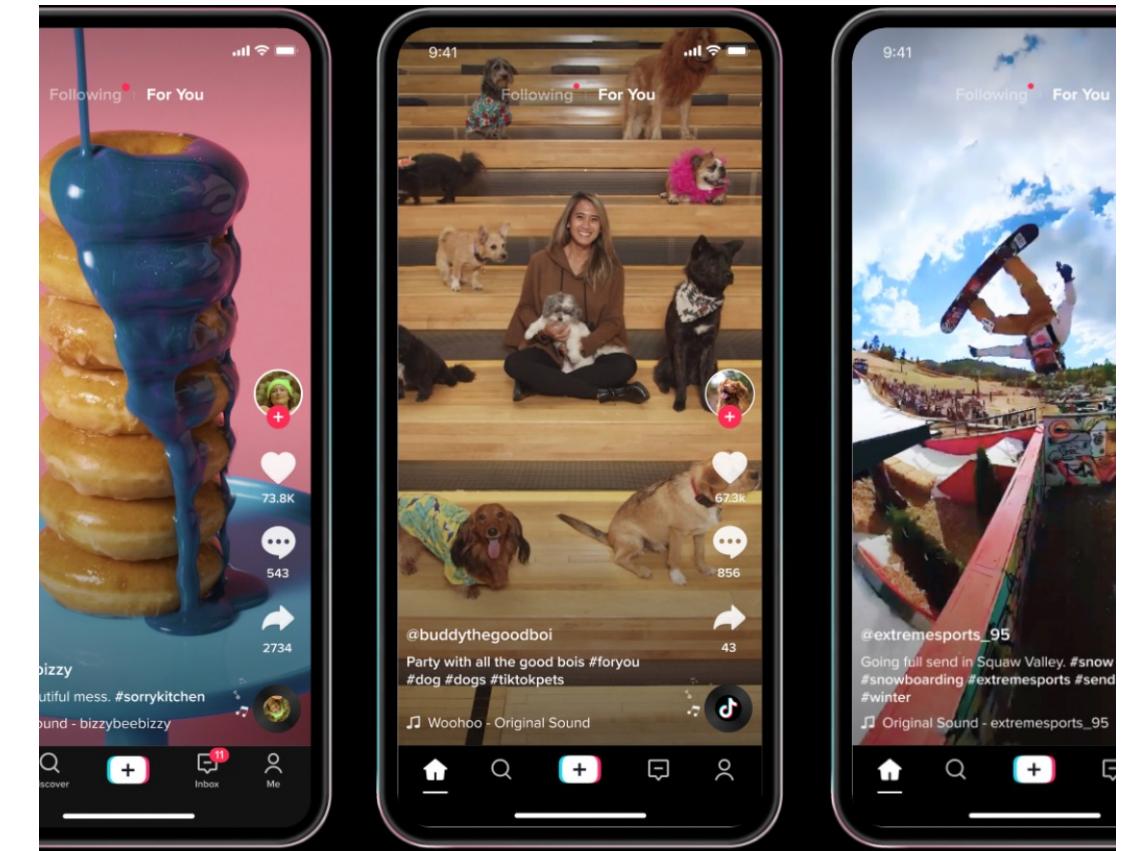
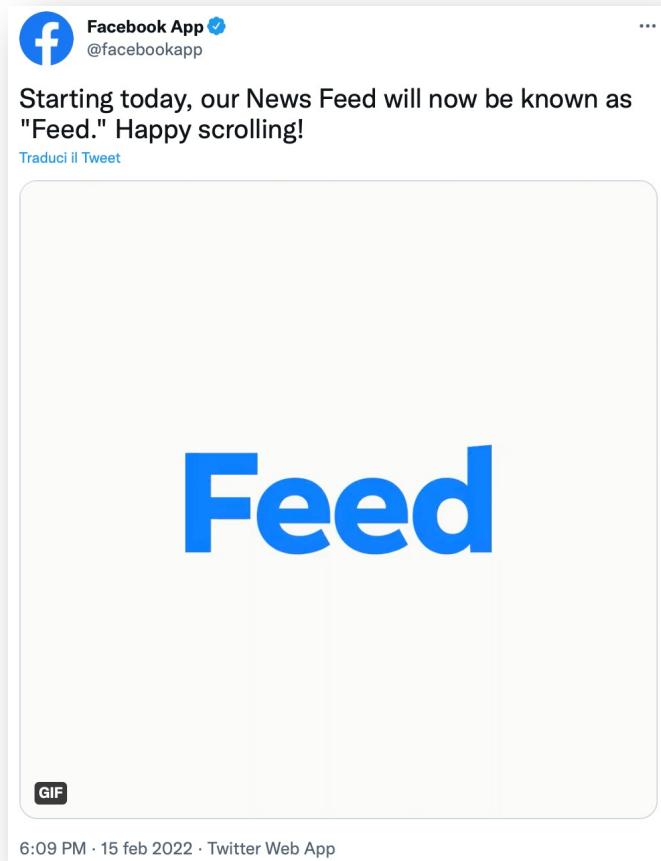
## Data input

- University of Lucerne, Frohburgstrasse 3
- ⋮
- 📍 Chapel Bridge, Kapellbrücke, 6002 Luzern

## Solution

- University of Lucerne  
Frohburgstrasse 3, 6002 Luzern
- ↑ Head north on Frohburgstrasse toward Route 9  
17 m
  - ;left Turn left onto Frohburgstrasse/Route 9  
47 m
  - right Turn right onto Robert-Zünd-Strasse/Route 9  
67 m
  - left Turn left onto Bahnhofpl./Route 9  
210 m
  - left Turn left onto Bahnhofstrasse/Route 9  
200 m
- Chapel Bridge  
Kapellbrücke, 6002 Luzern

# Newsfeed algorithms



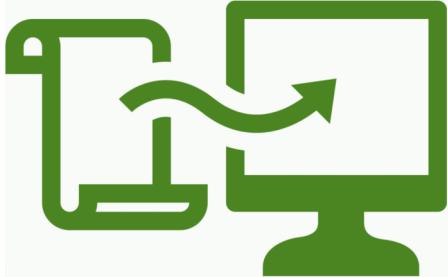
<https://tech.fb.com/engineering/2021/01/news-feed-ranking/>

<https://newsroom.tiktok.com/en-us/how-tiktok-recommends-videos-for-you>

# Do algorithms impact our lives? How?

Discuss it a moment with the person sitting next to you

# Digital processes



**Digitization**  
from analog  
to digital information



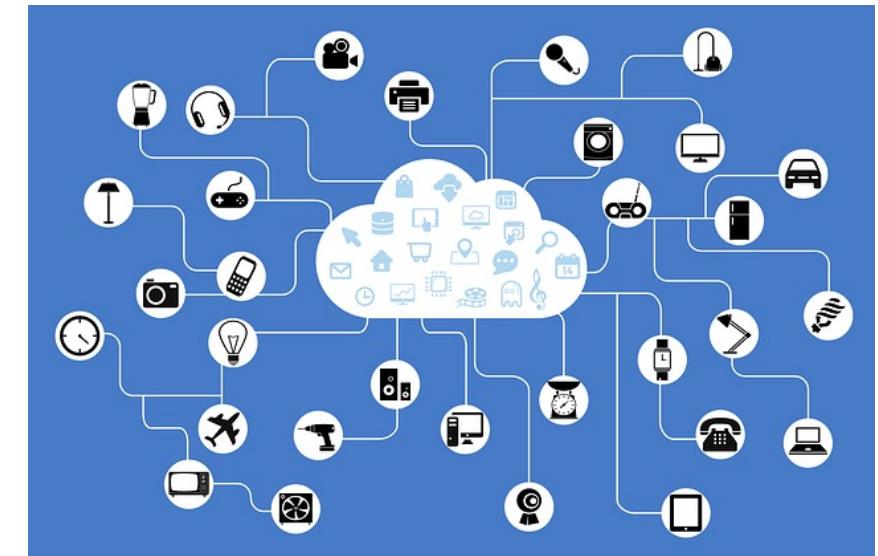
**Digitalization**  
how digitization  
changes social life  
(business models, social interactions,  
communication, learning...)



**Digital  
transformation**  
organizations embrace  
digitalization  
(e-learning, e-government,  
smart cities, smart factories)

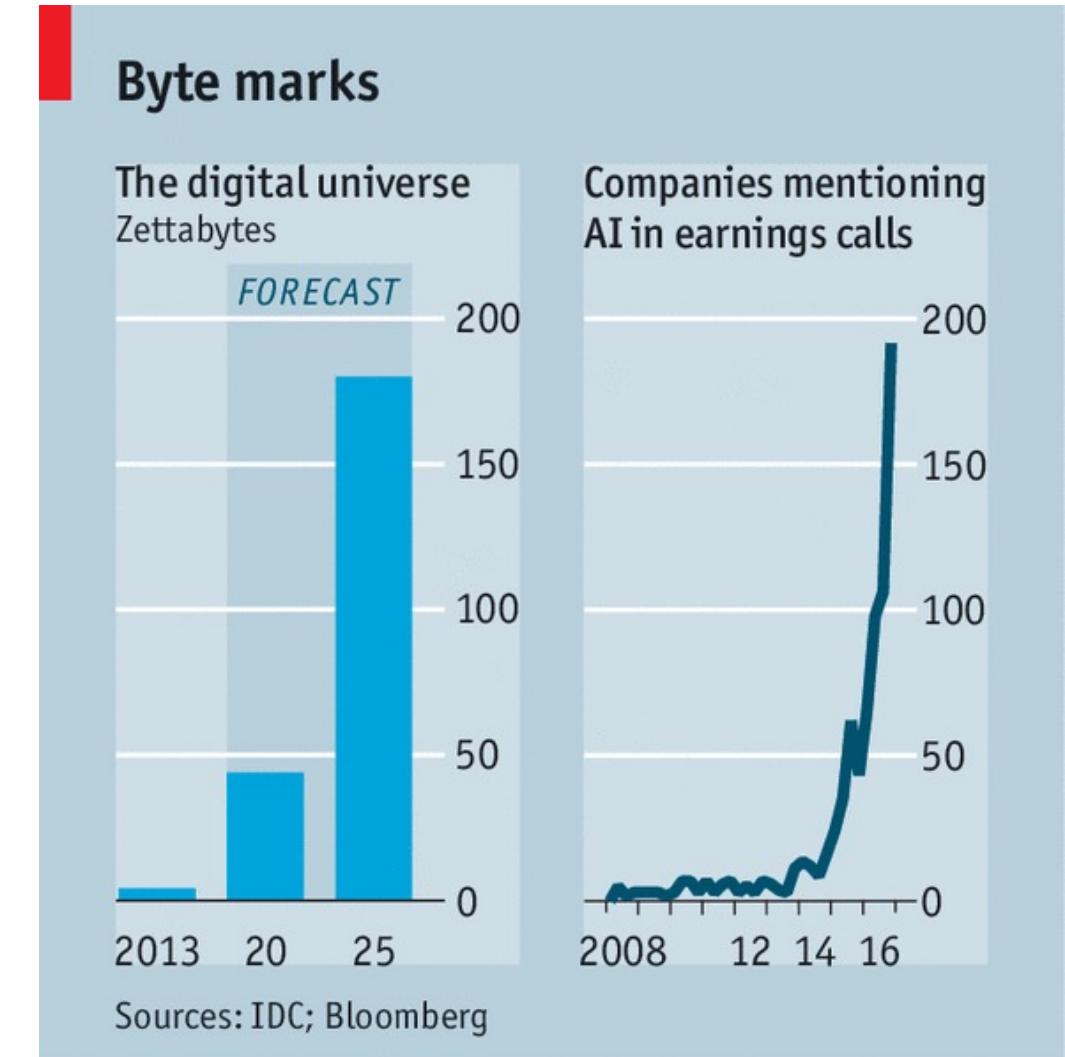
# The age of datafication

**Datafication:** growth of human  
expressions and interactions readily  
converted and stored as **data**



# The age of datafication

**90% of all data created  
in the past two years**



Economist.com

# An algorithmic "habitat"

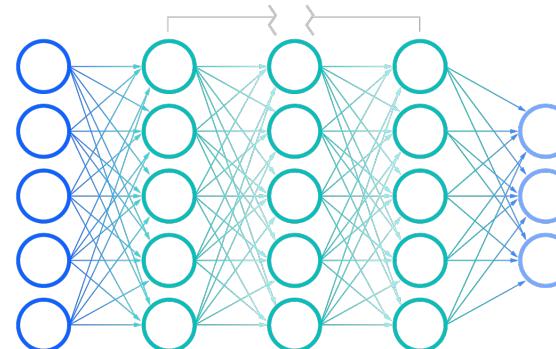
# Input

# Datafication



## Methods

ML & A



## Tools

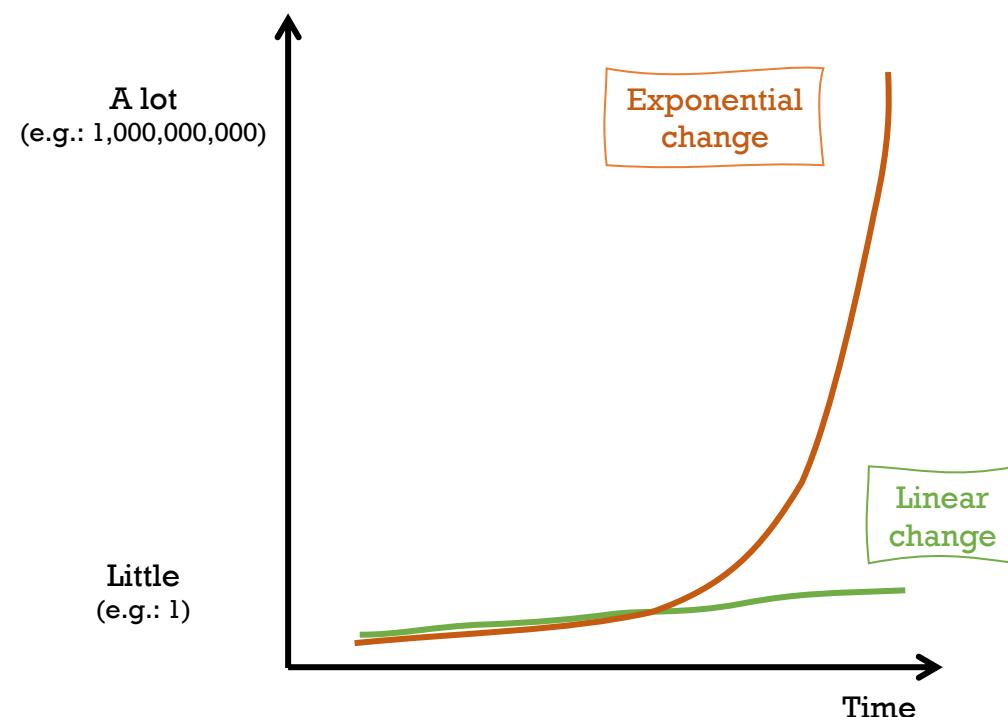
# Coding and computing



# The speed of change

*"The number of transistors in a dense integrated circuit doubles every two years"*

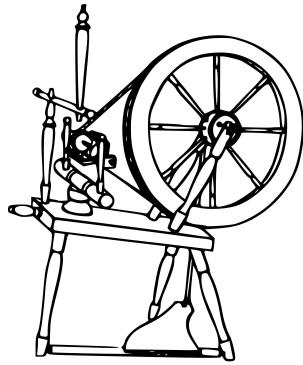
Gordon Moore, Intel co-founder, 1965



**Today** the speed of AI is doubling every 3.4 months

**≈55x faster** than Moore's law:  
300,000 times  
between 2015 and 2021

# The fourth industrial revolution



## Proto-industrialization

1770s

mechanized textile production,  
steam engines, factory system



## 2<sup>nd</sup> industrial revolution

1870s

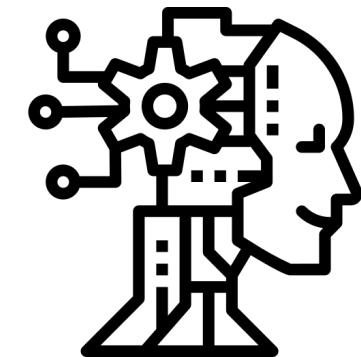
mass production, telegraphy,  
railroad networks, electrical power



## Digital revolution

1970s

digitization, computing  
integrated circuits, PCs, Internet



## Industry 4.0

2010s

AI & **algorithms**, cloud computing,  
IoT, blockchain

# Ending... employment?

salaried  
working  
contracts

outsourced  
digital  
services



Order translation from freelance translators

Order instantly from our tested pool of 21,000 translators.

[LEARN MORE](#)

OR

Join our translation team

[BECOME A TRANSLATOR](#)

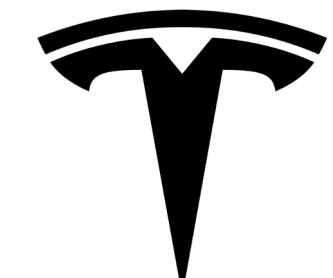
A screenshot of a website interface for translation services, showing options to either order translations from a pool of 21,000 translators or to join their translation team.

# Ending... work?

professional  
services

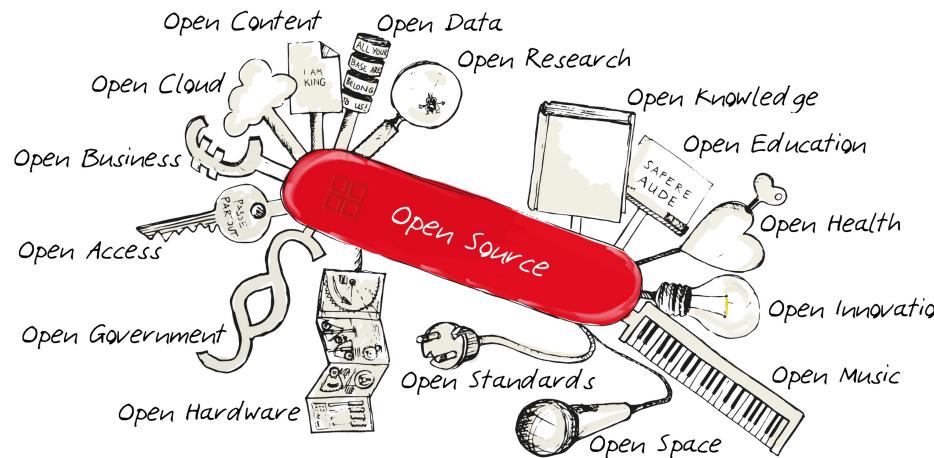


automated  
digital  
services



T E S L A

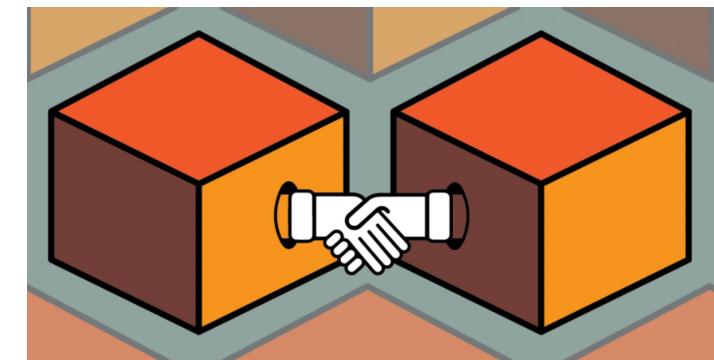
# Ending... property? currencies? states?



Free non-rival goods

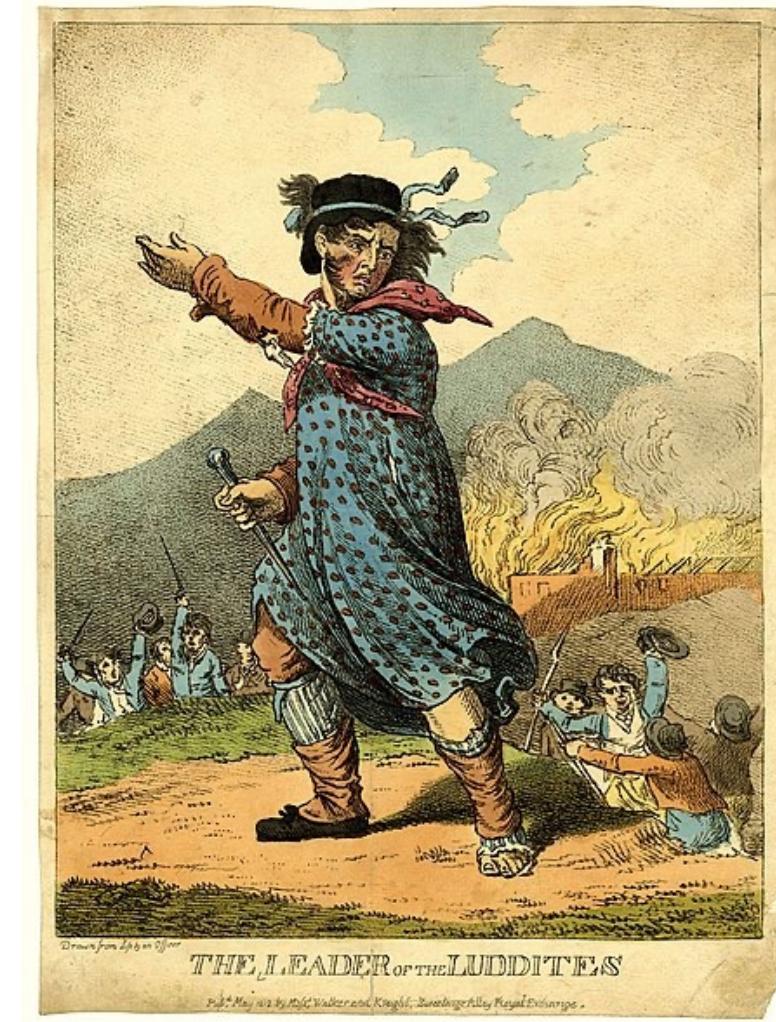
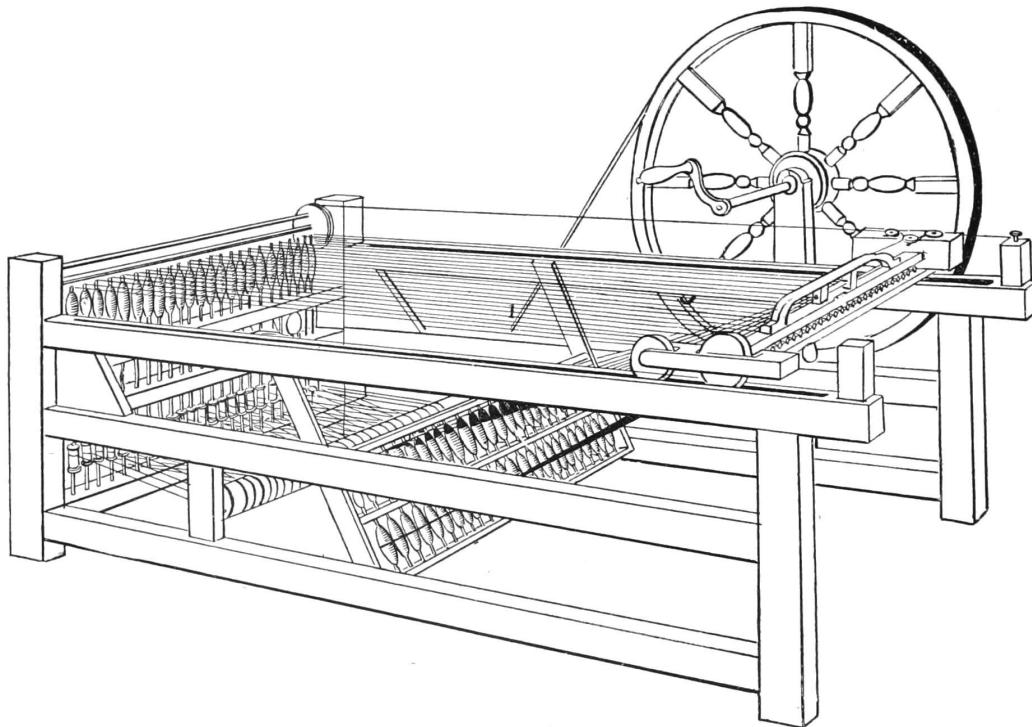


Crypto



Smart contracts,  
AI legal personhood

# Nothing new under the sun

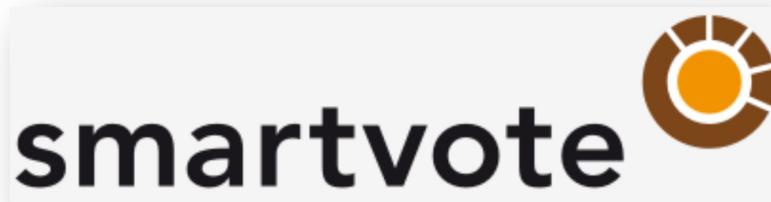


# Nothing new under the sun



# Do algorithms impact democracy? How?

# Some do... and it's good !



Matching algorithm providing  
personalized voting advice

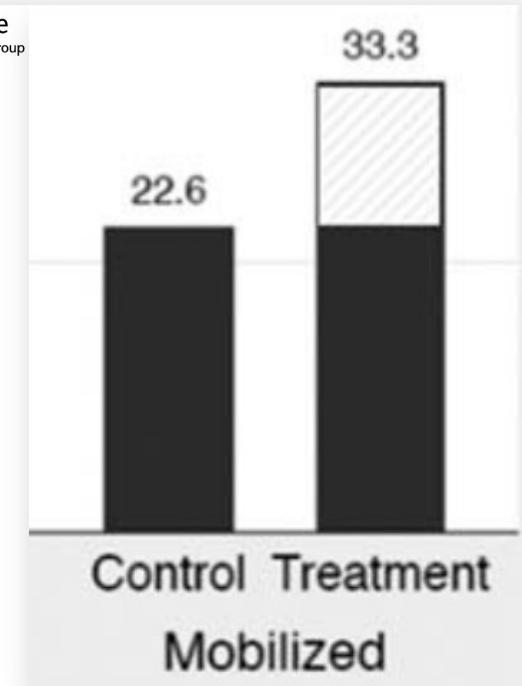
*Political Communication*, 34:424–443, 2017  
Copyright © Taylor & Francis Group, LLC  
ISSN: 1058-4609 print / 1091-7675 online  
DOI: 10.1080/10584609.2016.1267053

Routledge  
Taylor & Francis Group

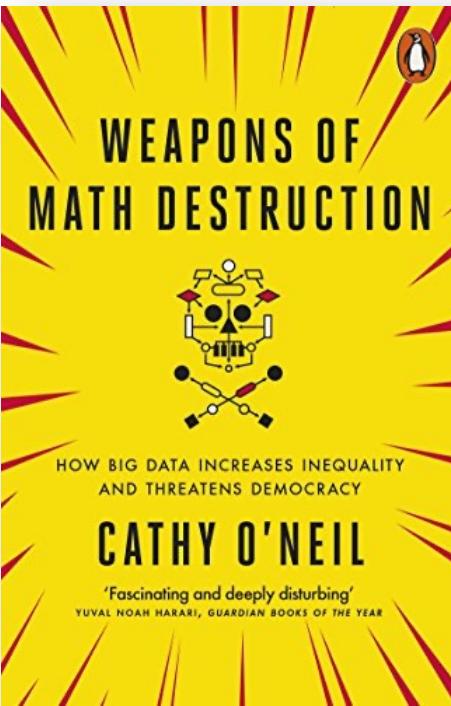
## Voting Advice Applications and Electoral Participation: A Multi-Method Study

DIEGO GARZIA, ALEXANDER H. TRECHSEL,  
and ANDREA DE ANGELIS

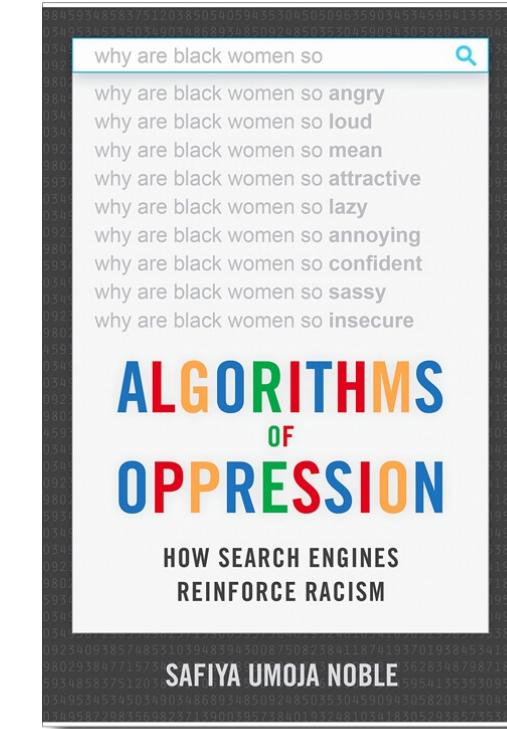
*Voting Advice Applications (VAAs) help users casting a vote by offering an explicit ranking of viable options. The wide amount of readily available information provided by VAAs to users has been shown to contribute to reducing the transactional costs involved in gathering relevant political information. Available evidence also supports the idea that VAA users are more likely to cast a ballot in elections as a result. The extent to which electoral participation is caused by using a VAA, however, remains unclear. Against this background, we reassess the mobilizing effect of VAAs by means of a multi-method approach. Our cross-sectional analysis of 12 national election study data sets provides further support to the idea that VAA usage increases users' chances of casting a ballot in elections as compared to non-users. This conclusion is strengthened by the results of a randomized field experiment conducted in the context of the 2013 Italian parliamentary election.*



# Others do and... can be bad !



Microtargeting: political attention towards few pivotal voters, while the majority is ignored



As algorithms learn from human data, they also learn human biases and prejudices related to gender, race, age, or nationality

**Algorithms should undergo audits and social impact assessments to eliminate human bias.**

POLITICAL SCIENCE

## Exposure to ideologically diverse news and opinion on Facebook

Eytan Bakshy,<sup>1\*</sup>† Solomon Messing,<sup>1†</sup> Lada A. Adamic<sup>1,2</sup>

Exposure to news, opinion, and civic information increasingly occurs through social media. How do these online networks influence exposure to perspectives that cut across ideological lines? Using deidentified data, we examined how 10.1 million U.S. Facebook users interact with socially shared news. We directly measured ideological homophily in friend networks and examined the extent to which heterogeneous friends could potentially expose individuals to cross-cutting content. We then quantified the extent to which individuals encounter comparatively more or less diverse content while interacting via Facebook's algorithmically ranked News Feed and further studied users' choices to click through to ideologically discordant content. Compared with algorithmic ranking, individuals' choices played a stronger role in limiting exposure to cross-cutting content.



**2016 filter bubble accusations.  
Facebook changes its algorithm to avoid fake news.**

**The algorithm is the news editor and Facebook did not think of this as a problem:  
"we are not a media company"**

# By the way...

## Affiliations

[Collapse All](#)

Eytan Bakshy <sup>\*, †</sup> 



Facebook, Menlo Park, CA 94025, USA.

[View all articles by this author](#)

Solomon Messing <sup>†</sup>



Facebook, Menlo Park, CA 94025, USA.

[View all articles by this author](#)

Lada A. Adamic



Facebook, Menlo Park, CA 94025, USA.

School of Information, University of Michigan, Ann Arbor, MI, USA.

[View all articles by this author](#)

**2018:** Cambridge Analytica scandal disclosed.  
Facebook under attack. \$5bl. fine from Federal  
Trade Commission for privacy violations.

Demands for a new **change in the algorithm**  
amid evidence linking to depression.

That's when Facebook decided to change its goal  
from helping people find "good content" to help  
them develop "**Meaningful Social Interactions**"  
with family and friends.

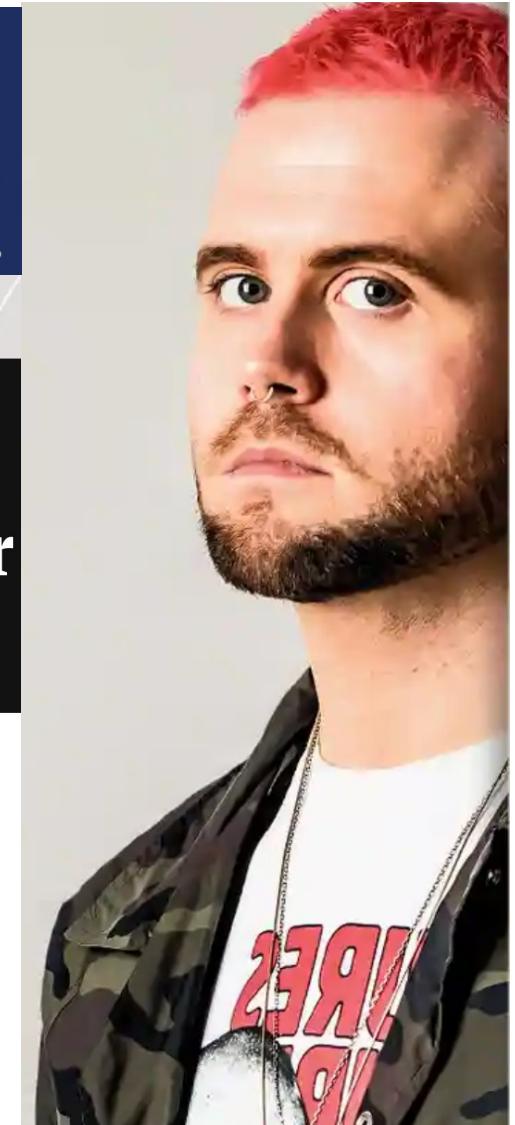
The Guardian

 The Cambridge Analytica Files

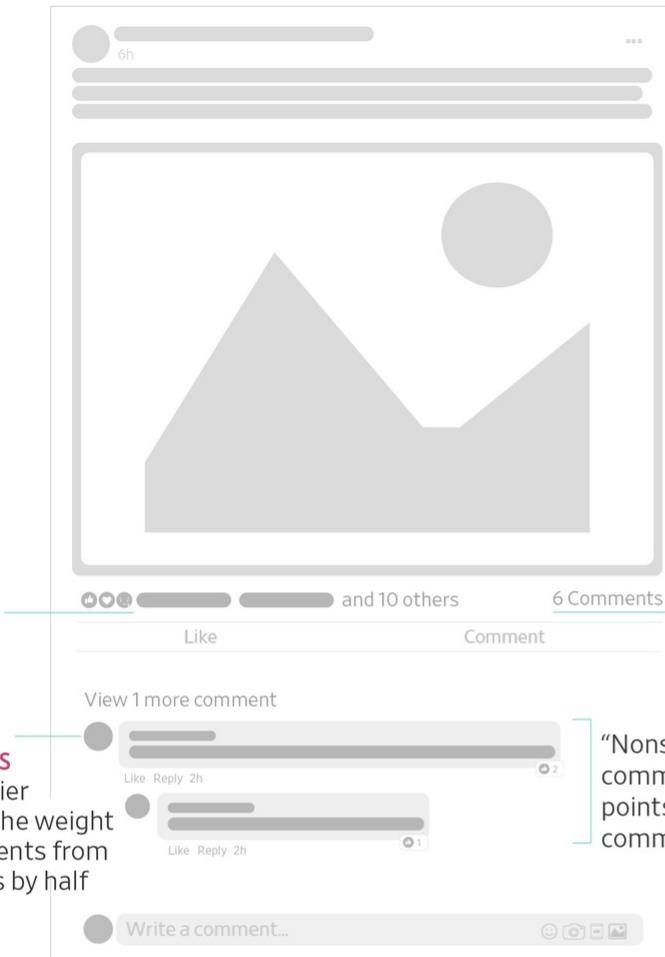
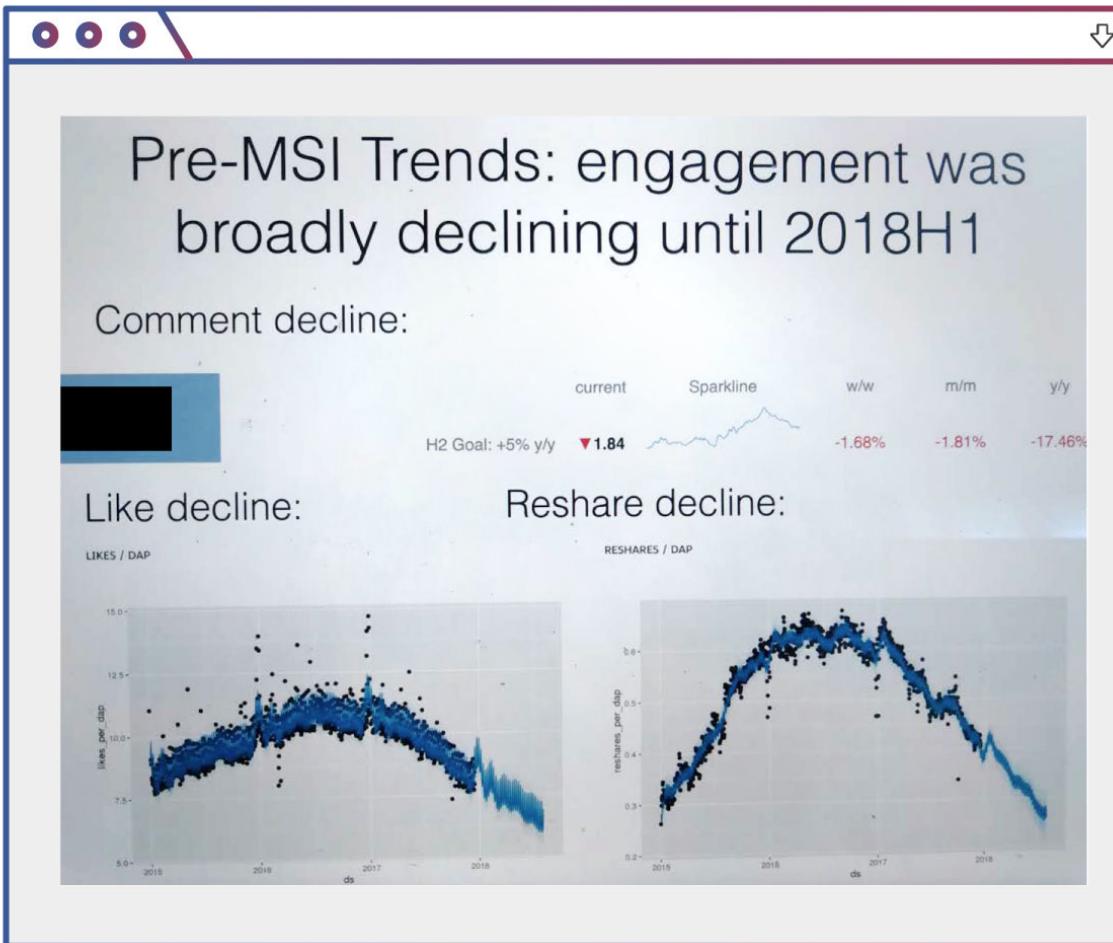
## 'I made Steve Bannon's psychological warfare tool': meet the data war whistleblower

For more than a year we've been investigating Cambridge Analytica and its links to the Brexit Leave campaign in the UK and Team Trump in the US presidential election. Now, 28-year-old Christopher Wylie goes on the record to discuss his role in hijacking the profiles of millions of Facebook users in order to target the US electorate

by [Carole Cadwalladr](#)



## The 2018 algorithm change



# THE WALL STREET JOURNAL.

the facebook files

## Facebook Tried to Make Its Platform a Healthier Place. It Got Angrier Instead.

Internal memos show how a big 2018 change rewarded outrage and that CEO Mark Zuckerberg resisted proposed fixes



### April 2019 Facebook internal report "Political Party Response to 2018 Algorithm Change"

"In Poland, the changes made political debate on the platform nastier: one party's social media management team estimates that they have shifted the proportion of their posts from 50% positive / 50% negative to 80% negative, explicitly as a function of the change to the algorithm. Many parties, including those that have shifted to the negative, worry about the long-term effects on democracy."



Elon Musk

@elonmusk

...

🚀⭐️❤️ Yesss!!! ❤️⭐️🚀

"Free speech is the bedrock of a functioning democracy, and Twitter is the digital town square where matters vital to the future of humanity are debated," said Mr. Musk. "I also want to make Twitter better than ever by enhancing the product with new features, making the algorithms open source to increase trust, defeating the spam bots, and authenticating all humans. Twitter has tremendous potential – I look forward to working with the company and the community of users to unlock it."

9:43 PM · 25 apr 2022 · Twitter for iPhone

307.432 Retweet 55.904 Tweet di citazione 2 Mln Mi piace

# Anecdotes are not evidence

A lot of anecdotes on the political consequences of algorithms...

...but scientific evidence is scarce.

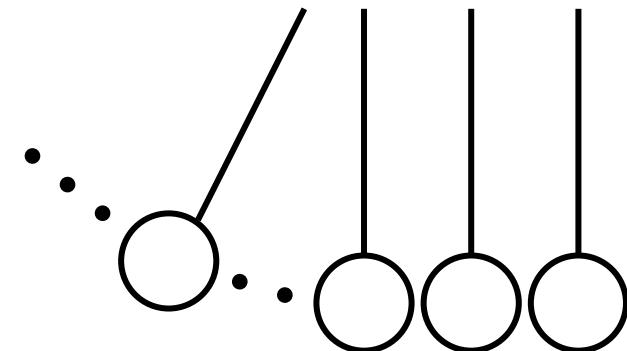


Lack of data access



Conceptual confusion

- exposure ≠ consumption
- algorithm ≠ network homophily



Few causal identification designs  
(algorithmic recommendations endogenous)

# Algorithmic Newsfeeds in the Swiss COVID-19 Referendum Vote



Alexander Trechsel



Andrea De Angelis



Alessandro Vecchiato

**Exposure to diverse viewpoints is the essence of democratic process**



# Hardly true for voters



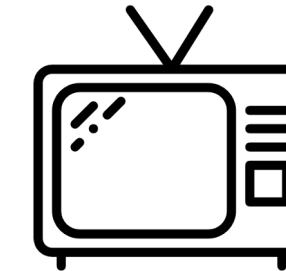
## Network homophily

McPherson, Smith-Lovin, Cook 2001



## Partisan Newspapers

Gentzkow, Shapiro 2010;  
Gentzkow, Gleaser, Goldin, 2006



## Cable Television

DellaVigna, Kaplan 2006;  
Martin, Yurukoglu 2018

# With algorithmic newsfeeds the problem got worse



SPEED

QUANTITY

PRECISION



# Research questions

Is algorithmic personalization causing **pro-attitudinal news consumption**?

---

Is algorithmic personalization affecting **beliefs, voting and turnout**?

---

# Swiss Referendum • June 2021



Posters for the campaign to eliminate pesticides, Source: New York Times

## 5 Objects

1. Clean water
2. Pesticides ban
3. COVID-19 restrictions
4. CO2 law
5. Anti-terrorism law

# Field experiment step-by-step



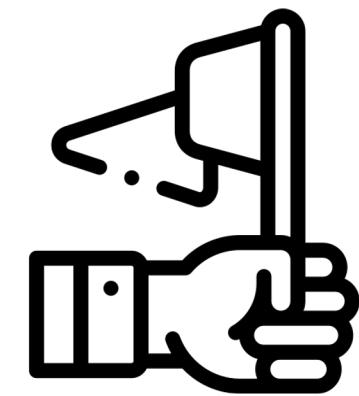
Consumption



Beliefs

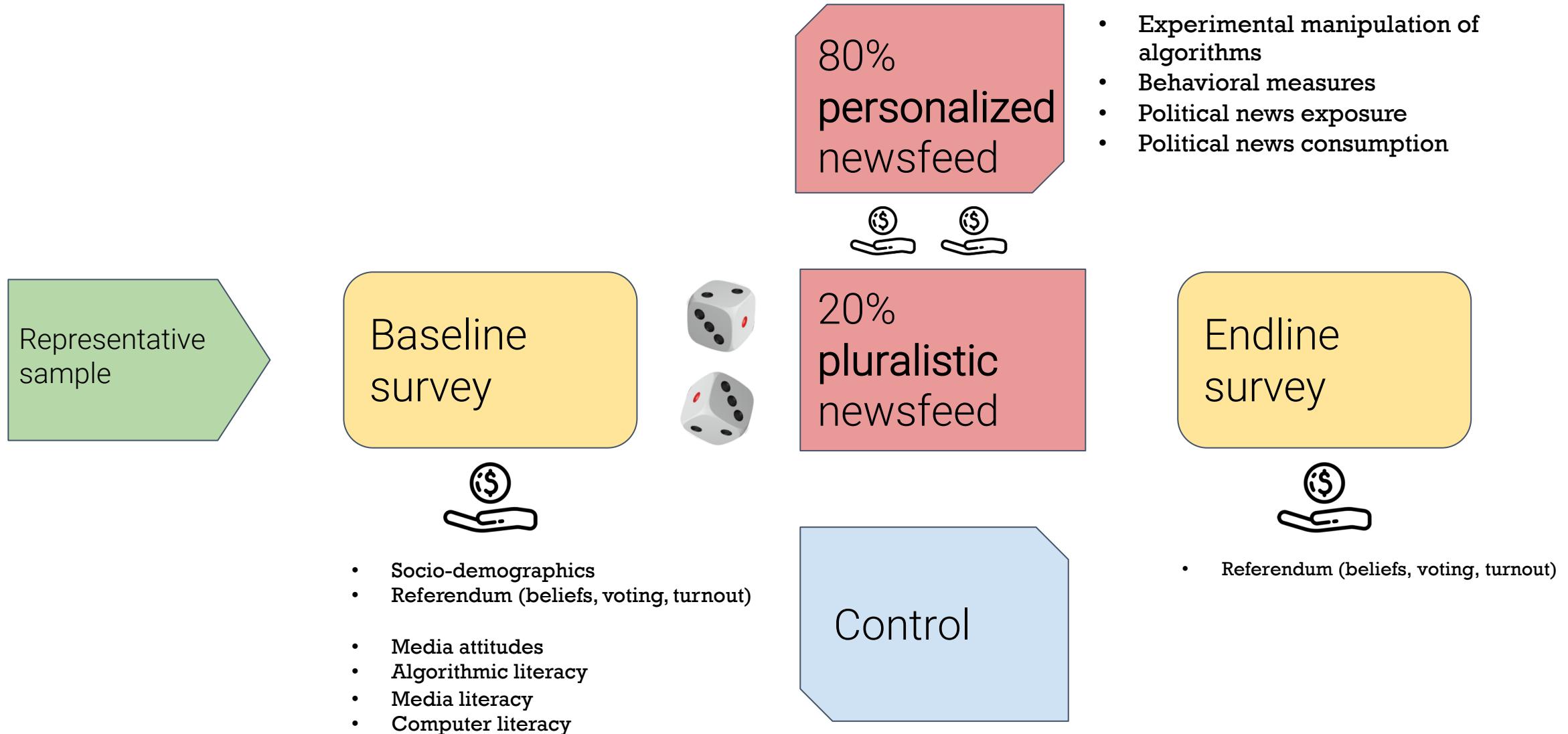


Turnout



Choice

# Research design



# Dossier app



The screenshot shows a news feed with five articles. Each article card includes a title, author/source, date, and two interaction icons (Bookmark and Like). The articles are:

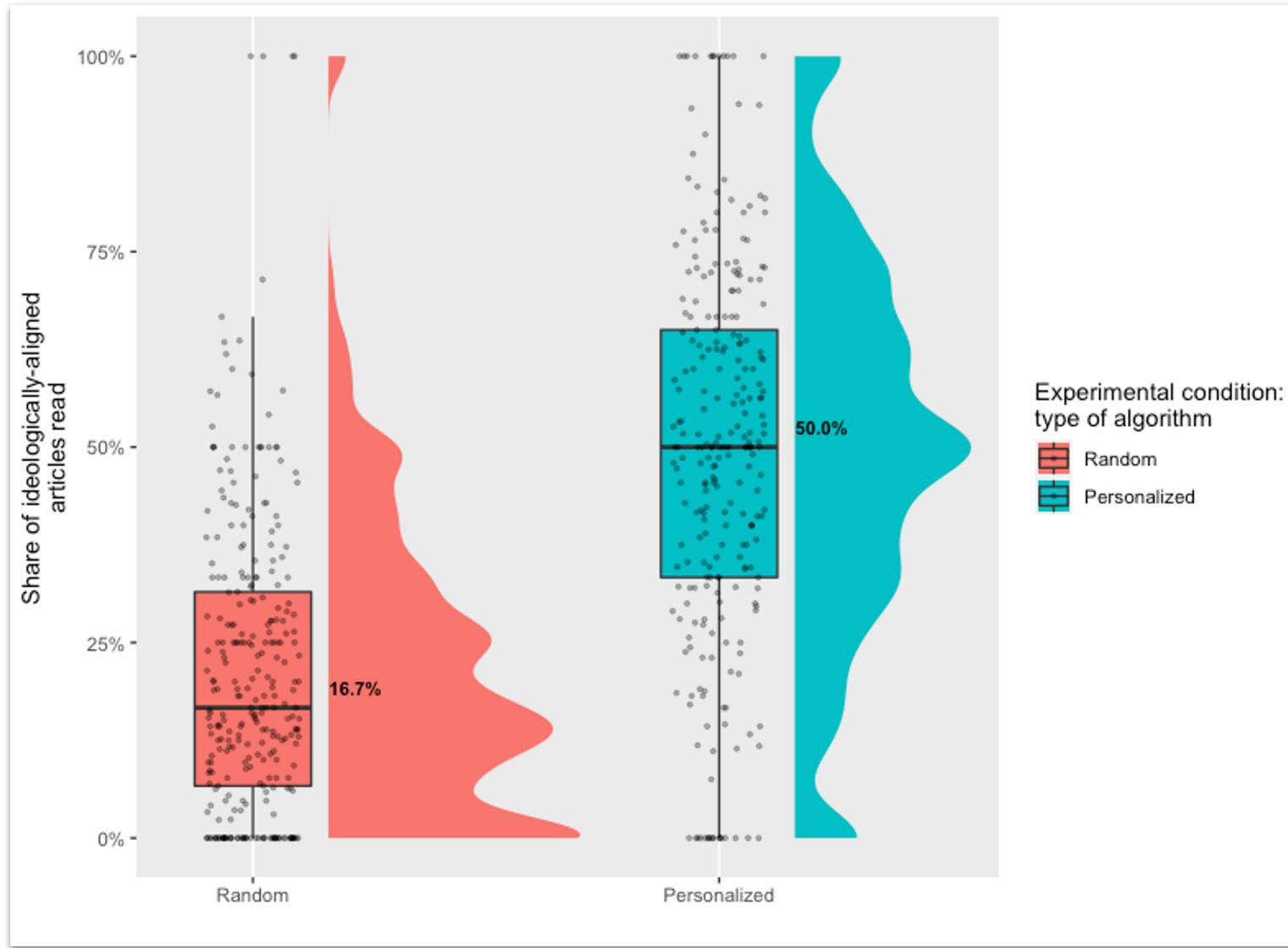
- Pia Zanetti, soixante ans de photo pour voir le monde tel qu'il est: pas toujours beau (Le Temps, 11/05/2021)
- Eric Zemmour : « La guerre civile a déjà commencé. Lorsqu'on égorgue un professeur dans la rue, cela s'appelle comment ? » (Les Observateurs, 11/05/2021)
- «On visite le château de Chillon sans en retenir l'histoire» (20 Minuten Front Page, 12/05/2021)
- Les résultats étonnantes de l'économie polonaise (Les Observateurs, 09/05/2021)
- Renseignement, franc-maçonnerie : démantèlement d'une incroyable officine criminelle

The screenshot shows the main menu of the Dossier app. It includes options for Home, Progress, Saved articles, and Logout, each with a corresponding icon.

- We **programmed** and **randomized** a personalizing algorithm and a pluralistic algorithm
- **Behavioral measures** of news exposure and consumption (reading time, likes, saves)
- Infinite-scroll news feed
- Sources across the political spectrum

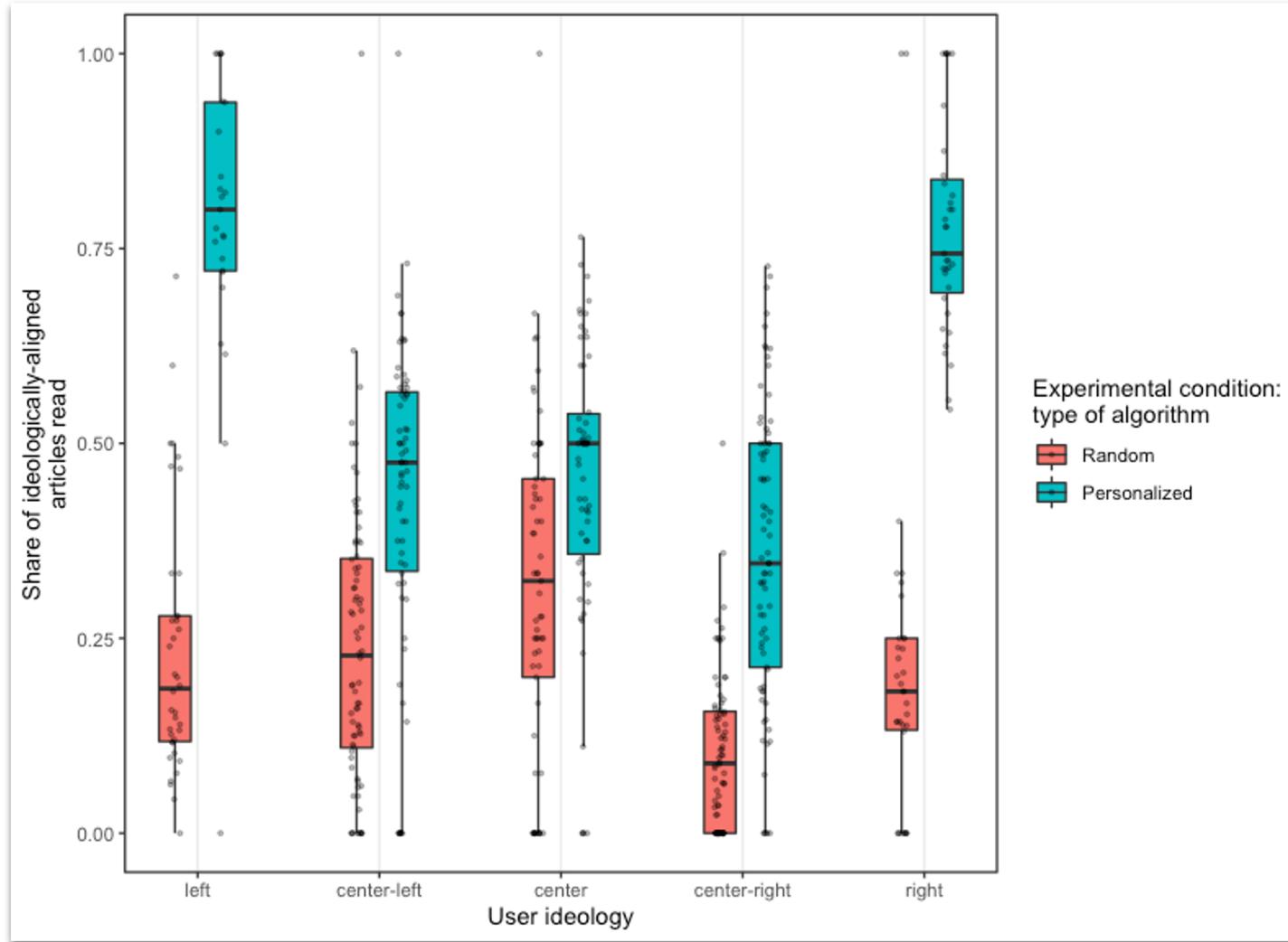
**Usage time:** at least 10 minutes per week during one month (incentivized)

# Results: news consumption



# Results: news consumption

Ideology moderates the effect of algorithmic personalization



# Other results

Beliefs



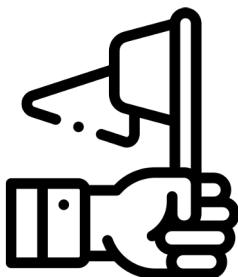
Personalized algorithm reinforces prior political arguments (small effect)

Turnout



Personalized algorithm demobilized those who had reported intention of "probably not" turn out (large effect)

Choice



Personalized algorithm made no difference in terms of voting patterns on average (but reinforcing effect for "Clean Drinking Water" and "CO2 Law")

# Limitations (?!)

1. Our algorithm is very simple
2. Our algorithm was used little time ( $\approx 10$  min / week)
3. Our algorithm was used only during one month

# Implications

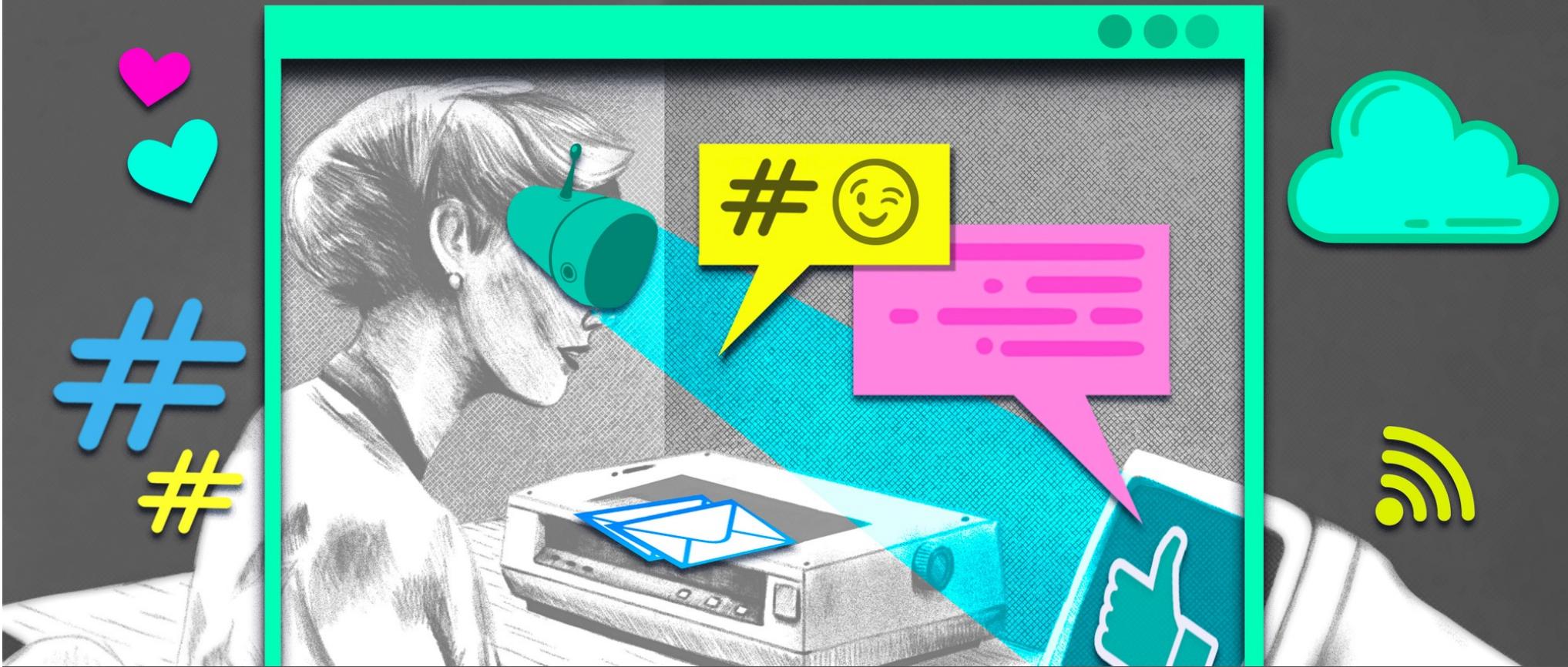
- **Algorithms are powerful:** they can strengthen or threaten democracy
- Need to move **beyond target metrics of engagement**
  - addiction and mental health problems
  - audits and social impact assessment
- **The challenge of algorithmic literacy:** raise awareness about how algorithms influence our digital experiences
- Re-design algorithmic **science & research:**
  - Regulation towards algorithmic transparency
  - Data access

# Instant poll !



# DIGITALER WANDEL

FRÜHJAHSSEMESTER 2022



# How much do Swiss people use algorithms?

## How frequently do you receive political news on the following social and digital media?

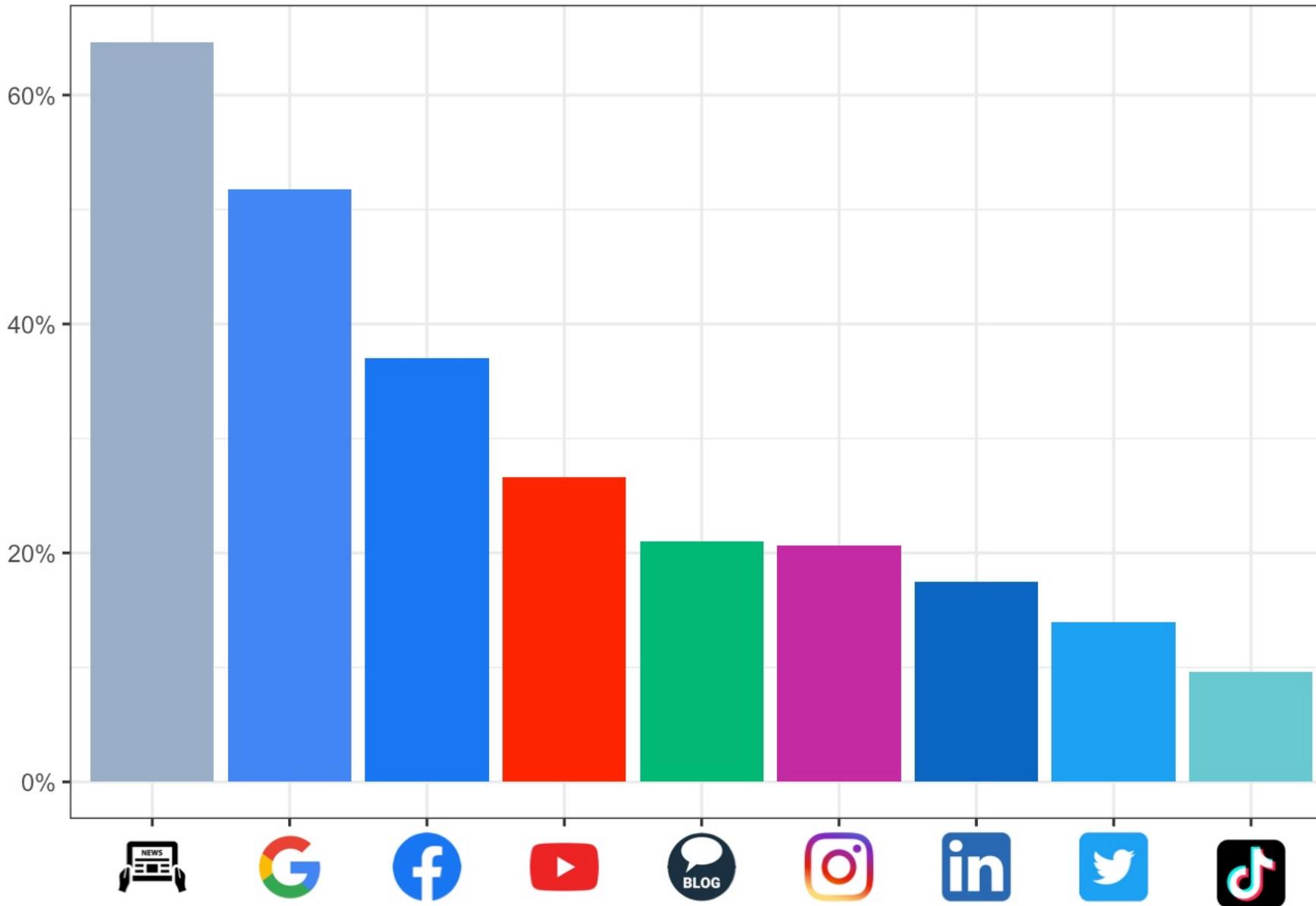
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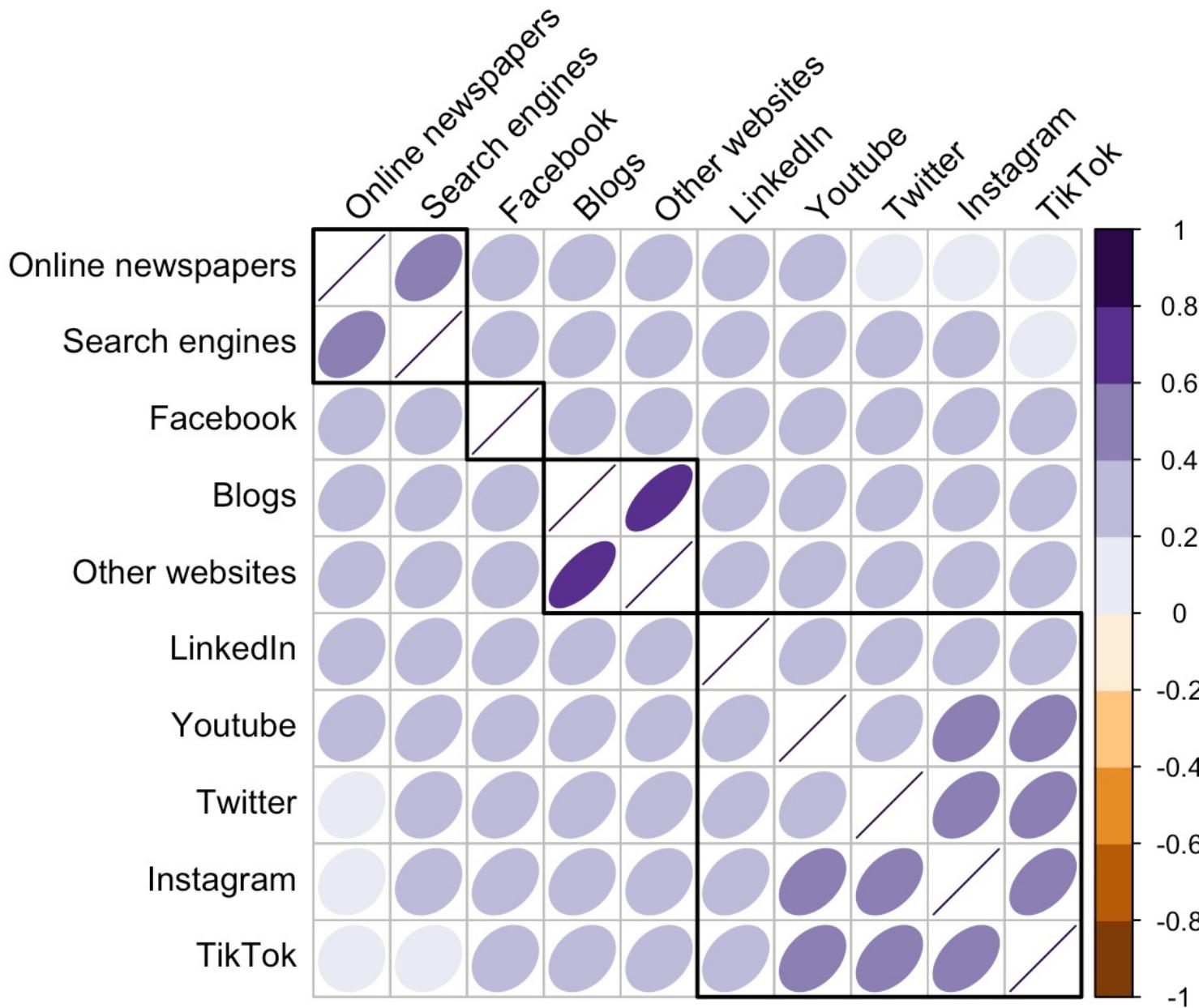
- 1 Facebook
- 2 Twitter
- 3 Instagram
- 4 TikTok
- 5 YouTube
- 6 LinkedIn
- 7 Online newspapers
- 8 Search engines (e.g. Google or Bing)
- 9 Online political blogs

### Answer categories

- Never
- Less than once a week
- At least once a week
- Almost every day
- Every day
- More than once a day

## Political news on digital media: % once a week or more

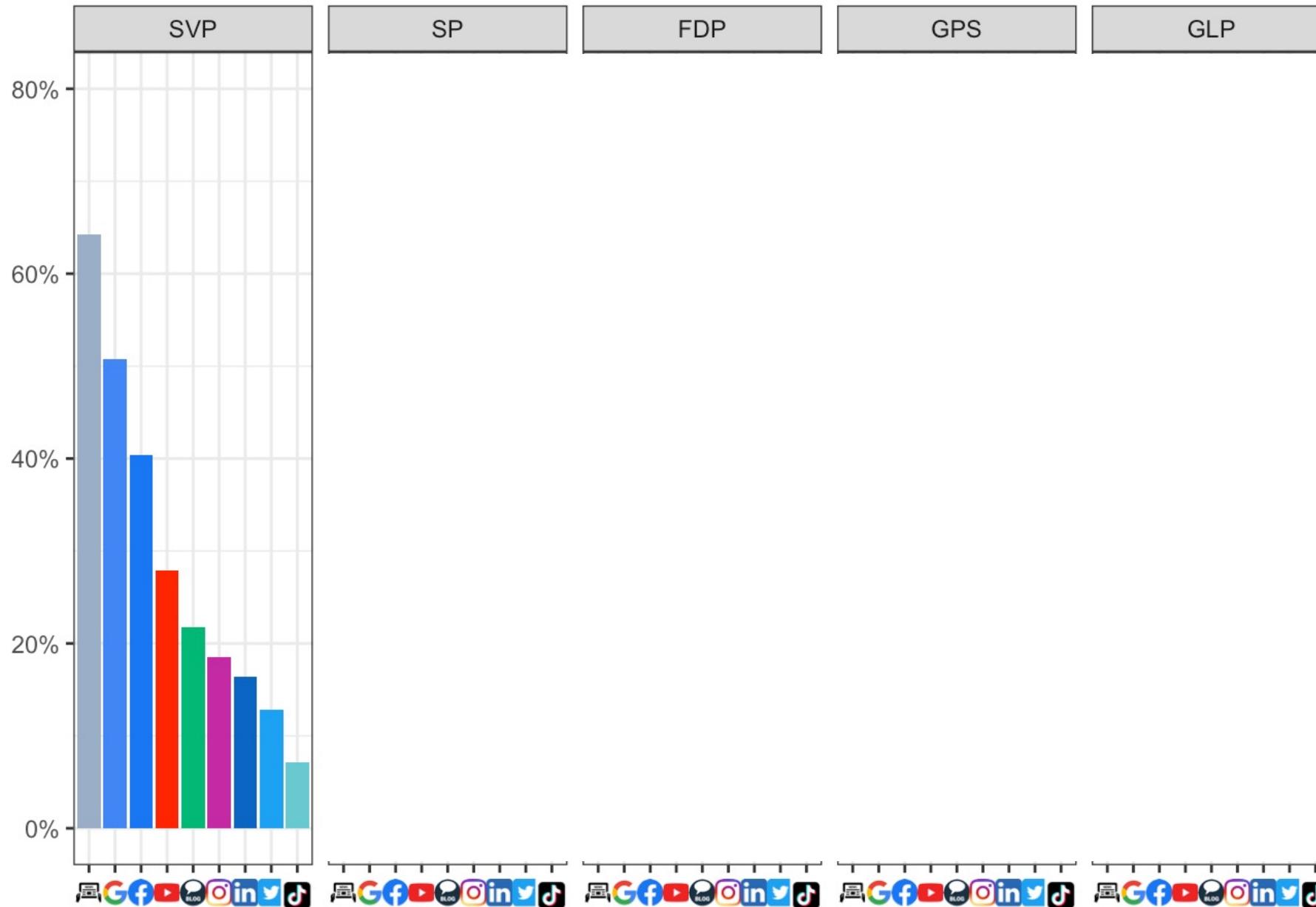




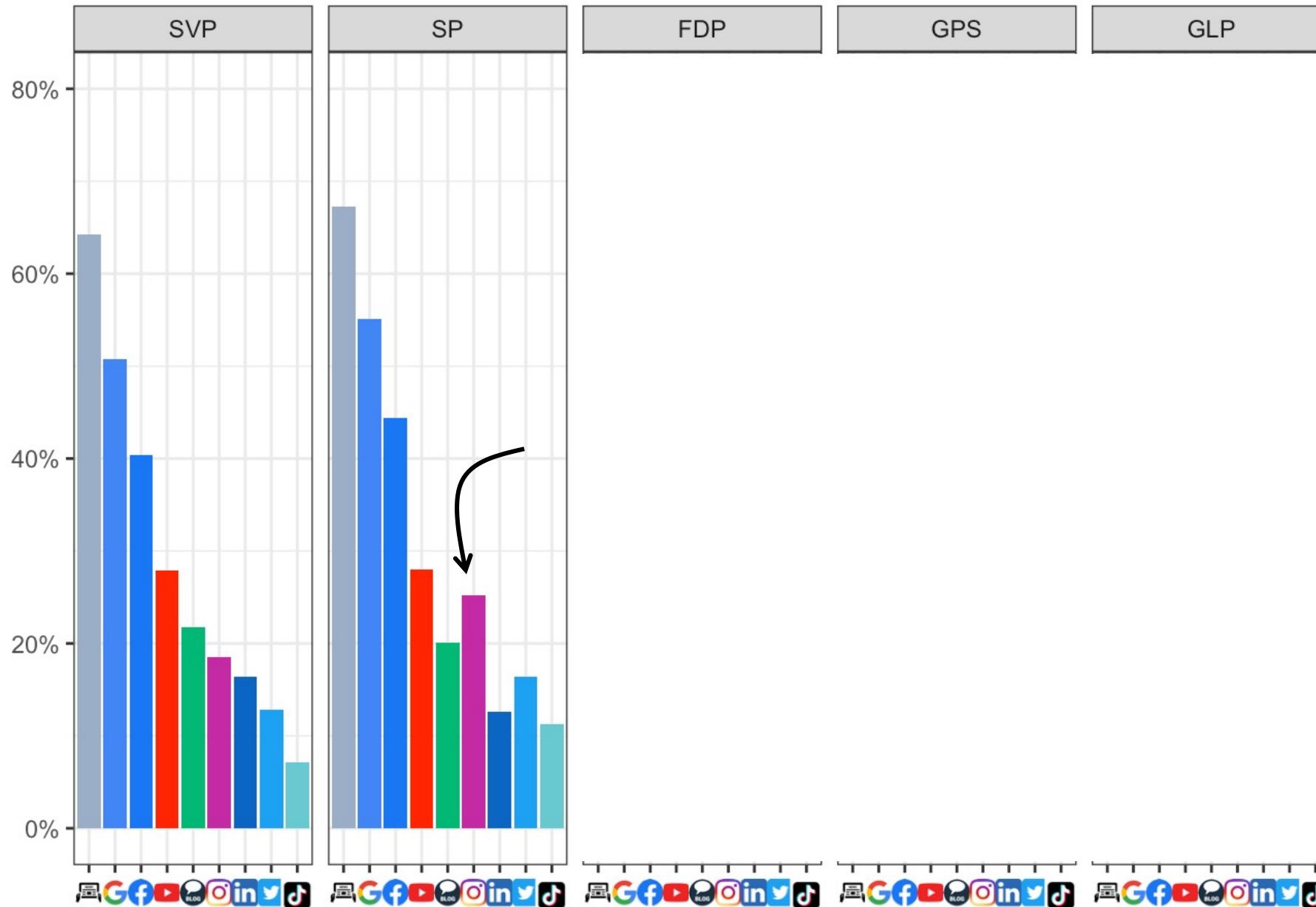
## Political news on digital media: % once a week or more



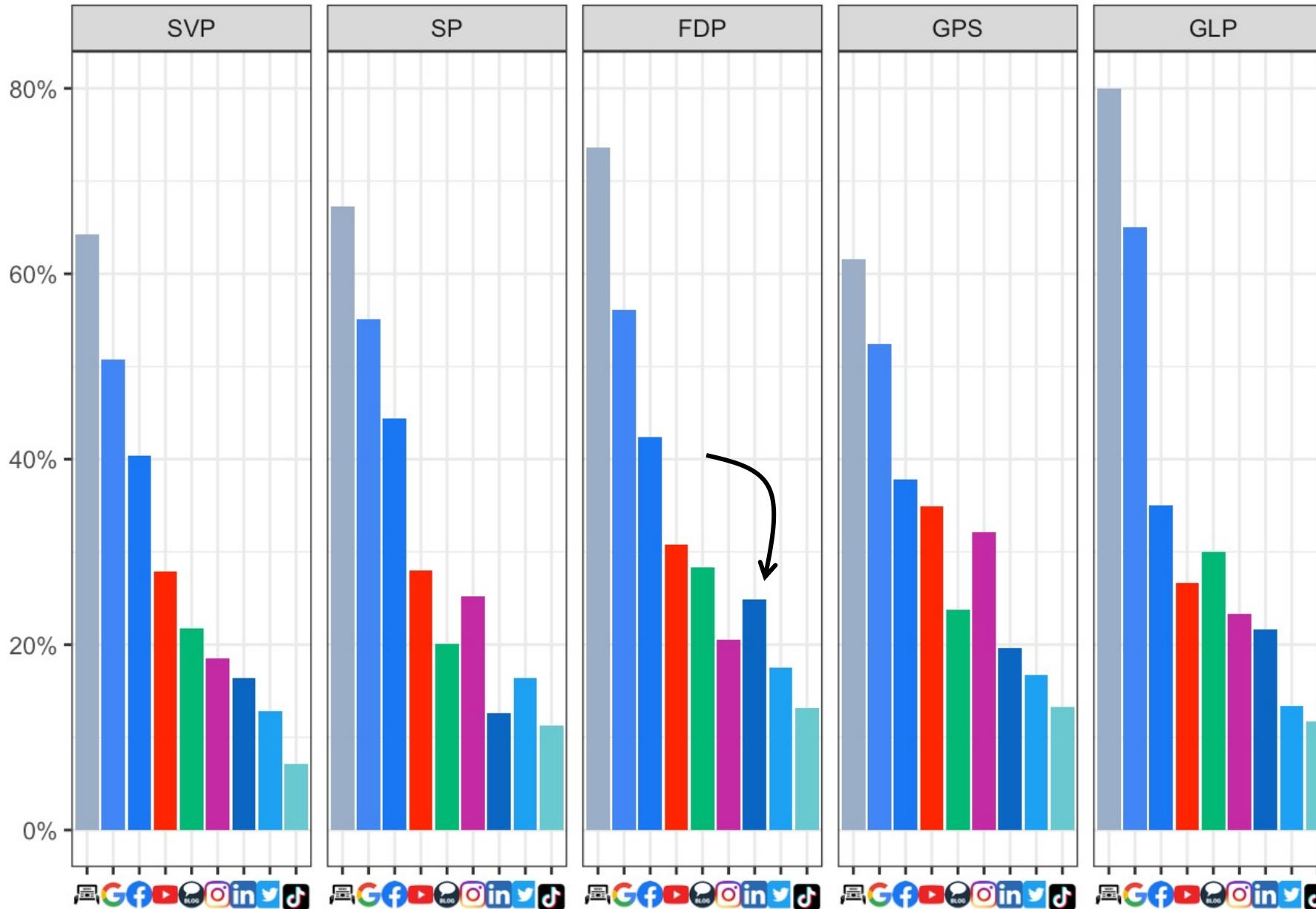
## Political news on digital media: % once a week or more



## Political news on digital media: % once a week or more



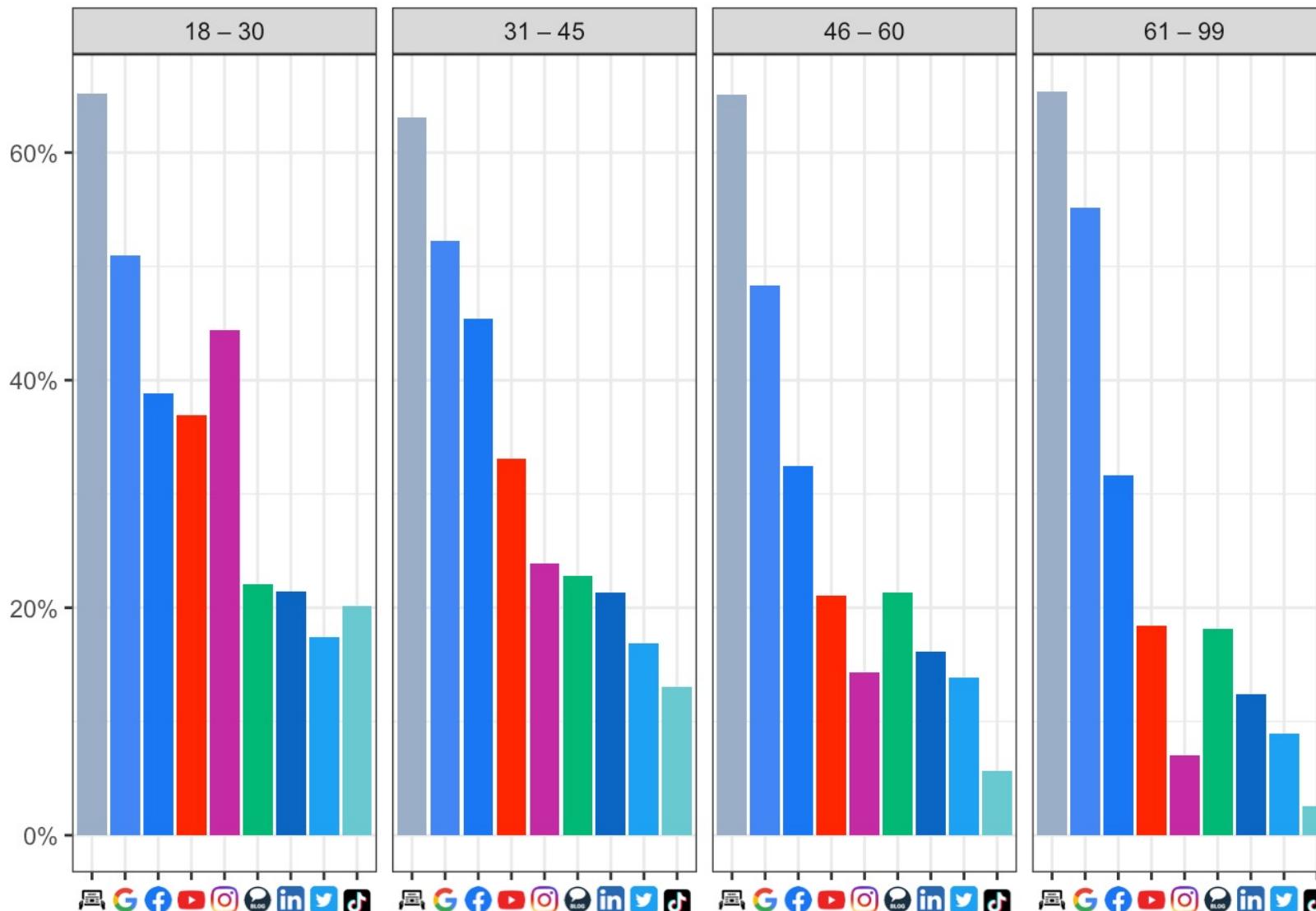
## Political news on digital media: % once a week or more



## Political news on digital media: % once a week or more

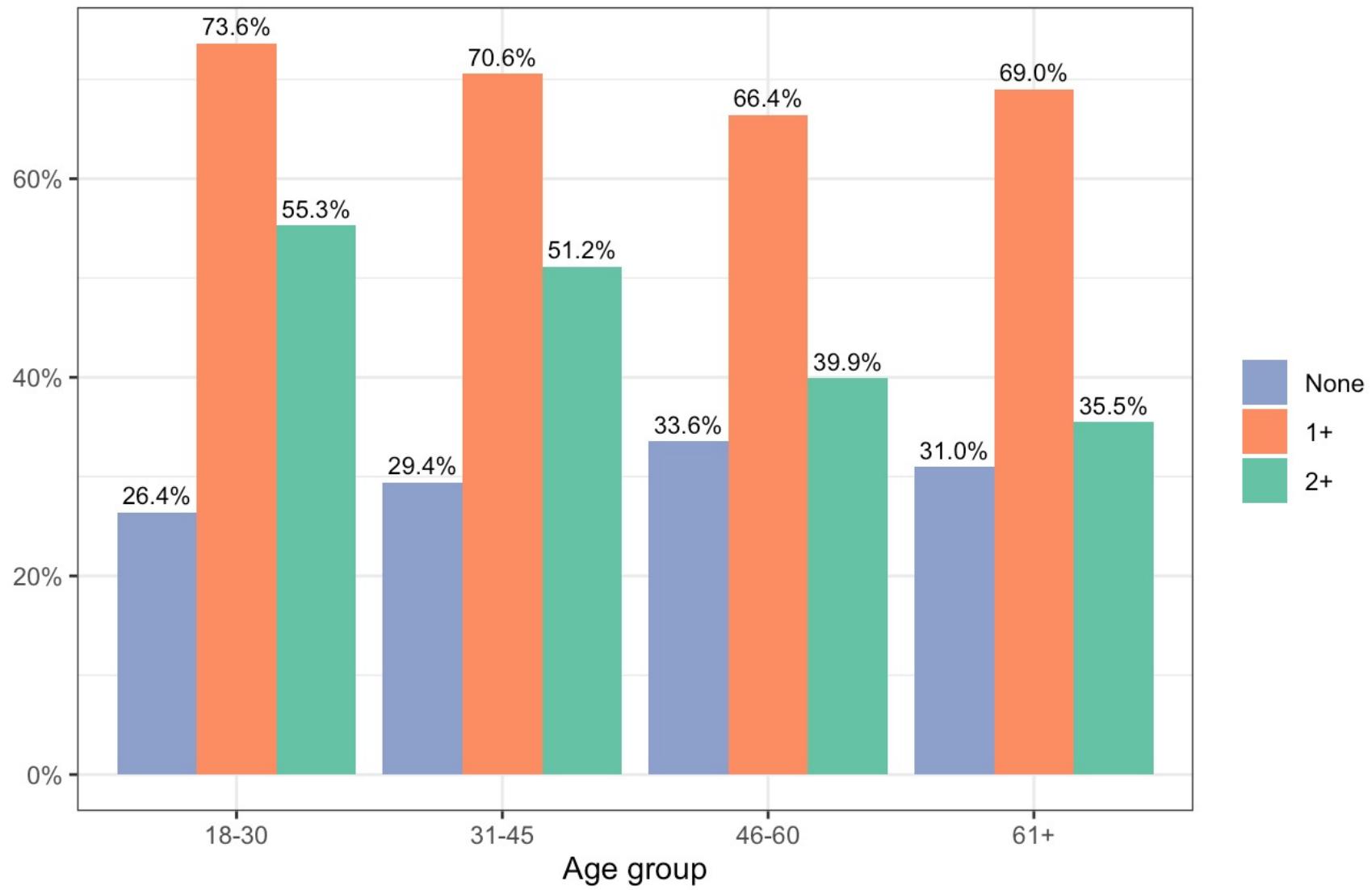


## Political news on digital media: % once a week or more



## Using algorithmic news sources for political news at least once per week

In all age groups  
the majority of people  
uses algorithmic news  
sources



SPARK Project data.

Platforms: Facebook, Instagram, Twitter, Tiktok, LinkedIn, YouTube, search engines.

# Do Swiss people know about algorithms?

## 11-item scale of Social Media and Algorithmic Literacy (SMAL)

---

- **Algorithmic awareness:** continuously updating tailor-made recommendations
- **Economic incentives:** awareness of engagement-maximization goals and data usage for targeted ads
- **Political information:** limited validity checks and no guarantee for pluralism

***The political news I see on social media  
depends on my political preferences***

Correct (agree) 45%

Don't know 34%

Incorrect (disagree) 21%

***The political news I see on social media is  
chosen to keep me on the platform***

Correct (agree) 53%

Don't know 27%

Incorrect (disagree) 19%

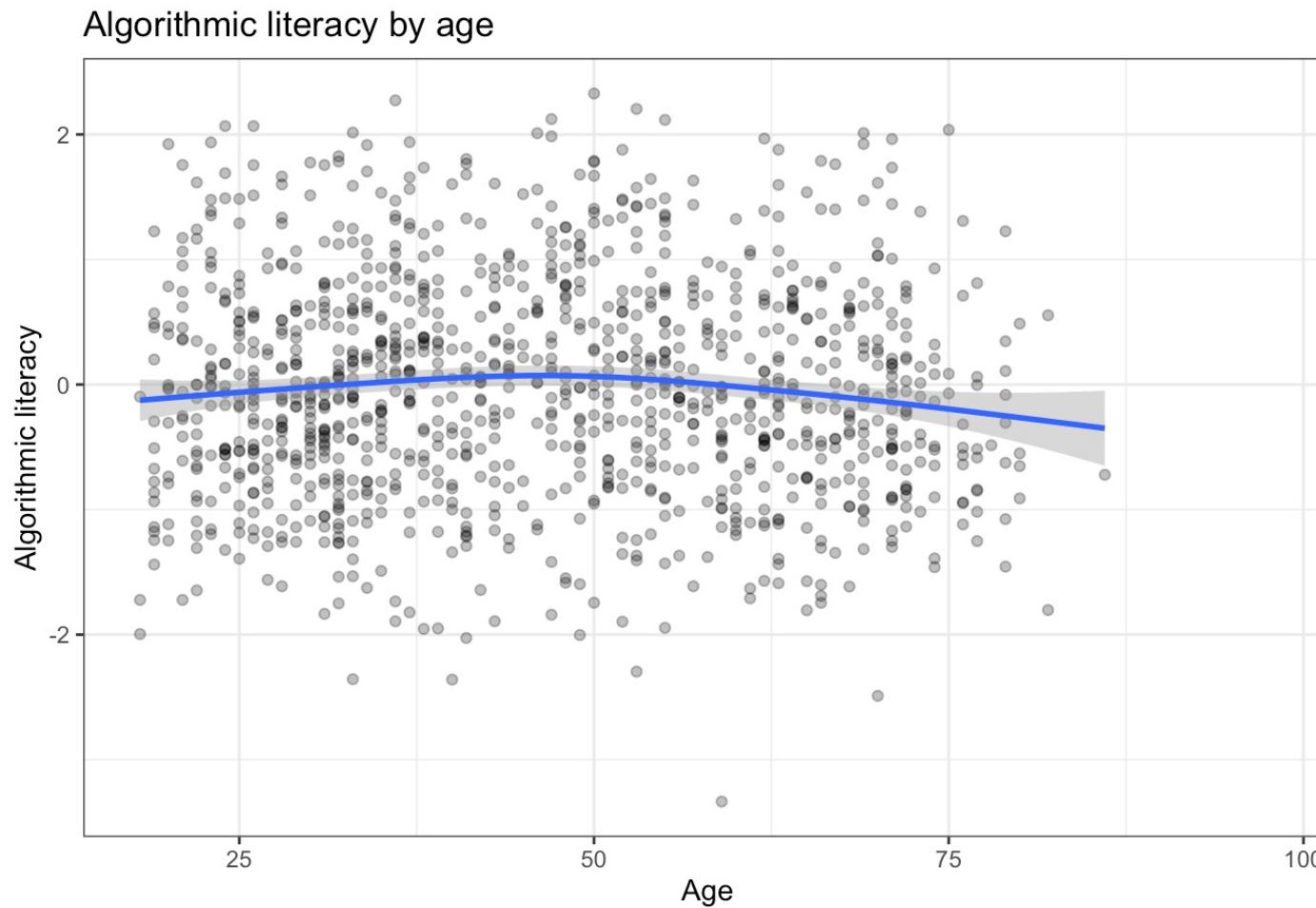
**[False] *Social media try to give me accurate political information***

Correct (disagree) 48%

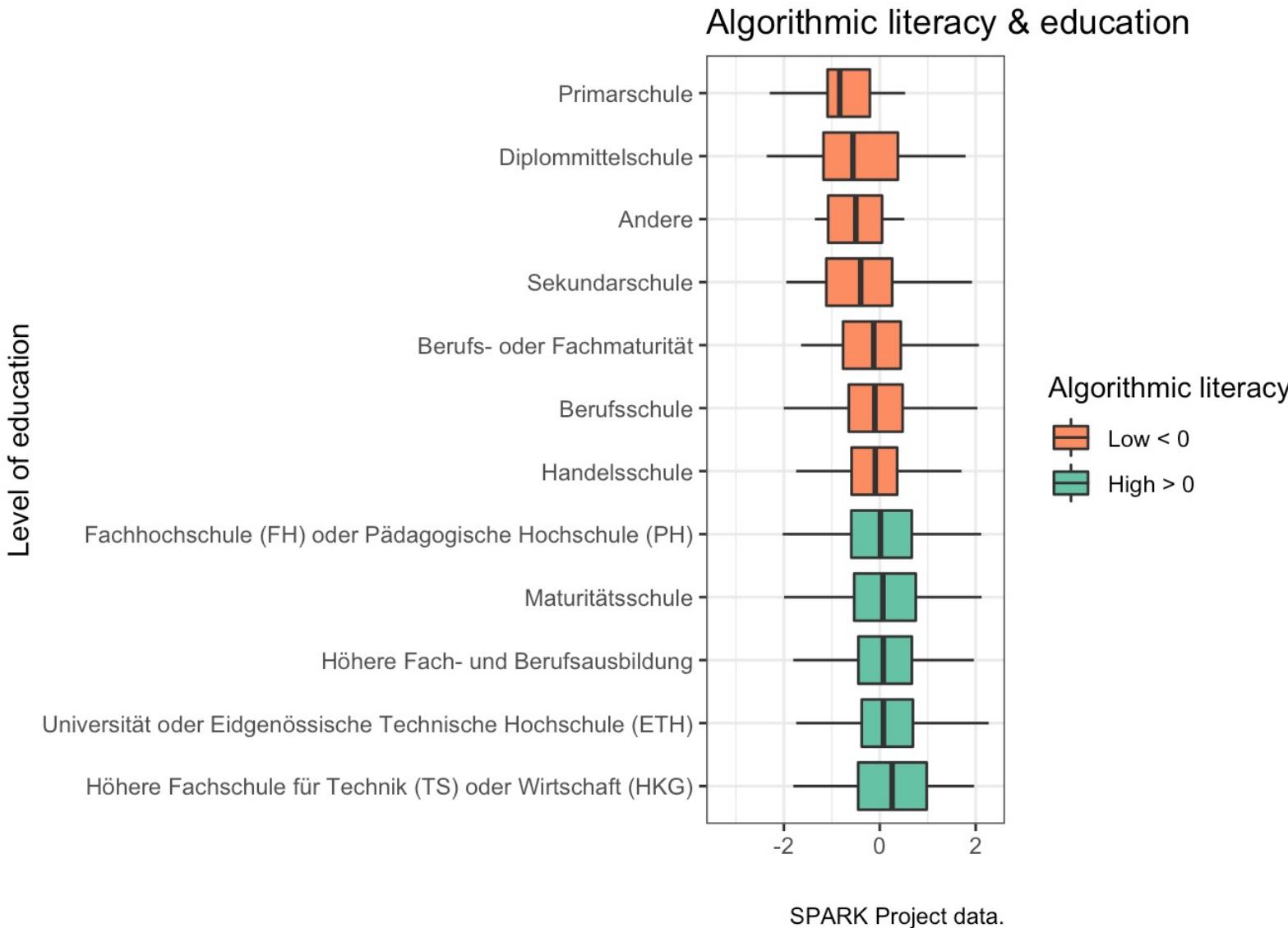
Don't know 29%

Incorrect (agree) 23%

# Algorithmic literacy does not correlate with age



# Algorithmic literacy correlates with type of education



# What predicts algorithmic literacy ?

## Internet skills

**10-item scale:** ability to navigate the Internet; awareness of the Internet as a public digital venue (what to share and not to share)

## General digital skills

**7-item scale:** familiarity with basic digital tools (PDF, smartphones)

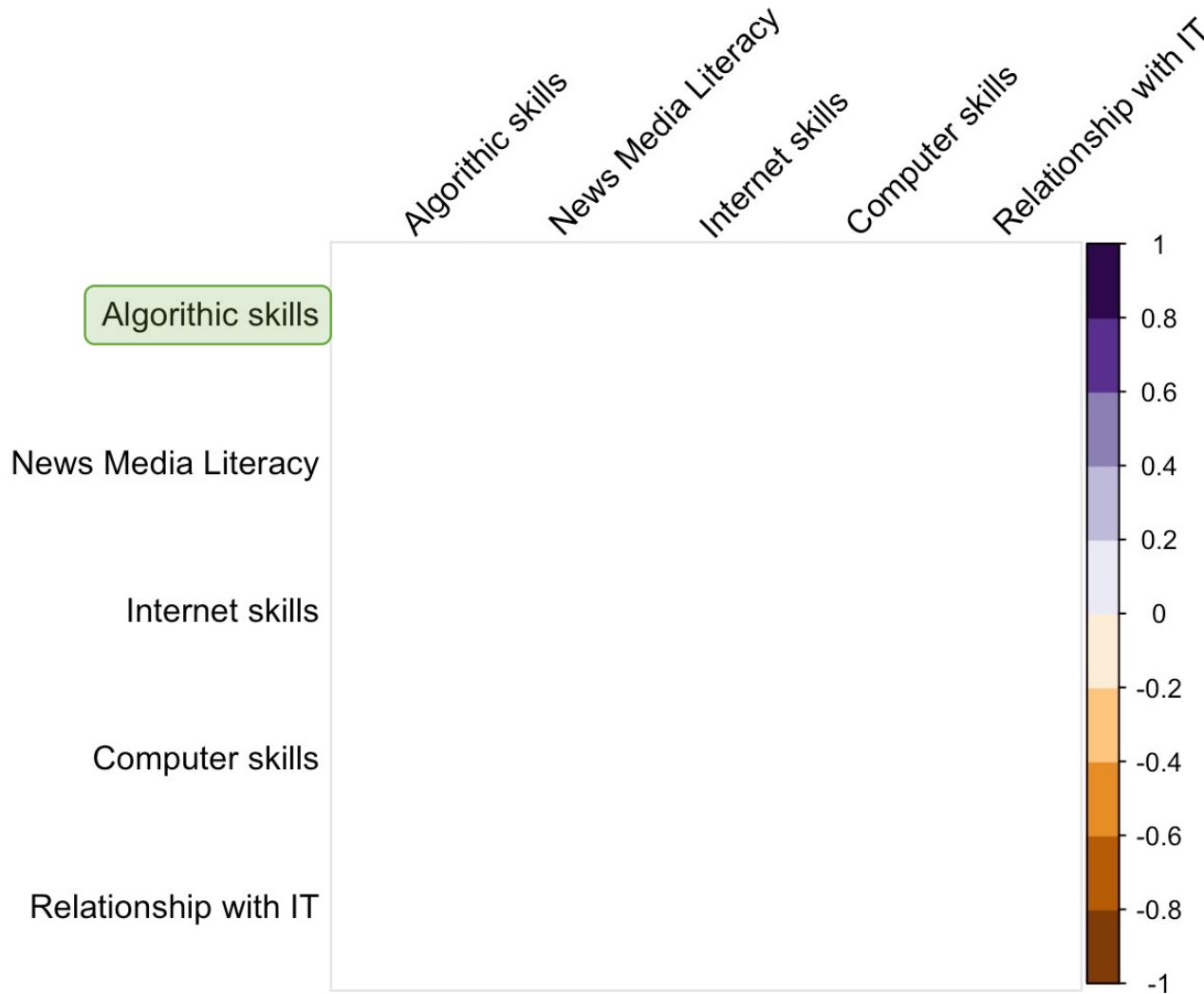
## Good personal relationship with IT

**7-item scale:** departs from knowledge (problems with viruses, IT make my job easier...)

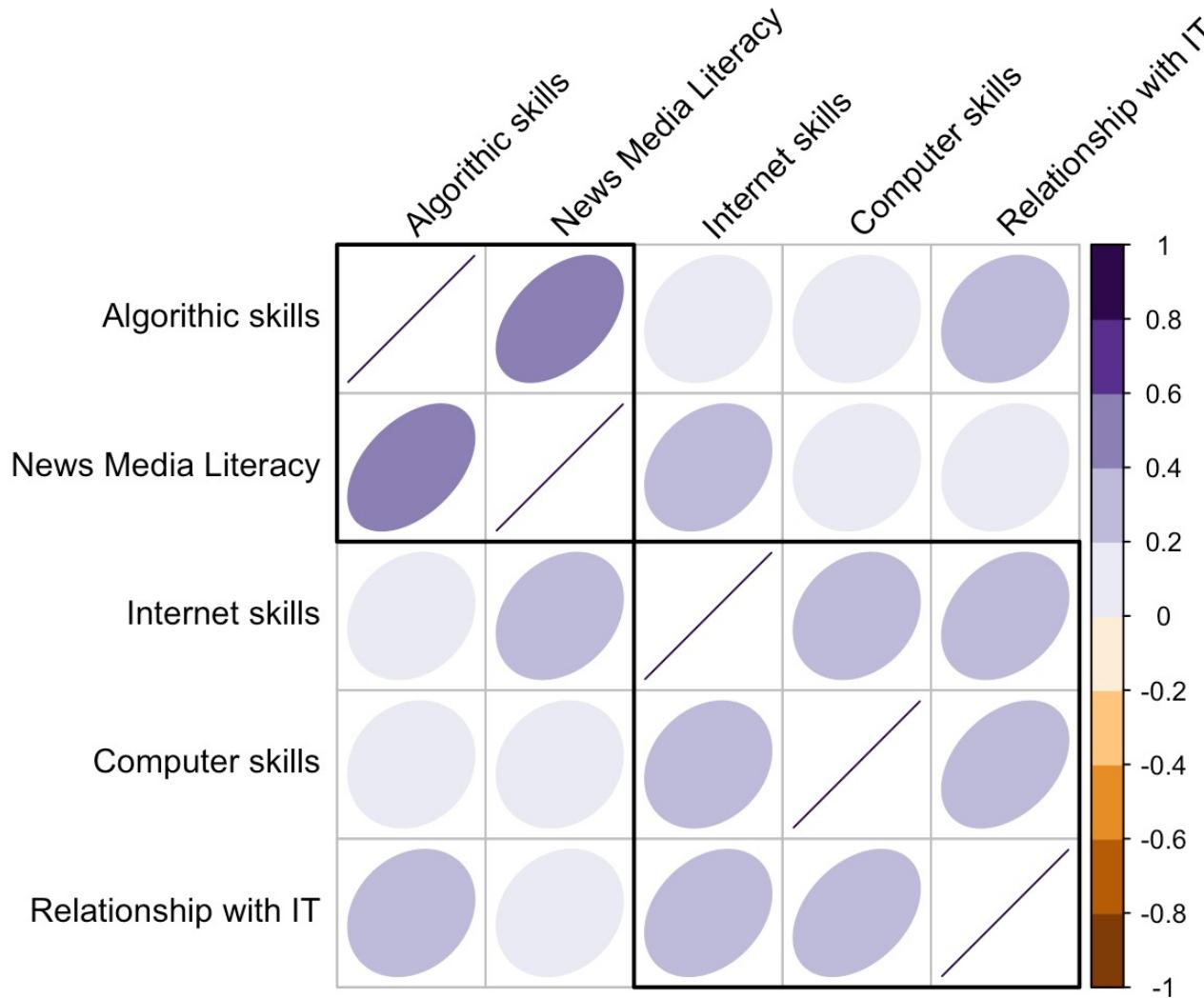
## News media literacy

**12-item scale:** Ashley, Maksl and Craft (204) scale (news production, audiences, journalism)

# What predicts algorithmic literacy ?



# What predicts algorithmic literacy ?



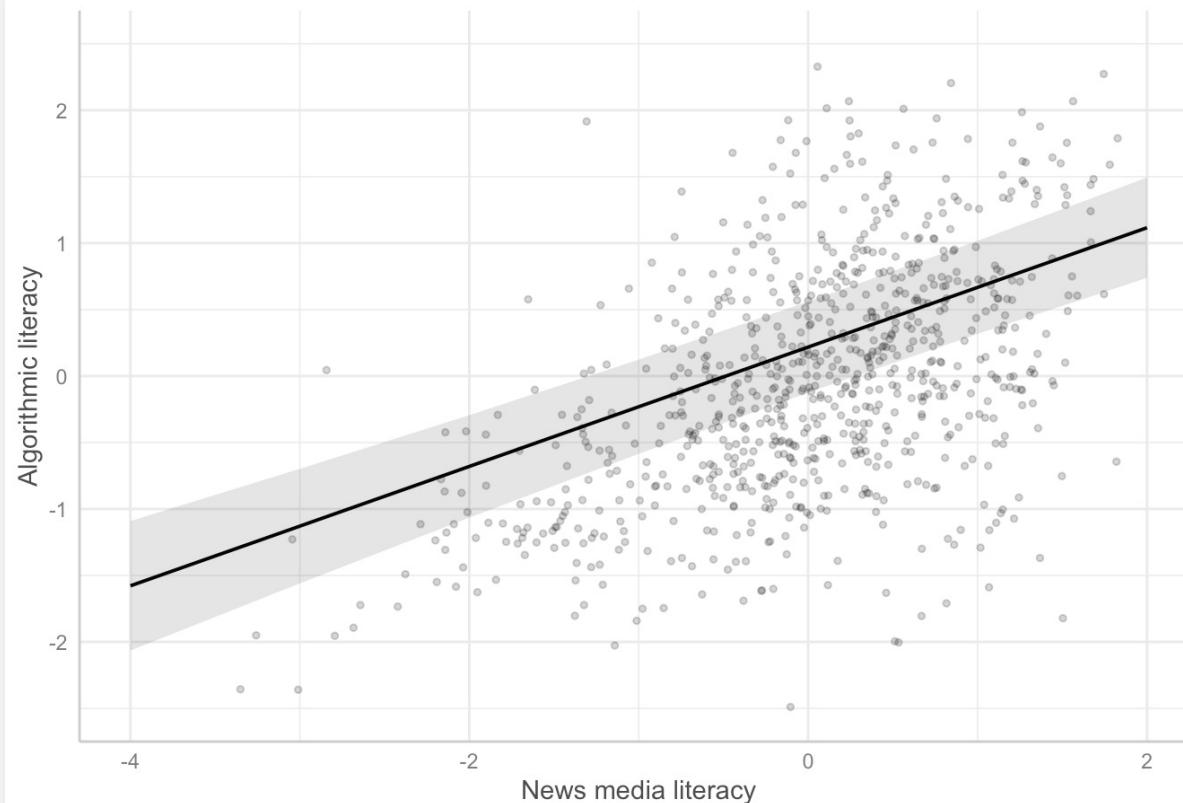
# What predicts algorithmic literacy ?

Multivariate regression model controlling for:

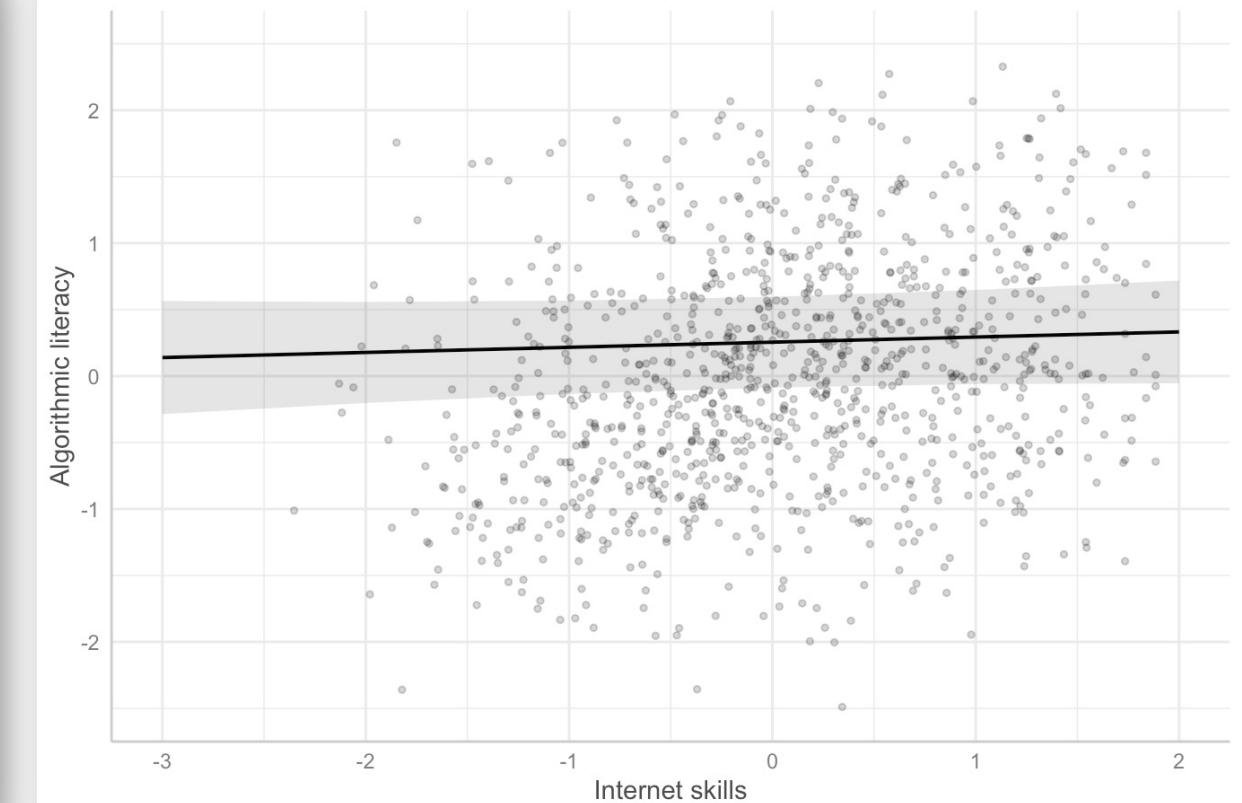
- age group
- gender
- canton
- type of education
- left-right ideology
- party identity
- interest in politics
  
- Internet skills
- General digital skills
- Good relationship with IT

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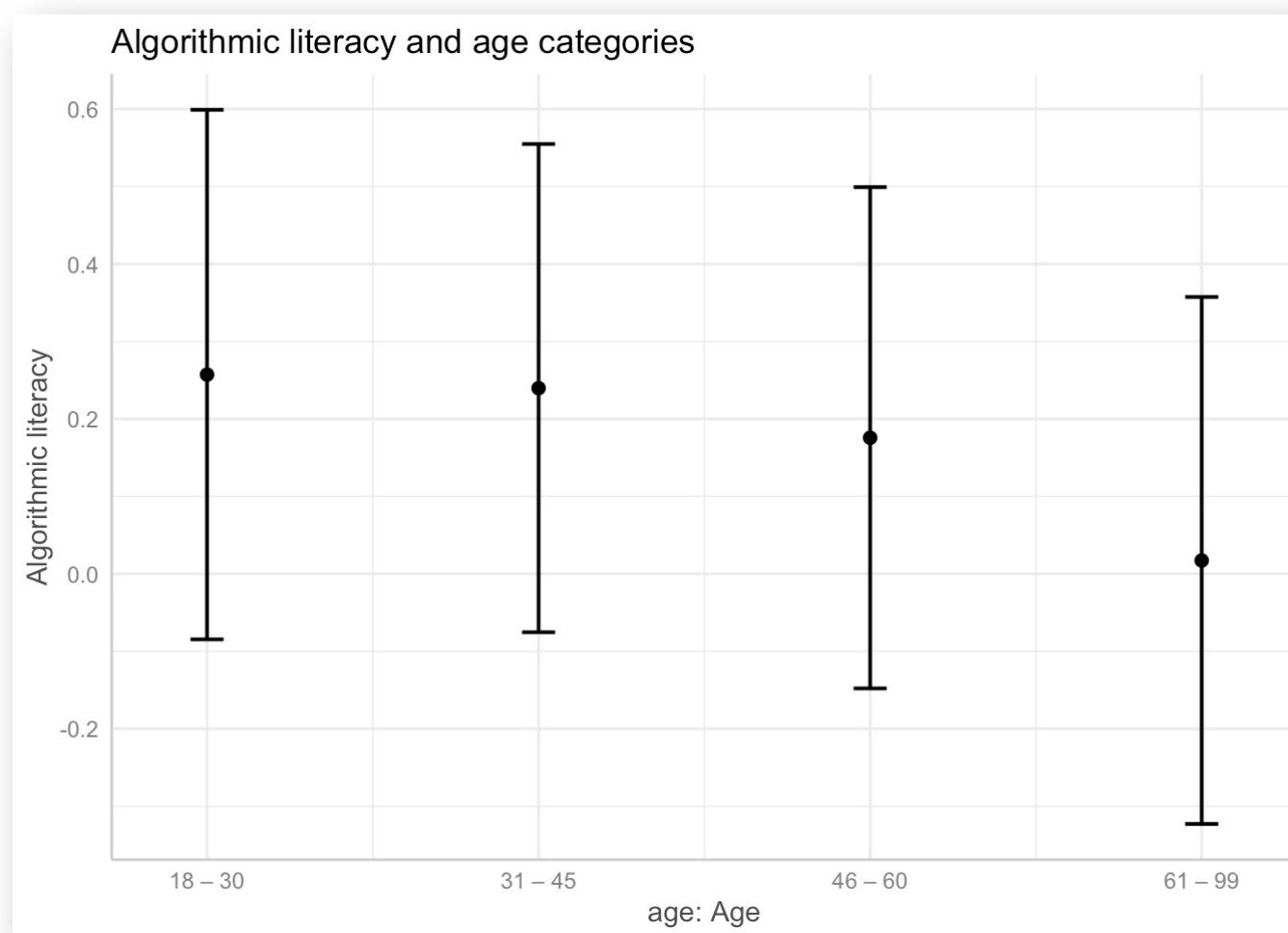
Algorithmic Literacy and News Media Literacy



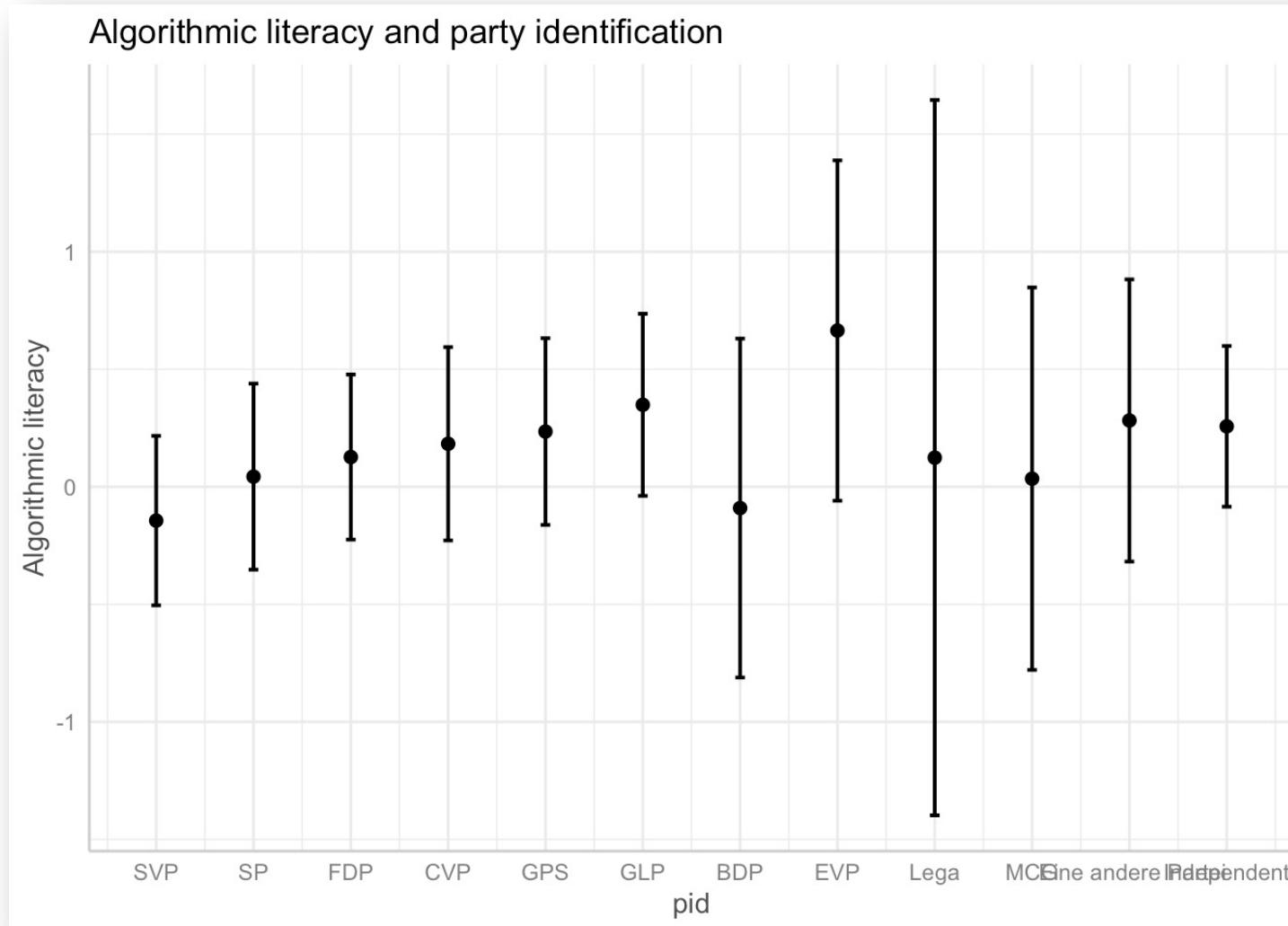
Algorithmic Literacy and general Internet skills



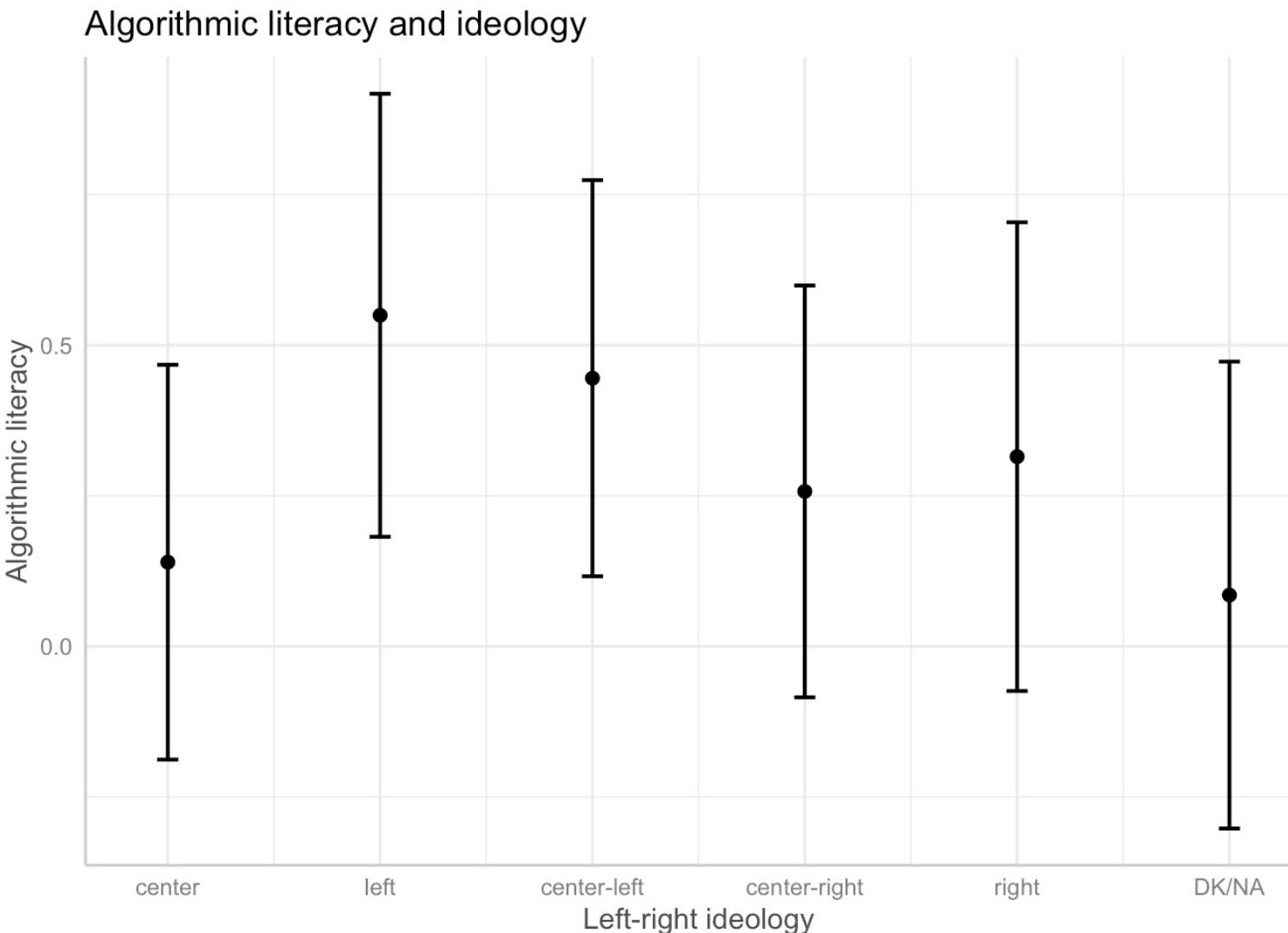
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# UNESCO's Algorithmic & Data Literacy Project

