

# Computing in Contemporary Society

Check in Code:



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School of Computing,  
Engineering & the  
Built Environment

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## Last week

- we explored algorithms and algorithmic bias

## This week

- we will look at datafication and data justice

# Datafication and Data Justice

Lecture Six  
Khristin Fabian

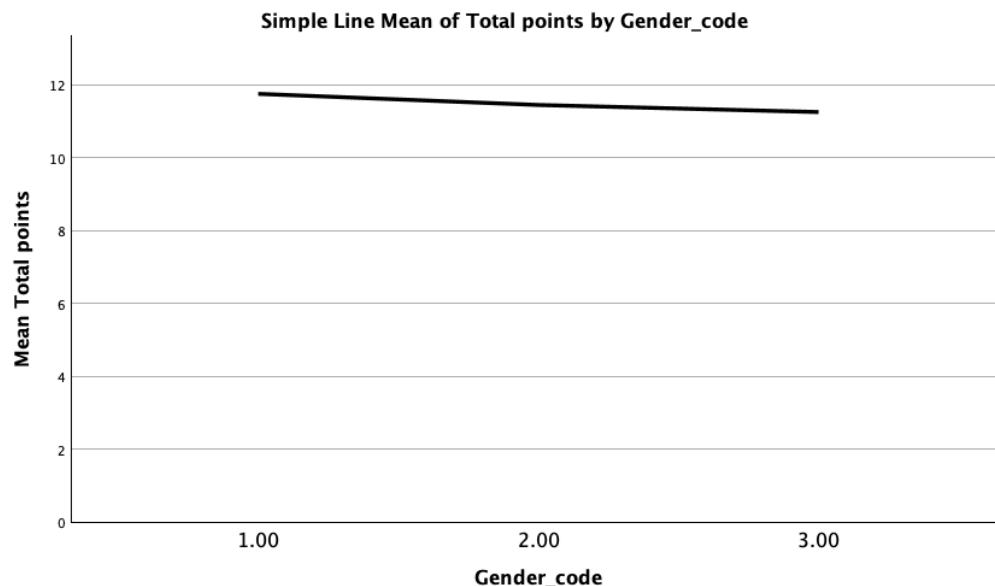
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# Today's lecture is about

- Datafication
- Data Justice

# An example of datafication

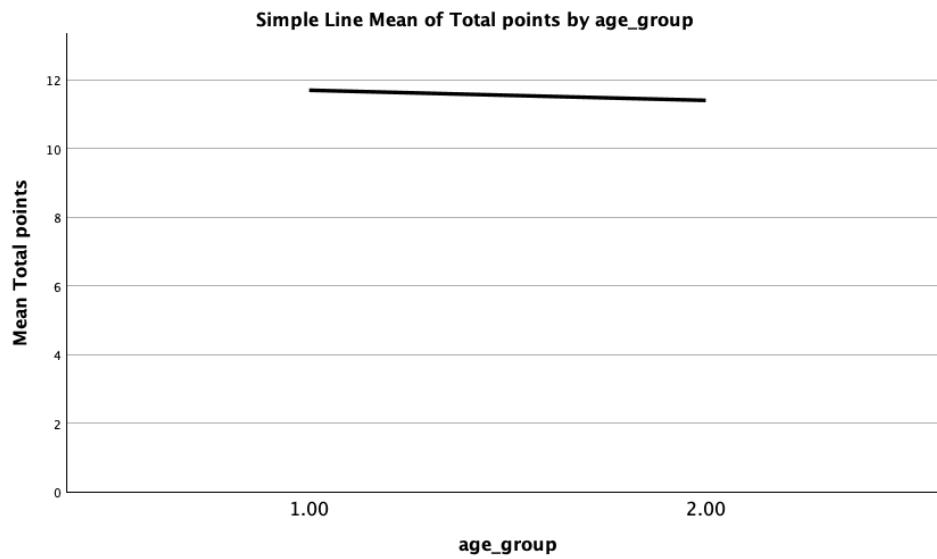
- From last week's algorithm literacy scale (max 15 points): 37 respondents
- Male scores mean 11.75, Female 11.44, Prefer not to say/other 11.25 ( $p$ -value  $> .05$ )



1 male  
2 female  
3 prefer not to say

## Datafication example: By age group

- Age 21-24 mean 11.70, Age 25+ mean 11.4, ( $p > .05$ )



1 Age 21-24  
2 Age 25+

## Datafication example: By SIMD

- The Scottish Index of Multiple Deprivation is a relative measure of deprivation.
- If an area is identified as 'deprived', this can relate to people having a low income but it can also mean fewer resources or opportunities. SIMD looks at the extent to which an area is deprived across seven domains: income, employment, education, health, access to services, crime and housing.
  
- SIMD (low) mean 11.33,
- SIMD (high) mean 10.5, p-value  $>.05$ 
  - note that SIMD high were invalid entries (address given was the university)
- based only on 7 valid postcodes

# Datafication

- Turning human behaviour and social activities into data points that can be collected and analysed (Cukier and Mayer-Schonberger, 2013)
- The process of rendering of social and natural world in machine-readable digital format (in Williamson, 2020)



# How do we data-fy education

- Learning analytics
- AI to monitor, assess and personalise learning experience
- Student engagement monitoring systems
- Robot/Chatbot teaching assistants
- Online learning systems (moodle, blackboard)
- Interactive games (not necessarily AI enabled)
- Online discussion boards
- Online services that facilitate collaboration (google docs, padlet, etc)
- Classroom response systems
- Online quizzes
- PISA
- TIMMS
- University Rankings



## Benefits of datafication in education

Personalised learning

Data-driven strategies

Improved student outcomes

Enlarged the scope of measurement across education systems

Enhanced the uptake and use of data for various forms of audit, inspection, evaluation and decision-making (Williamson, 2020)



# Menti: How do we data-fy society?

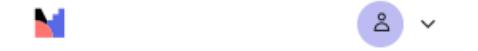
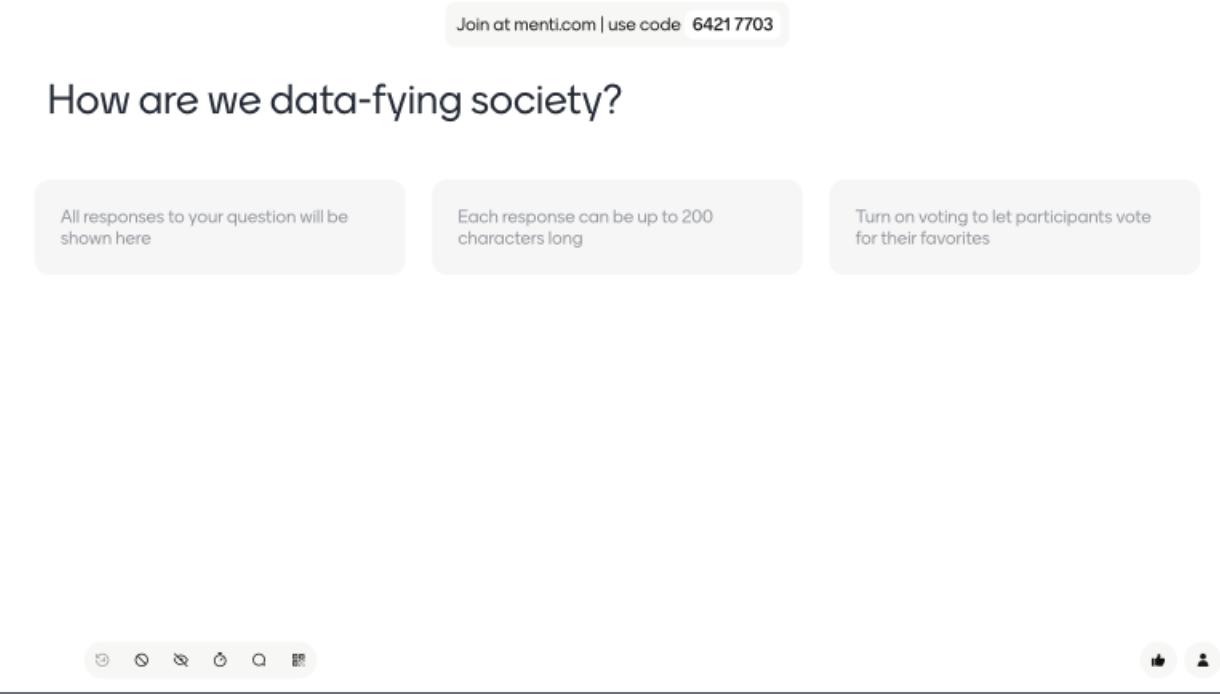
Join at [menti.com](https://menti.com) | use code 6421 7703

## How are we data-fying society?

All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting to let participants vote for their favorites



Menti  
data justice



Choose a slide to present

How are we data-fying society?  
1 response



What are the benefits of datafication of society?  
1 response



# Menti: Benefits of datafication of society

Join at [menti.com](https://menti.com) | use code 6421 7703

What are the benefits of datafication of society?

All responses to your question will be shown here

Each response can be up to 200 characters long

Turn on voting to let participants vote for their favorites



**Menti**  
data justice



Choose a slide to present



How are we data-fying society?  
0 responses



What are the benefits of datafication of society?  
0 responses

► This article is more than **16 years old**

## Facebook a valid educational tool, teachers told

Teachers and lecturers are getting the lowdown on how to use social networking sites such as Facebook and Bebo in an educational way.

Most schools and colleges in the UK block access to the websites but they are missing out on their potential for education, a government-funded guide says.

The [report](#) for Childnet International and funded by Becta, the government body for technology in learning, says while teachers and lecturers may be using social networking services they may not recognise the educational potential for their students.

Schools could help students develop "e-portfolios" where learners can record their achievements and collect examples of their work, the guide suggests. Or teachers could use social networking services to set up groups that "semi-formalise" students' online communications and "document discussions and milestones as they go".

2008



2018

# Risks and Challenges of Datafication



Privacy concerns



Algorithmic bias



Surveillance



Algorithmic  
filtering and echo  
chambers



Pedagogic  
reductionism

# Risks and Challenges of Datafication



Privacy concerns



Algorithmic bias



Surveillance

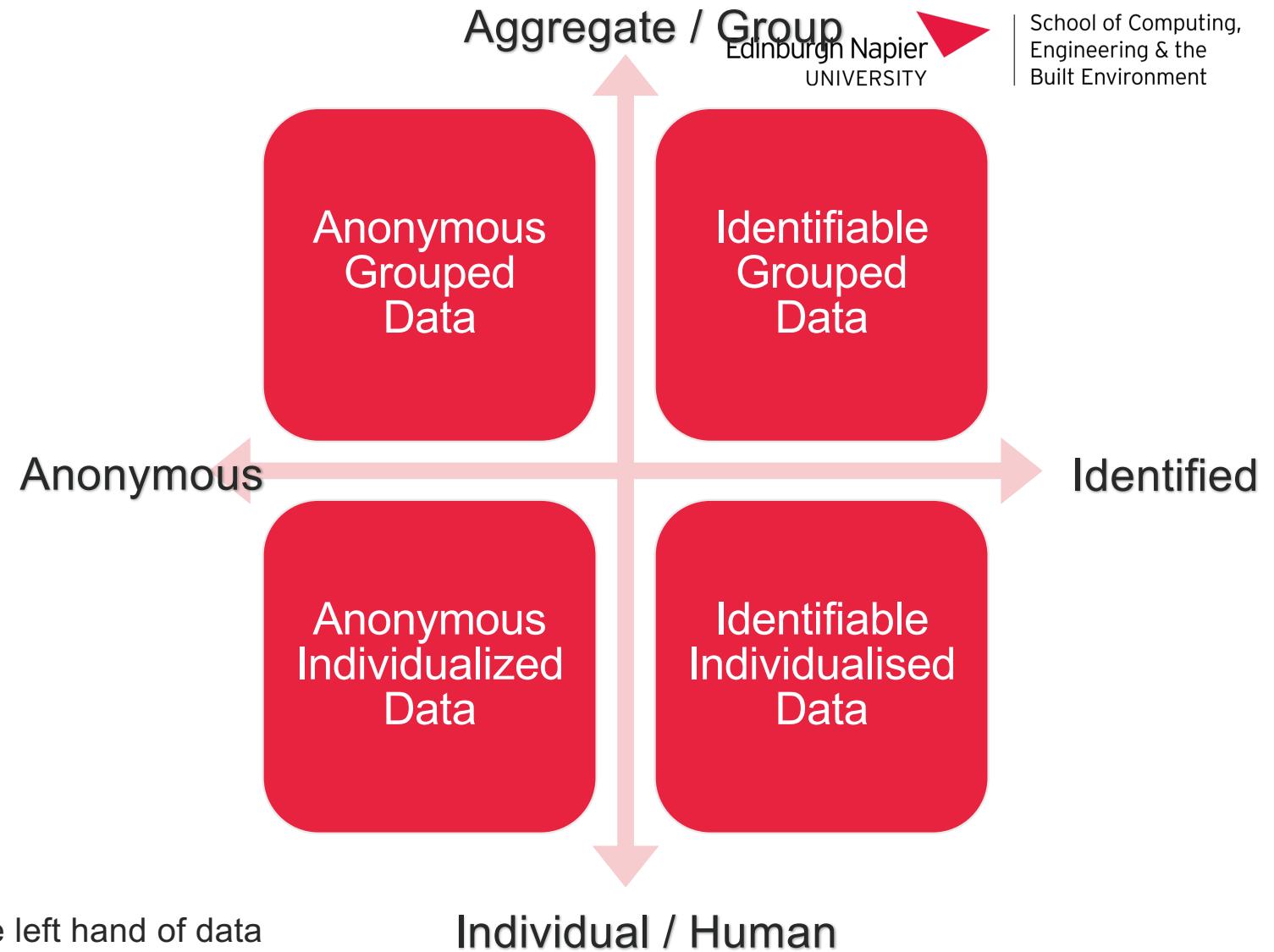


Algorithmic  
filtering and echo  
chambers



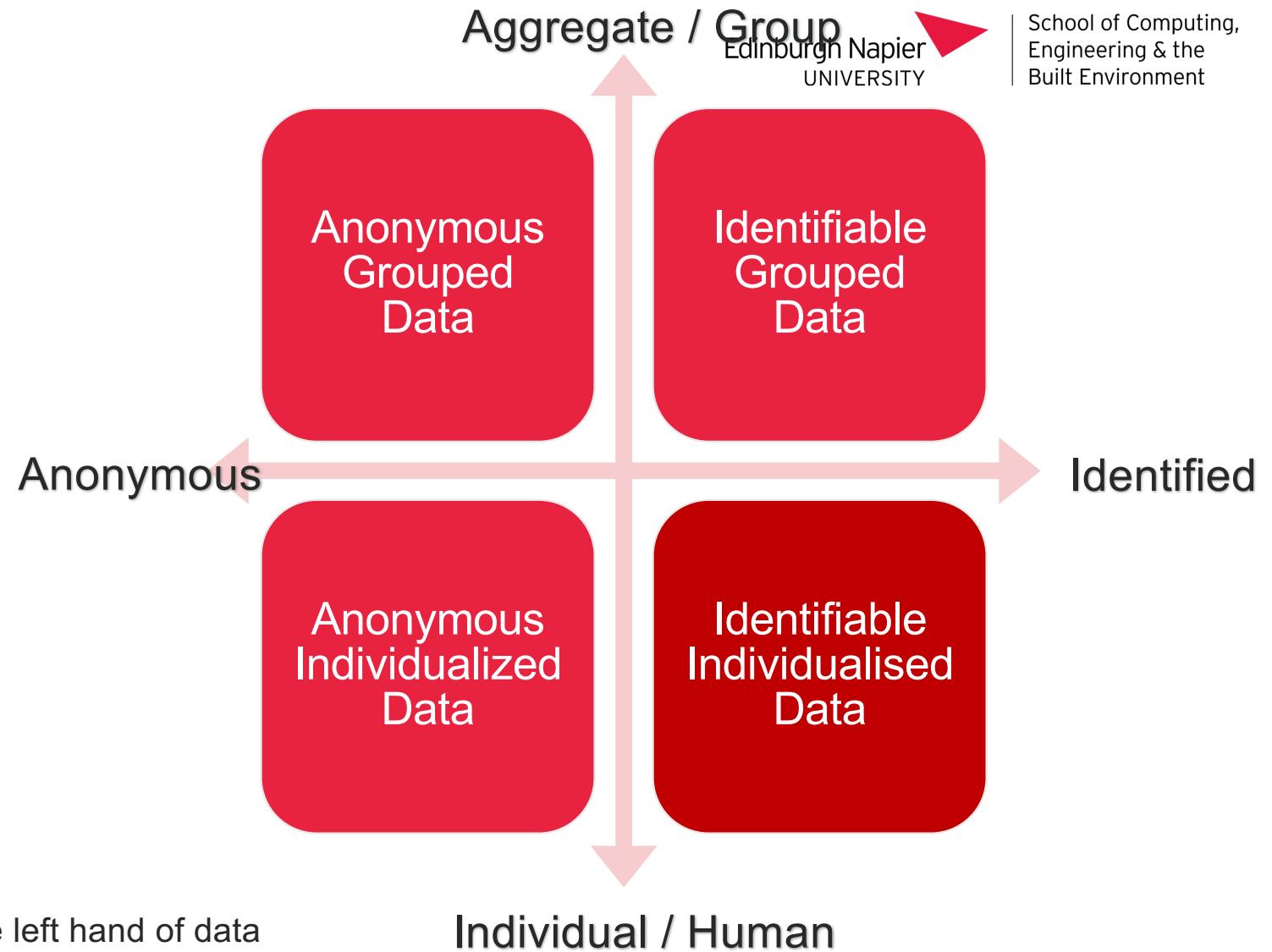
Pedagogic  
reductionism

# The Anonymity Spectrum



Berland and Garcia (2024). The left hand of data

# The Anonymity Spectrum



Berland and Garcia (2024). The left hand of data

# Risks and Challenges of Datafication



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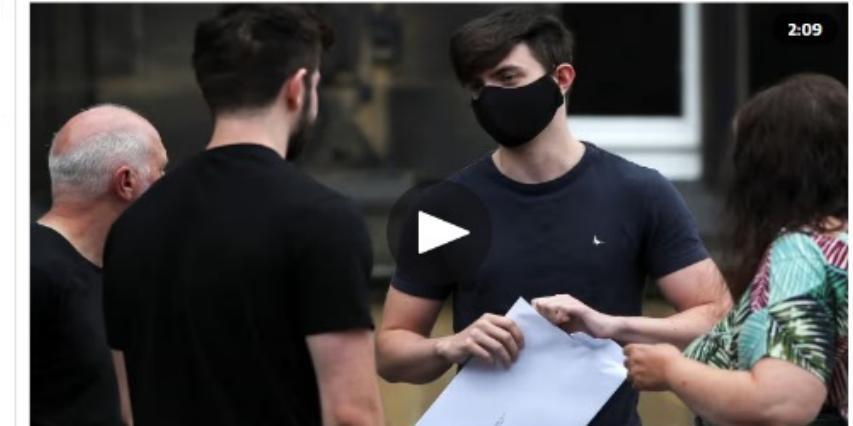
# Algorithmic Bias



## A-level results: almost 40% of teacher assessments in England downgraded

Ofqual figures show 39.1% of 700,000 teacher assessments were lowered by at least one grade

• [A-level results - live updates](#)



# Risks and Challenges of Datafication



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# Student attendance systems

University attendance monitoring apps spark controversy amid surveillance and deportation fears

by Rei Takver | May 3, 2024 12:26PM | Campaigns - Immigration laws | 0 comments



# Risks and Challenges of Datafication



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reductionism



# **Filter bubble and Echo chambers**



# Risks and Challenges of Datafication



Privacy concerns



Algorithmic bias



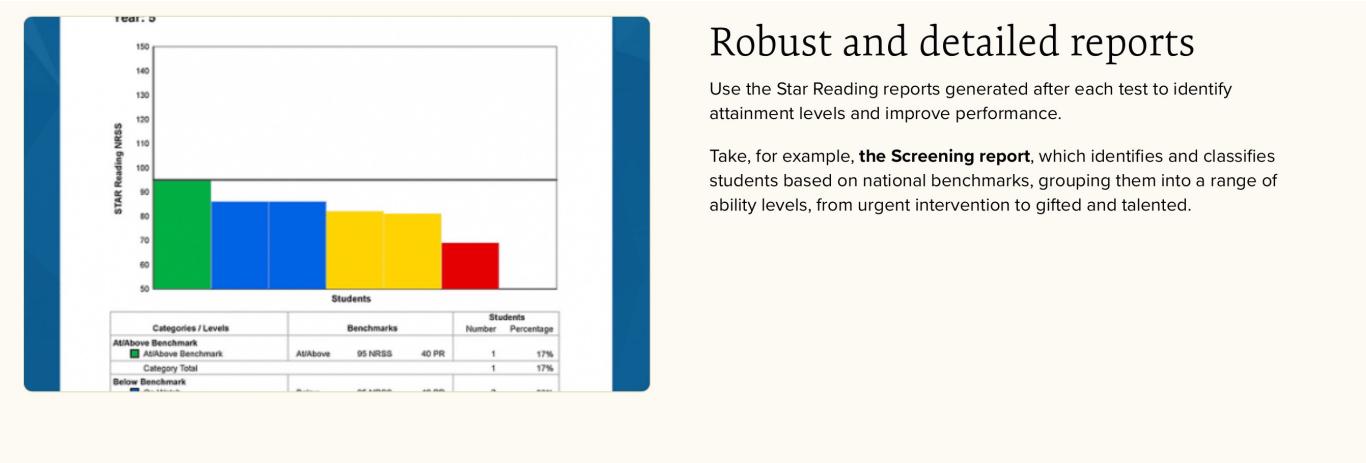
Surveillance



Algorithmic filtering  
and echo chambers



Pedagogic  
reductionism/  
Quantification bias



## Robust and detailed reports

Use the Star Reading reports generated after each test to identify attainment levels and improve performance.

Take, for example, the **Screening report**, which identifies and classifies students based on national benchmarks, grouping them into a range of ability levels, from urgent intervention to gifted and talented.



## Why Star Reading is quick and accurate



### No marking = More teacher time

Unlike paper-based tests, there is **no marking** involved when taking a Star Reading test. The test is administered to students on a computer, and once finished, reports are **automatically generated**.

Additionally, the reports generated can be **tailored to characteristics** such as **pupil premium, free school meals, or EAL**, enabling you to demonstrate the progress made by any of these groups of students.



### Accurate and detailed assessment data

Star Reading gives you access to an accurate set of data to inform your teaching and your children's reading practice, including **Reading age** (in years and months), **Zone of Proximal Development**, **Norm-Referenced Standardised Score**, **Percentile Rank** and **Scaled Score**.

## How do we data-fy education

Institution wide  
infrastructures

Smaller Scale Tools  
for Classroom  
Interaction

Data about different  
universities being  
used for  
comparisons

## The Risks and challenges of Datafication



Privacy  
concerns



Algorithmic  
bias



Surveillance



Filter  
bubbles



Pedagogic  
reductionism



**Focusing on the at-risk but forgetting all the others**

- Balancing Interactivity and equity
- Balancing GenAI and Academic Integrity



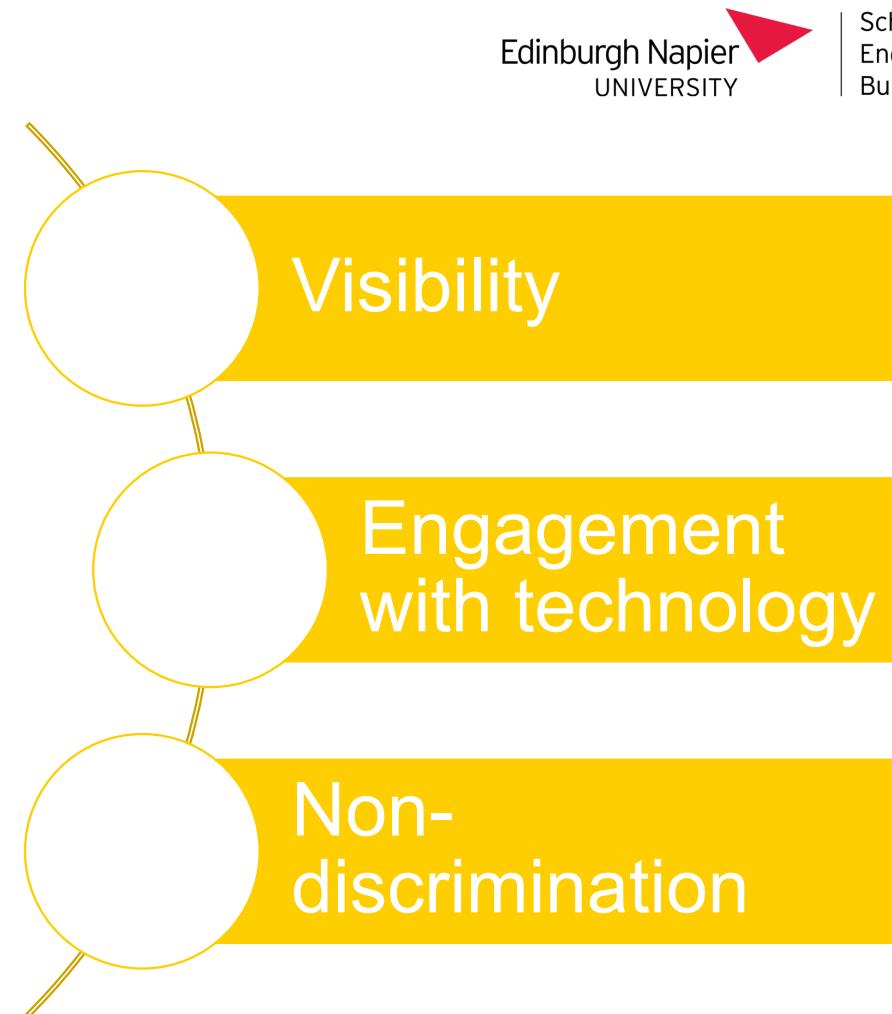


**Break 15 mins**



# Data Justice

- fairness in the way people are made visible, represented and treated as a result of their production of digital data (Linnet 2017)

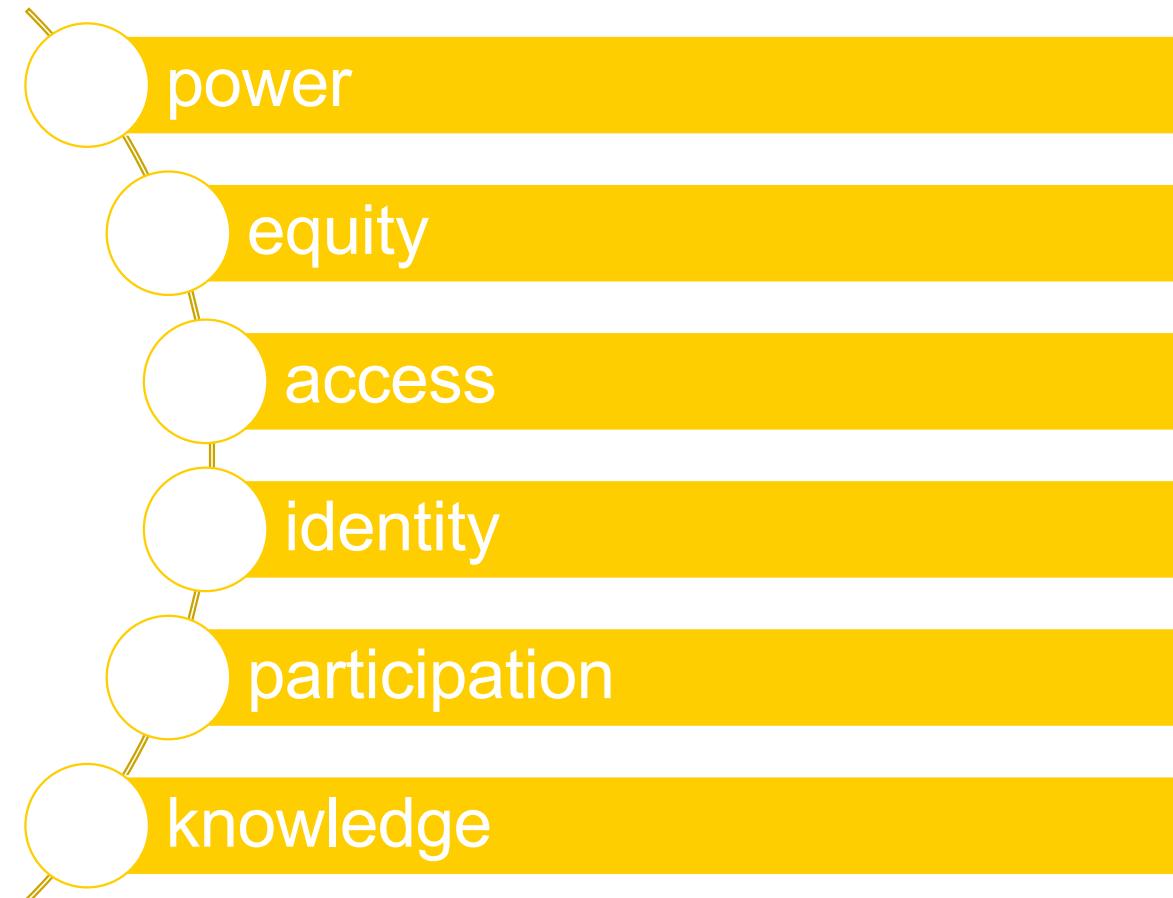




# Data Justice

- Data justice constitutes data as a means of power and seeks to understand how power is exercised through data (Pangrazio et al, 2024)

# Pillars of data Justice (GPAI, 2022)



# Power

- demonstrates the importance of understanding the levels at which power operates and how power manifests in the collection and use of data in the world.
  - What are the interests of those who wield power or benefit from existing social hierarchy?
  - How do these interests differ from other stakeholders who are impacted by or impact data practices and their governance?
  - How do power imbalances shape the differing distribution of benefits and risks among different groups who possess varying levels of power?
  - How do power imbalances result in potentially unjust outcomes for marginalised, vulnerable or historically discriminated against groups?

<p>⚠ App required for this service requires broad device permissions</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ The service collects information about your health and health insurance</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ This service shares your personal data with third parties that are not essential to its operation</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ This service tracks you on other websites</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your personal data may be used for marketing purposes</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ This service tracks which web page referred you to it</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Information is gathered about you through third parties</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your profile is combined across various products</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ You are tracked via web beacons, tracking pixels and device fingerprinting</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Extra data may be collected about you through promotions</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ This service receives your precise location through GPS coordinates</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your personal information is used for many different purposes</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your personal data is used to employ targeted third-party advertising</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ This service gives your personal data to third parties involved in its operation</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your biometric data is collected</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Your data may be processed and stored anywhere in the world</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>
<p>⚠ Tracking pixels are used in service-to-user communication</p>	<input type="checkbox"/> <input type="radio"/> <input type="button" value="edit"/>

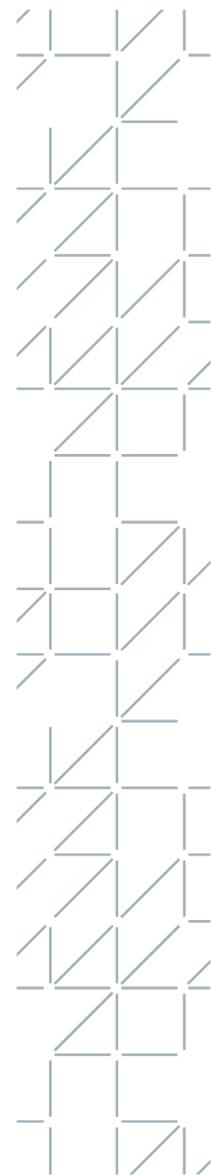


# Equity

- addresses the need to confront the root causes of data injustices as well as to interrogate choices about the acquisition and use of data, particularly where the goal or purpose is to target and intervene in the lives of historically marginalised or vulnerable populations.



*Figure 9: Single axis modes of statistical representation;  
adopted from the 5 D's presented by Kukutai and Taylor (2016)*



## How Uber's dynamic pricing model works



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## Uber hammered by price gouging accusations during NYC's explosion

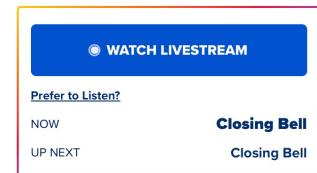
PUBLISHED SUN, SEP 18 2016 · 10:38 AM EDT | UPDATED SUN, SEP 18 2016 · 6:19 PM EDT

Javier E. David  
@TEFLONGEEK

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Robert Galbraith | Reuters



### TRENDING NOW



Ukraine agrees to U.S.-led ceasefire plan if Russia accepts



## Access

- illuminates how a lack of access to the benefits of data processing is a starting point for reflection on the impacts and prospects of technological interventions.

Distributive justice

Capabilities-centered social justice

Restorative and reparational justice

Representational and recognitional justice



# Robodebt: Illegal Australian welfare hunt drove people to despair

© 7 July 2023



GETTY IMAGES

| The "Robodebt" policy vilified recipients of welfare, an inquiry has found



# Identity

- addresses the social character of data and problematises its construction and categorisation, which is shaped by the sociocultural conditions and historical contexts from which it is derived.



Implicit practice of erasure	Corrective practices of inclusion
<input type="checkbox"/> Male	<b>Gender</b> <input type="text"/>
<input type="checkbox"/> Female	Prefer not to say <input type="checkbox"/>
	<hr/>
	<b>Is your gender the same as the sex you were assigned at birth?</b>
	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	Prefer not to say <input type="checkbox"/>

# Participation

- promotes the democratisation of data, scientific research and data innovation practices and the need to involve members of impacted communities, policymakers, practitioners, and developers together to collaboratively articulate shared visions for the direction that data innovation agendas should take



# Chinese market regulator strengthens protection for food delivery workers

By Reuters

July 26, 2021 4:08 PM GMT+1 · Updated 4 years ago



A food delivery rider leaves after picking up parcels at a makeshift lunch hour distribution spot outside an office building following an outbreak of the coronavirus disease (COVID-19) in Beijing, China, August 4, 2020. REUTERS/Thomas Peter [Purchase Licensing Rights](#)

BEIJING, July 26 (Reuters) - Food delivery platforms in China are being pushed to guarantee their workers with income above minimum pay, insurance and a relaxation in delivery deadlines, under a set of reforms announced on Monday by China's market regulator.

The guidelines were issued by the State Administration for Market Regulation along with six other administrative departments, including the National Development and Reform Commission, the Cyberspace Administration of China and the Ministry of Public Security.

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# Knowledge

- involves recognising that diverse forms of knowledge and understanding can add valuable insights to the aspirations, purposes, and justifications of data use—including on the local or context-specific impacts of data-intensive innovation.

# Data Justice Pillar in Action

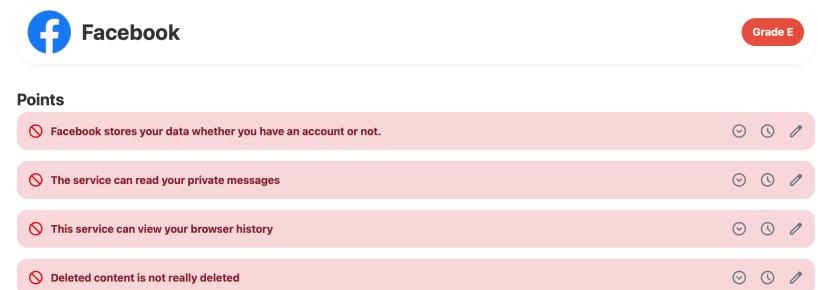
- A website that simplifies Terms of Service and Privacy policies to help individuals understand how their data is being used before they click accept.



## Terms of Service Didn't Read

"I have read and agree to the Terms" is the biggest lie on the web. Together, we can fix that.

<https://tosdr.org/en>



The screenshot shows a list of privacy concerns for the Facebook service, each with a red 'X' icon and a 'Details' link. The items listed are:

- Facebook stores your data whether you have an account or not.
- The service can read your private messages.
- This service can view your browser history.
- Deleted content is not really deleted.

## Data Justice Pillar in Action

- Motoon is a community foundation that provides technical services to progressive causes and local communities by connecting them with people in tech.



In Motoon, we believe that technology is not just a tool, but a space of possibilities. In many cases, it is an opportunity to reconsider what is taken for granted. Motoon was born out of this context, to enable people with technology, whether through services, consultancies, and training.

<https://motoon.org>



## **Requirements for humans to flourish in a datafied society (Hintz et al, 2019)**



Accessible, stable and trustworthy  
infrastructure



Supportive legal and regulatory  
framework for secure online  
interactions



Informed and knowledgeable  
understanding for all stakeholders of  
the technologies in place and how  
they might be used

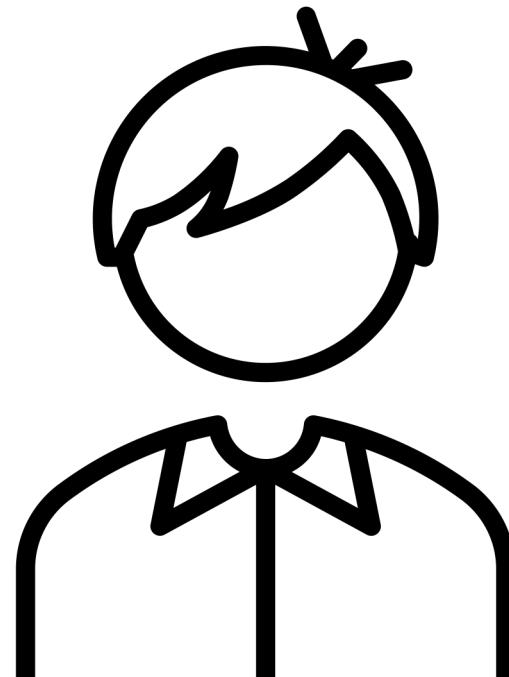
# Let's design a math game





# Level 1

All students start at level 1 difficulty



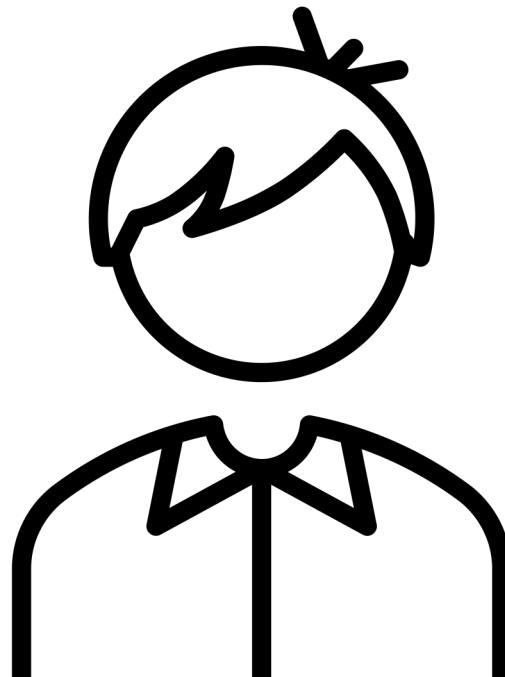


The system randomly chooses a number for A and B between 0 to 10.

As well as a random allocation of operation

## Level 1

A ? B

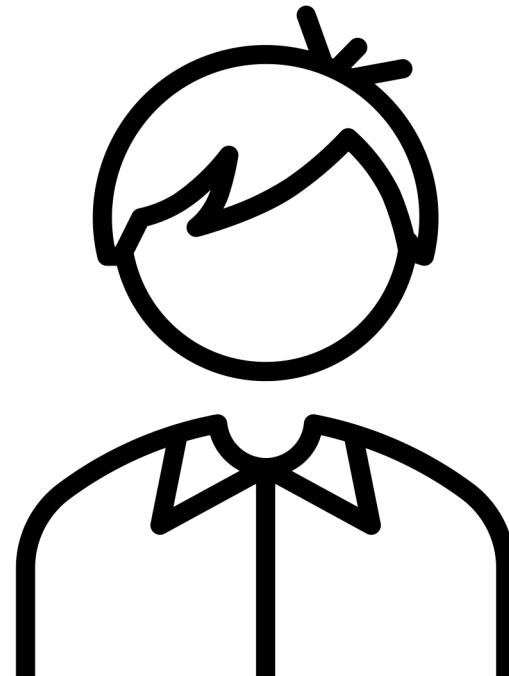




If they get it right, they level up

## Level 2

$$7 + 5 = 12$$



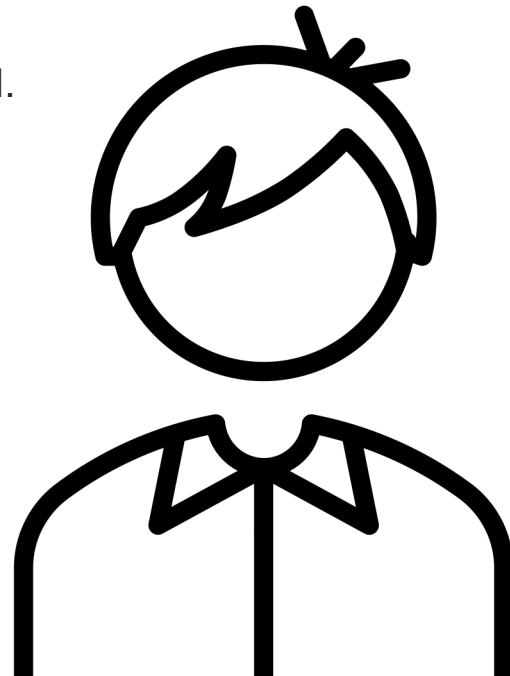


If they answer incorrectly  
they go back a level.

They can't be lower than  
level 1 as we don't want  
students to be disheartened.

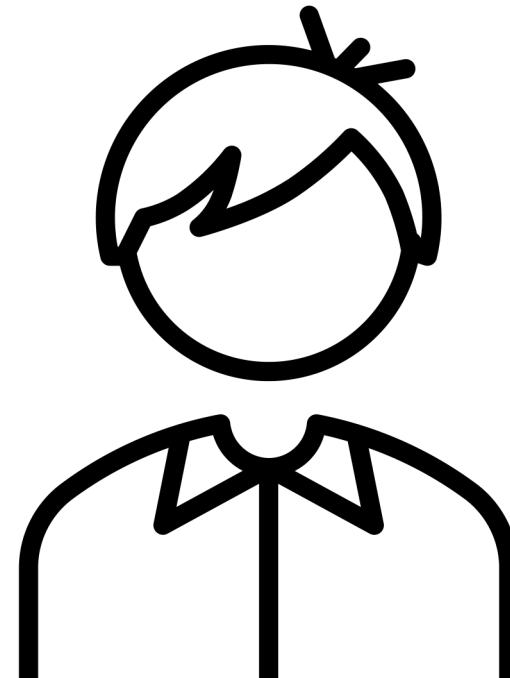
## Level 1

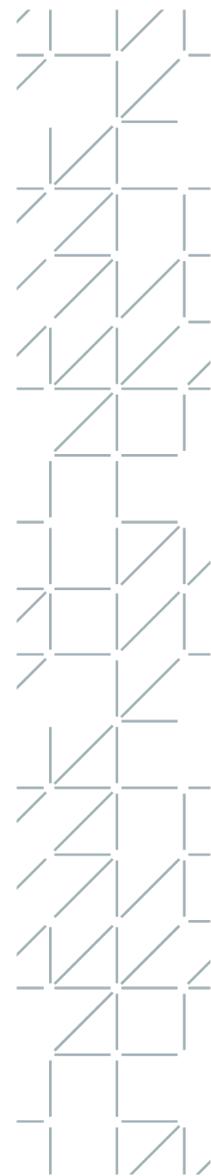
$$4 \times 5 = 9$$



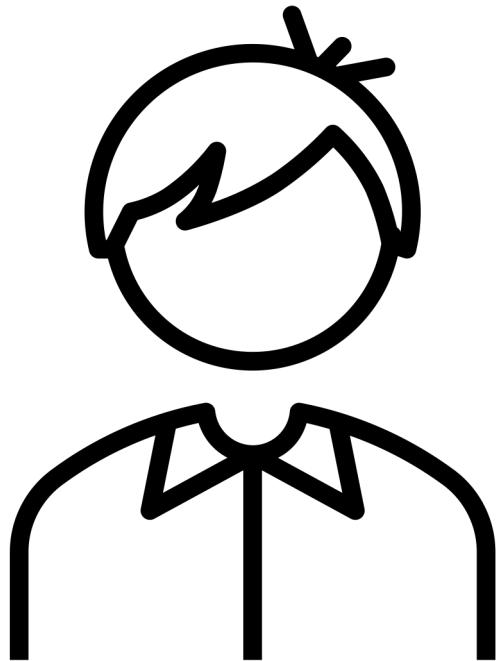
At the end of 10 questions

**Congratulations you've reached Level 7**





Level 7

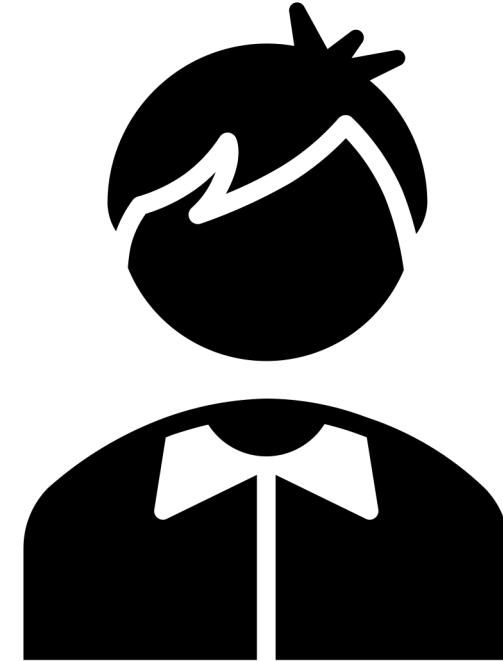


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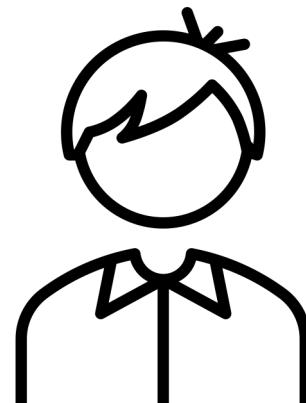


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Level 4

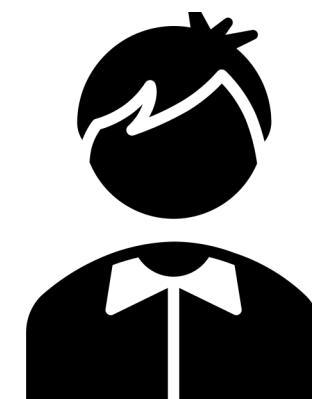


1.  $7 + 5 = 12 \rightarrow \text{Correct} \rightarrow \text{Level 2}$
2.  $9 - 4 = 5 \rightarrow \text{Correct} \rightarrow \text{Level 3}$
3.  $3 \times 6 = 18 \rightarrow \text{Correct} \rightarrow \text{Level 4}$
4.  $8 \div 2 = 4 \rightarrow \text{Incorrect} \rightarrow \text{Level Down to 3}$
5.  $4 + 3 = 7 \rightarrow \text{Correct} \rightarrow \text{Level Up to 4}$
6.  $6 - 1 = 5 \rightarrow \text{Correct} \rightarrow \text{Level Up to 5}$
7.  $2 \times 7 = 14 \rightarrow \text{Correct} \rightarrow \text{Level Up to 6}$
8.  $9 \div 3 = 3 \rightarrow \text{Incorrect} \rightarrow \text{Level Down to 5}$
9.  $5 + 2 = 7 \rightarrow \text{Correct} \rightarrow \text{Level Up to 6}$
10.  $8 - 5 = 3 \rightarrow \text{Correct} \rightarrow \text{Level Up to 7}$



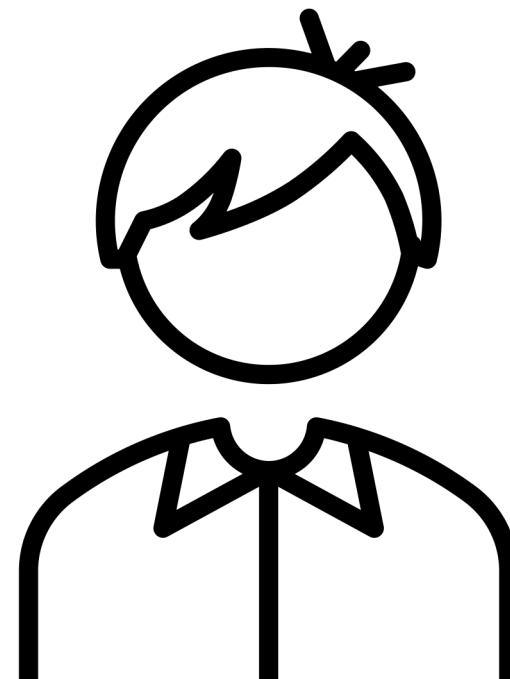
Level 7

1.  $9 \times 7 = 63 \rightarrow \text{Correct} \rightarrow \text{Level 2}$
2.  $8 \div 4 = 2 \rightarrow \text{Correct} \rightarrow \text{Level 3}$
3.  $6 + 7 = 13 \rightarrow \text{Correct} \rightarrow \text{Level 4}$
4.  $9 - 8 = 1 \rightarrow \text{Incorrect} \rightarrow \text{Level Down to 3}$
5.  $5 \times 6 = 30 \rightarrow \text{Correct} \rightarrow \text{Level Up to 4}$
6.  $8 \div 2 = 4 \rightarrow \text{Correct} \rightarrow \text{Level Up to 5}$
7.  $9 + 3 = 12 \rightarrow \text{Incorrect} \rightarrow \text{Level Down to 4}$
8.  $7 - 4 = 3 \rightarrow \text{Correct} \rightarrow \text{Stay at Level 4}$
9.  $4 \times 9 = 36 \rightarrow \text{Correct} \rightarrow \text{Level Up to 5}$
10.  $9 \div 3 = 3 \rightarrow \text{Incorrect} \rightarrow \text{Level Down to 4}$



Level 4

## Group discussion: How will you make the game more fair for all players?



**15 minutes**

## Your role as designer, developer or producer of data systems

### Interrogate and critique power

- what, if any, power imbalances exist between me (or my firm or organisation) and the communities impacted by the data innovation agendas I pursue?
- Focus on the transformative power of data equity
  - When undertaking machine learning:
    - Could our categorisation, annotation, or labelling practices serve to discriminate against certain groups?
    - Do we explore whether a model contains any lurking proxies or correlations that are discriminatory or inequitable? What are the processes we have in place to safeguard against these?
  - Equitably open access to data through responsible data sharing
    - Are my data practices (and those of my firm or organisation) currently supporting and advancing responsible data sharing?

(Excerpts from GPAI 2022)

## Your role as designer, developer or producer of data systems

Interrogate, understand, and critique harmful categorisations

- Do our data aggregation, categorisation, and labelling practices ensure that they accurately reflect the ways in which members of impacted communities self-identify? Do such practices (and those of reviewing automated labelling processes, where present) include the perspectives of members of impacted communities—especially of those who are marginalised, vulnerable, or historically discriminated against?
- Challenge existing, domination-preserving modes of participation
  - In what ways could the way we approach community participation and involvement in our data innovation practices and their governance operate to normalise or support existing power imbalances and the harmful data practices that could follow from them?
- Embrace the pluralism of knowledges
  - To what extent do we value non-technical, socially-situated knowledge in our work?

(Excerpts from GPAI 2022)

# Reminders

- Coursework due in two weeks
- **Class test is in-person**, on Week 13. JKCC @ 10am, 90mins test,
  - Format: multiple choice, will cover topics 1 - 10

# References

- Berland, M., & Garcia, A. (2024). The left hand of data: Designing education data for justice. MIT Press.
- GPAI (2022) Data Justice in Practice: A Guide for Developers. *ArXiv*.
- Pangrazio, L., G. Auld, J. Lynch, C. Sawatzki, G. Duffy, S. Hannigan, and J. O'Mara. 2024. Data Justice in Education: Toward a Research Agenda. *Educational Philosophy and Theory* ahead-of-print, no. ahead-of-print: 1–12.
- Taylor, L. 2017. What Is Data Justice? The Case for Connecting Digital Rights and Freedoms Globally. *Big Data & Society* 4, no. 2: 2053951717736335.