



Research opportunities in sustainability

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Tips for sustainability research

- A relatively nascent field: a lot of opportunities for cutting-edge research

Sustainable Data Engineering: Building Business Success With Eco-Friendly Innovations

[PDF] researchgate.net

[S Banerjee](#) - Driving Business Success Through Eco-Friendly ..., 2025 - igi-global.com
 ... **data**-driven, the environmental impact of managing vast amounts of information is often overlooked. **Data engineering**, ... the concept of **sustainable data engineering**, emphasizing the ...
 ☆ Tallenna 📄 Viittaa Viittausten määrä 22 Aiheeseen liittyviä artikkeleita Kaikki 4 versiota

Data Engineering in Sustainability: Building the Foundations for a Resilient Future

[KR Kotte](#) - ... on Promoting Environmental **Sustainability**, 2025 - Springer
 ... **data**. This chapter explores the essential role of **data engineering** in building resilient, **sustainable** ... By focusing on the core principles of **data engineering**, including **data** collection, ...
 ☆ Tallenna 📄 Viittaa Viittausten määrä 2 Aiheeseen liittyviä artikkeleita Kaikki 3 versiota

A data engineering approach for sustainable chemical end-of-life management

[PDF] sciencedirect.com

[JD Hernandez-Betancur, M Martin](#)... - Resources, Conservation ..., 2022 - Elsevier
 ... Hence, this work proposes an EoL **data engineering** ... This work uses publicly-available **data** to identify potential post-... A case study demonstration shows how the **data engineering** ...
 ☆ Tallenna 📄 Viittaa Viittausten määrä 17 Aiheeseen liittyviä artikkeleita Kaikki 7 versiota

Energy-Efficient Data Engineering: A Comprehensive Analysis of Sustainable Data Engineering Practices

[PDF] techrxiv.org

[H Bhoite](#) - Authorea Preprints, 2025 - techrxiv.org
 ... The clarion call for **sustainability** in **data engineering** has ... to **Sustainable Data Engineering**
 This paper embarks on a journey through the complex terrain of **sustainable data engineering**...
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Aiheeseen liittyvät haut

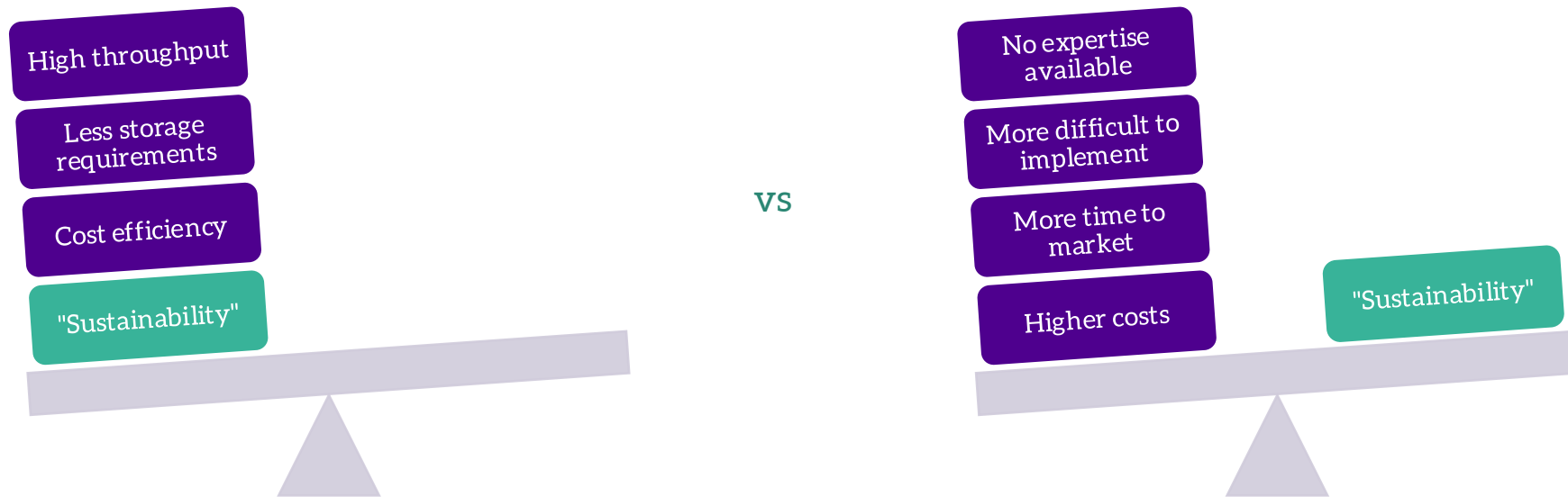
data engineering sustainable **learning**
 sustainable data **governance**
 data engineering **framework**
 data engineering **eco-friendly innovations**

data engineering **approach**
 data engineering **resilient future**
 data engineering **cloud platforms**
 data engineering **comprehensive analysis**

That's it...

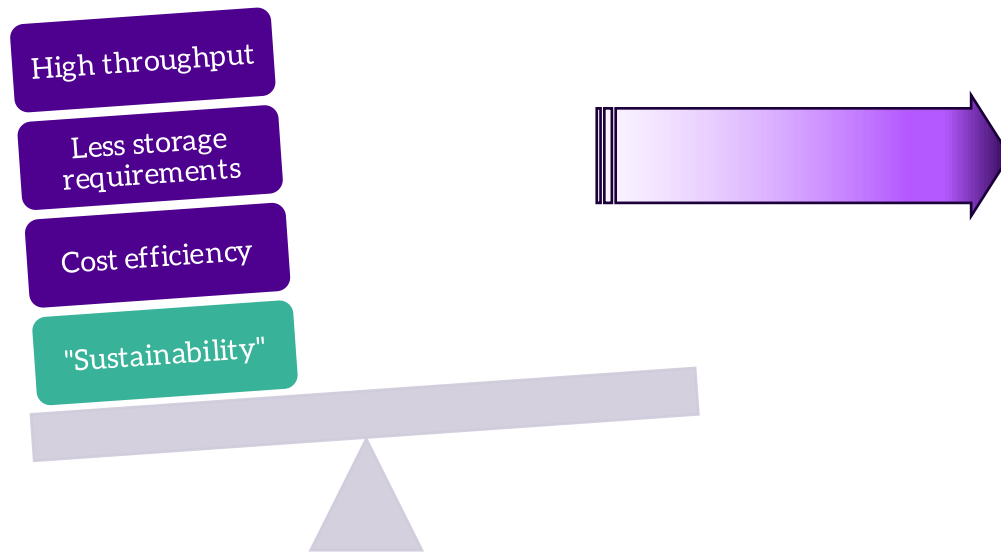
Tips for sustainability research

- Identify if your goal is aligned with some other (at least seemingly) important metric



Tips for sustainability research

- Identify contexts that benefit the most from sustainability



E.g., efficient storage & reduced energy consumption:

- Battery-powered devices
- Low-end hardware (IoT etc.)
- Data centers

Scale of things

MONDAY, 15 DECEMBER 2025 - 09:34

Data centers in Netherlands use as much power as 2 million homes

Data centers in the Netherlands are using increasingly more electricity. Last year, consumption rose to almost 5,100 gigawatt hours. According to Statistics Netherlands (CBS), this is equivalent to the power consumption of almost 2 million homes. Figures for this year are not yet available.

The electricity consumption of data centers has almost doubled in five years. Last year, data centers used almost 5 percent of all electricity in the Netherlands.

Global data center electricity use to double by 2026 - IEA report

AI and cryptocurrency workloads are driving up demand

January 26, 2024 By: Matthew Gooding [Have your say](#)

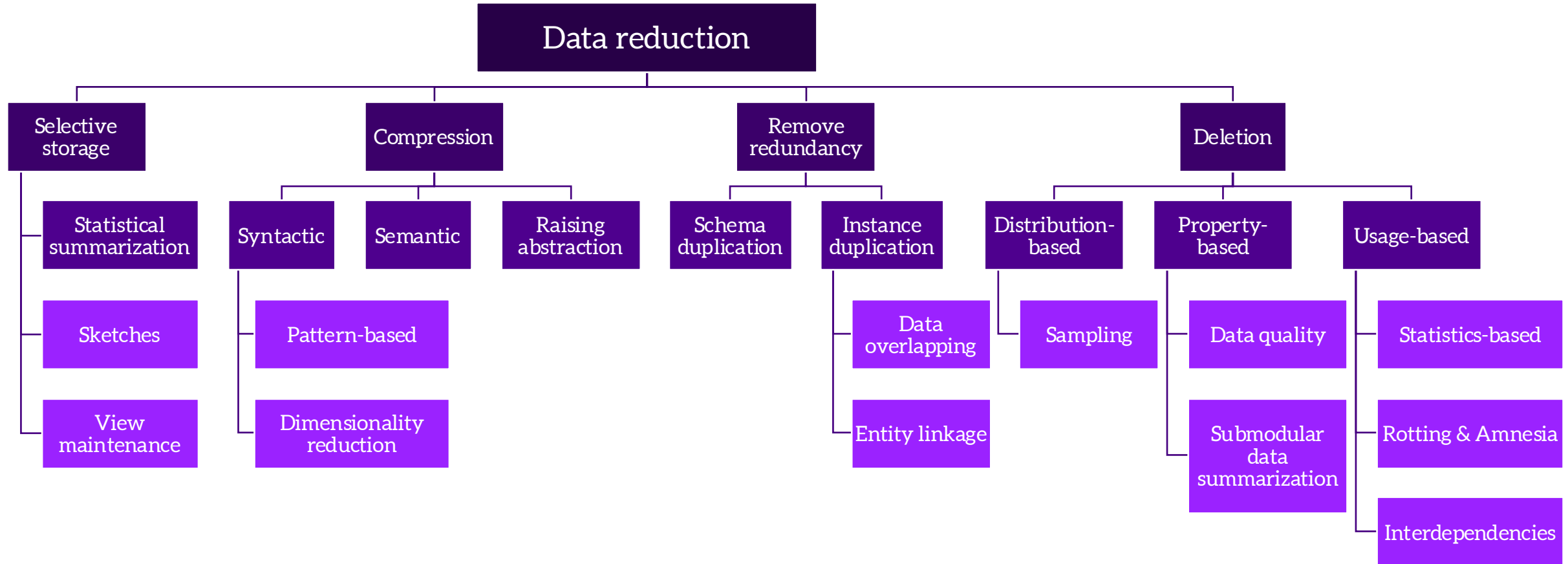


Data center electricity usage is set to double by 2026 according to a new report, which blames the rise of power-intensive workloads such as AI and cryptocurrency mining for this growing demand.

The annual electricity report from the International Energy Agency (IEA) says data centers consumed 460TWh in 2022, a figure that could rise to more than 1,000TWh by 2026 in a worst-case scenario.

“However, data storage is climbing the ladder on the list of sectors responsible for the largest carbon footprint. In fact, data storage now accounts for more carbon emissions than the commercial airline industry – and a single data center uses the same amount of electricity that can power up to 50,000 homes. Keep in mind, there are over 8,000 data centers all around the world, and as the need and desire for data storage continues to grow – so do the amount of data centers, eating up electricity, across the globe.”

Green data



Data reduction

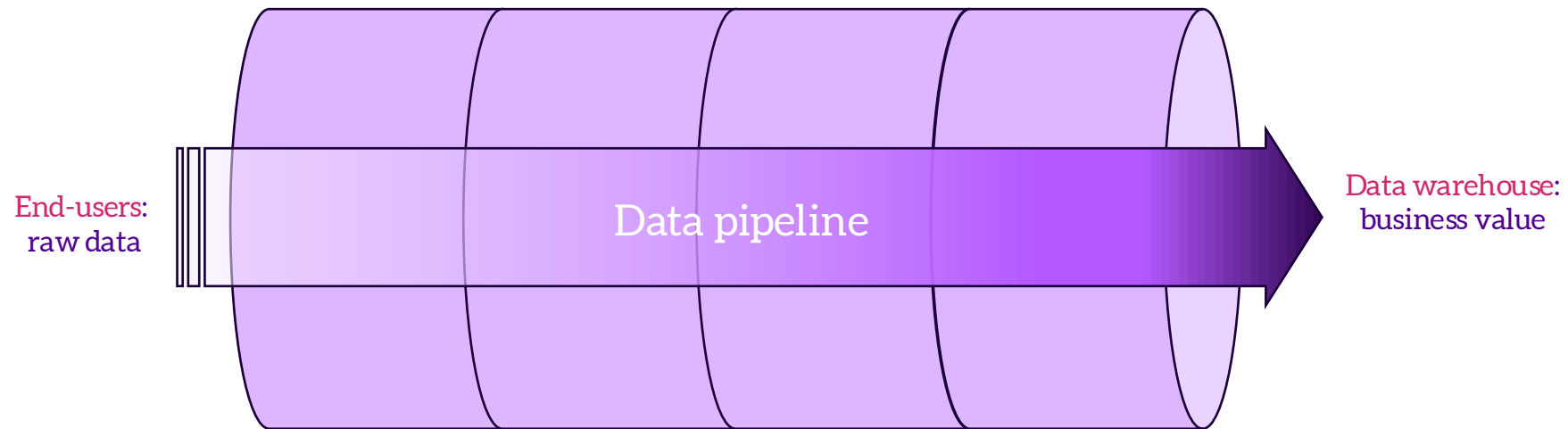
Remove
redundancy

abstraction

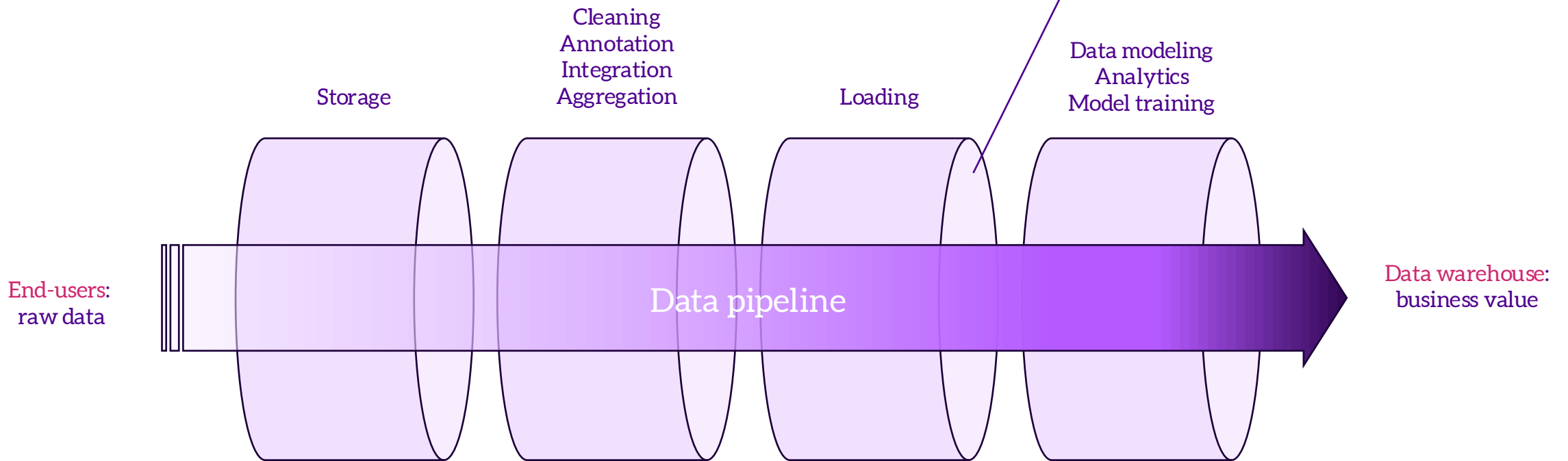
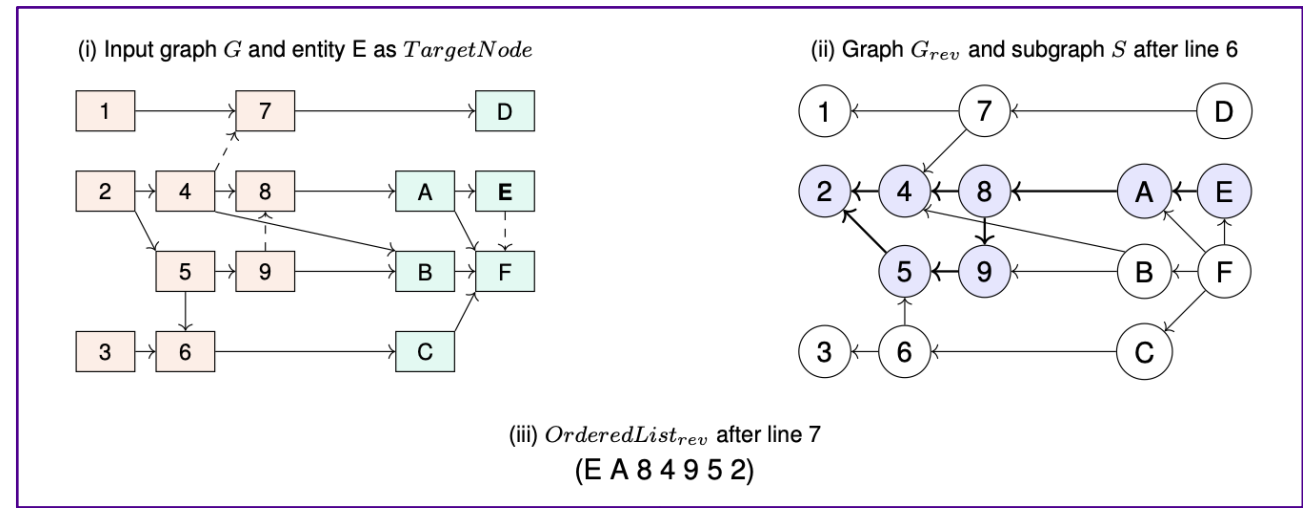
Schema duplication

Instance duplication

Smart data processing

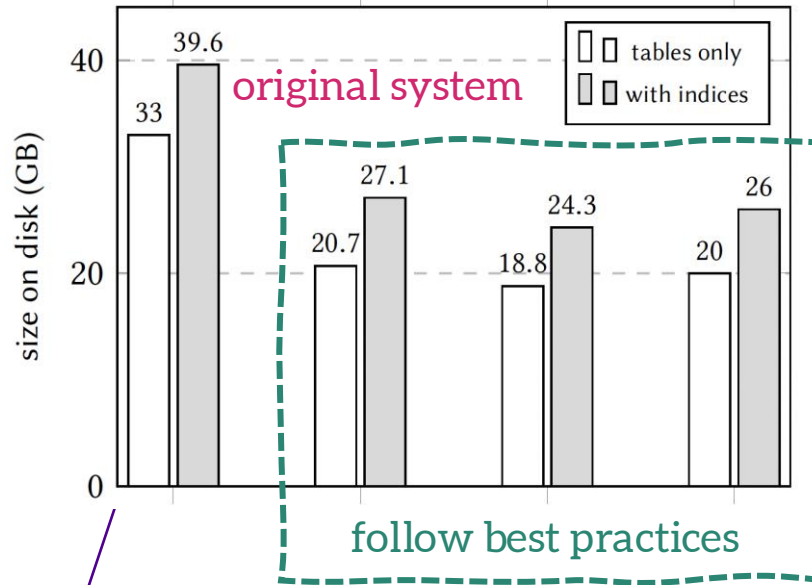


Smart data processing

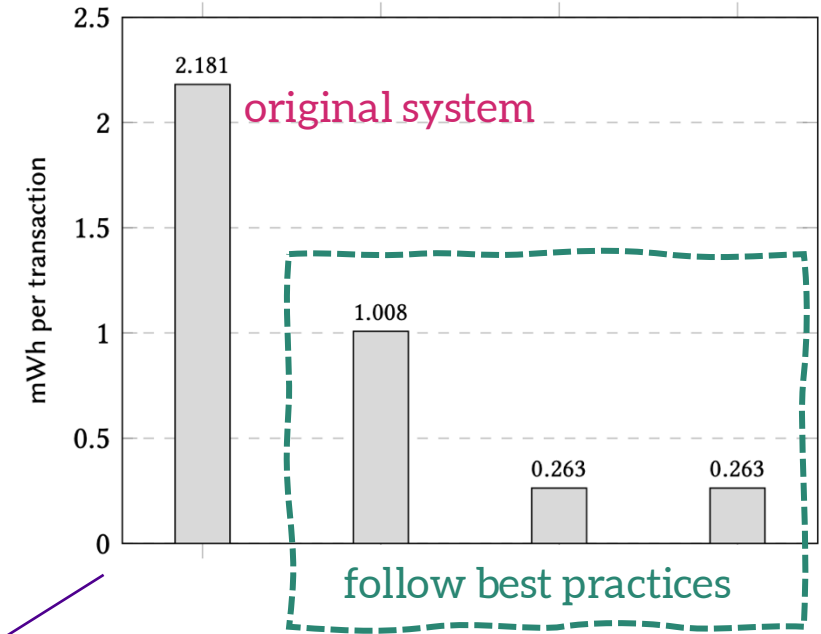


Smart data storage

storage requirements (lower = better)



energy consumption (lower = better)



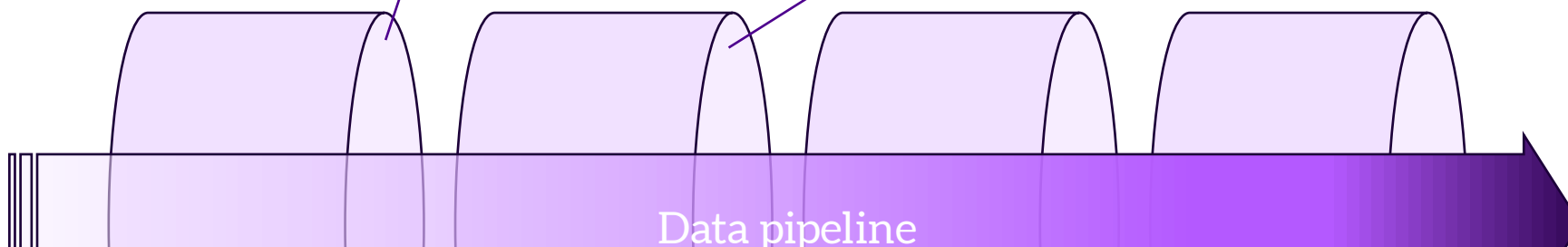
Storage

Cleaning
Annotation
Integration
Aggregation

Loading

Data modeling
Analytics
Model training

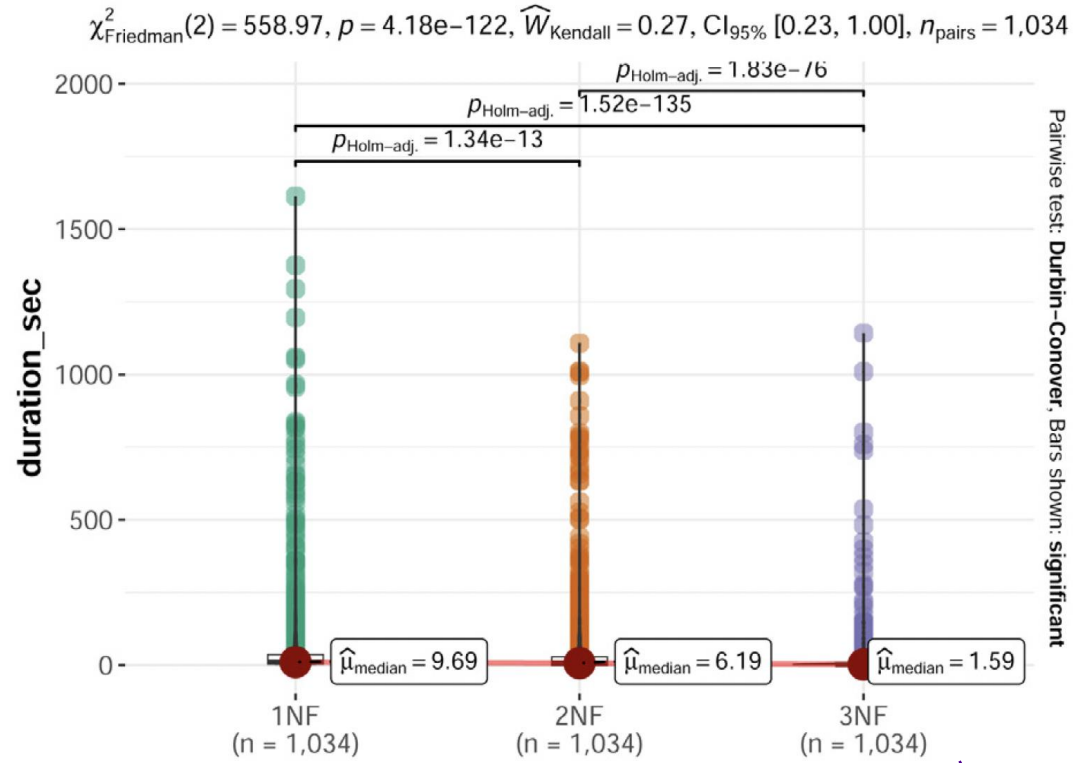
End-users:
more data



Data pipeline

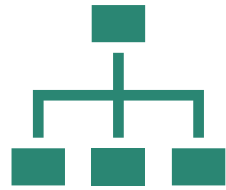
Data warehouse:
business value

Query Duration vs. Normal Form – PostgreSQL



Research directions for sustainability

- What would increase your likelihood of adopting *green data engineering* practices? (N = 601)



1. Clear organizational support
(55% of respondents)

“I know what to do, how to do it,
and why it is important.”

There is just no
professional incentive
to do it.”

-Anonymous data engineer



4. External regulations
(35%)



2. Better tools and
frameworks
(53%)



3. Quantifiable metrics
(41 %)



5. Peer behaviour
(32 %)

DBS research group



Thank you