Reclaiming Knowledge: Open Science Meets Digital Humanism

Dr. Katja Mayer
Digital Humanism Summerschool 2025

From where do I speak?

- Feminist epistemology
  - Explores how knowledge is situated, shaped by social contexts, particularly gender, and challenges "neutral" perspectives by valuing diverse standpoints and experiences, aiming for more inclusive, socially just ways of knowing.
- Science and Technology Studies (STS)
  - Examine how science and technology shape, and are shaped by, society, culture, and politics. Explores the social, historical, and ethical dimensions of scientific knowledge and technological innovation, and issues like power, authority, institutionalisation…
- Postdigital Posthumanism ;-)
  - Views technology as inseparably intertwined with human existence, emphasizing a world beyond dualities where human and non-human, organic and technological entities co-evolve in complex, interconnected systems.

Kulle, Daniel/Lund, Cornelia/Schmidt, Oliver/Ziegenhagen, David: „Welcome to Post-Digital Culture: A Short Introduction." ——: *Post-digital culture*, http://www.post-digital-culture.org.Haraway, D. J. (1985). A cyborg manifesto: Science, technology, and socialist-feminism in the late twentieth century. In Simians, cyborgs, and women: The reinvention of nature (pp. 149–181). Routledge.; Hayles, N. K. (1999). How we became posthuman: Virtual bodies in cybernetics, literature, and informatics. University of Chicago Press.; Braidotti, R. (2013). The posthuman. John Wiley & Sons.

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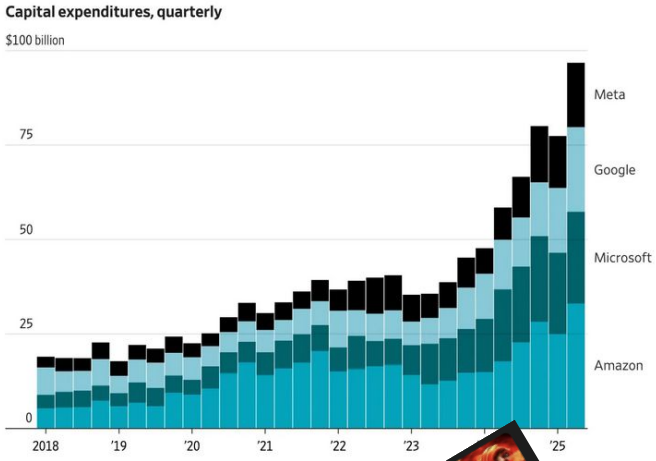

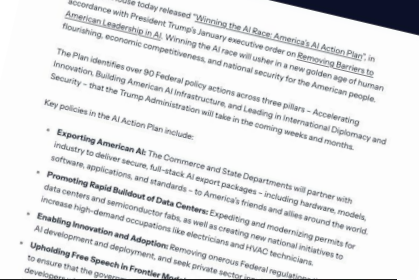

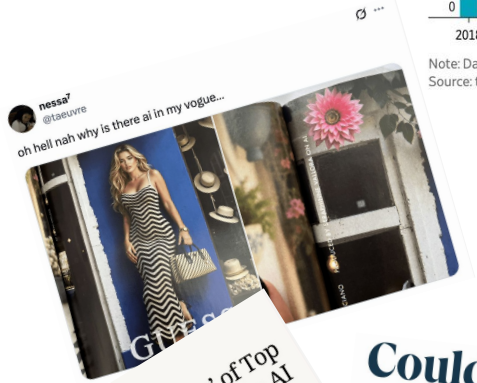

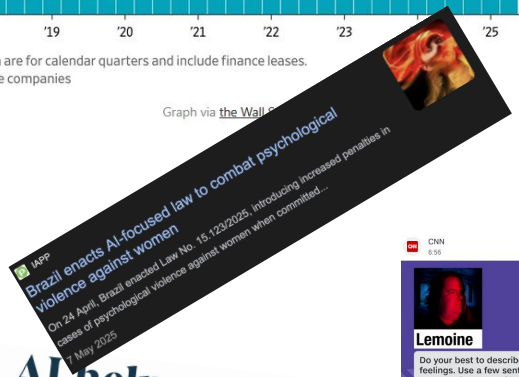

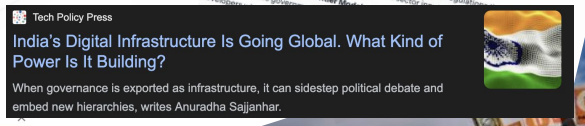

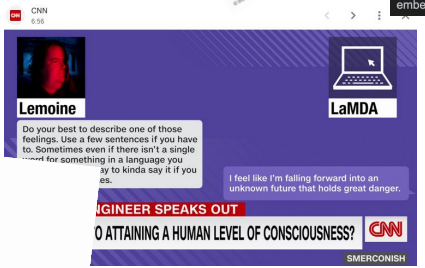

A 'Shocking Number' of Top AI Researchers Don't Use AI
THE ALGORITHMIC BRIDGE
by Alberto Romero

Could AI help save the planet? Four ways it's already making a world of difference

AI: Bubble, Threat, Hype, Solution….

Digital Humanism and Open Science

Digital Humanism

Open Science

Open science is the idea that **scientific knowledge of all kinds** should be openly shared as early as is practical in the research process.
Open Science is a foundation of Digital Humanism because its tools to align knowledge production with **democratic values, ensuring that research is accessible, participatory, and directed toward the common good.**

Sticker by Jon Tennant @protohedgehog and Melanie Imming @melimming

Why Open Science?

- Replication crisis
- Competitive and not cooperative practices
- Massification, competition, embargos, positivity bias unproductivity
- Monopolized and expensive publication markets
- Privatization of infrastructures and problems of knowledge ownership / knowledge access
- Non-recognition of importance of knowledge commons outside of specialist communities
- Brain Drain and publish or perish...

Just some of the problems of the science system….

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Open Access

https://en.wikipedia.org/wiki/Paywall:_The_Business_of_Scholarship

Open Access explained: https://phdcomics.com/

Further information:
https://open-access.network/en/home

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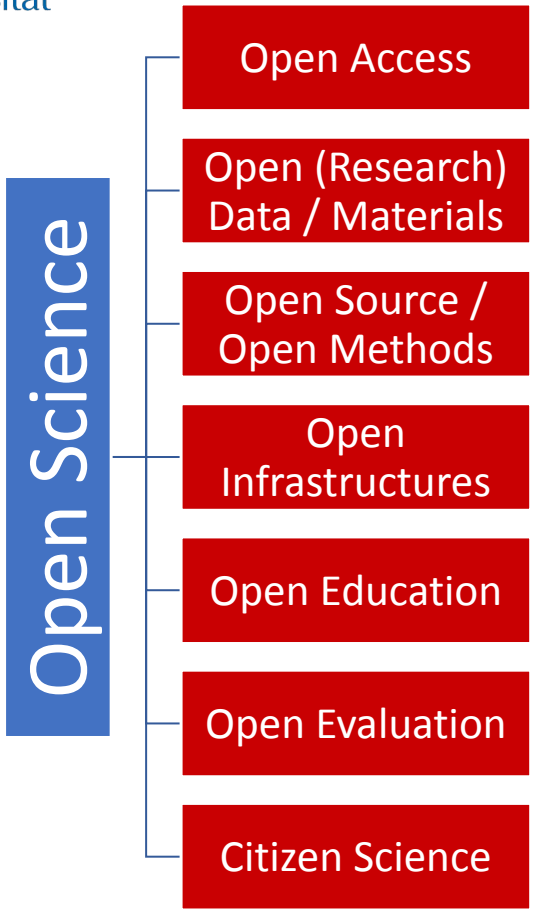

Open science is the idea that scientific knowledge of all kinds should be openly shared as early as is practical in the research process.

Open strategies in science share the following objectives

- sharing and collaboration
- transparency and reproducibility
- re-usability and new applications
- societal participation and feedback loops

How is openness envisioned and enacted in practices?

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OPEN SCIENCE – OPEN CULTURES

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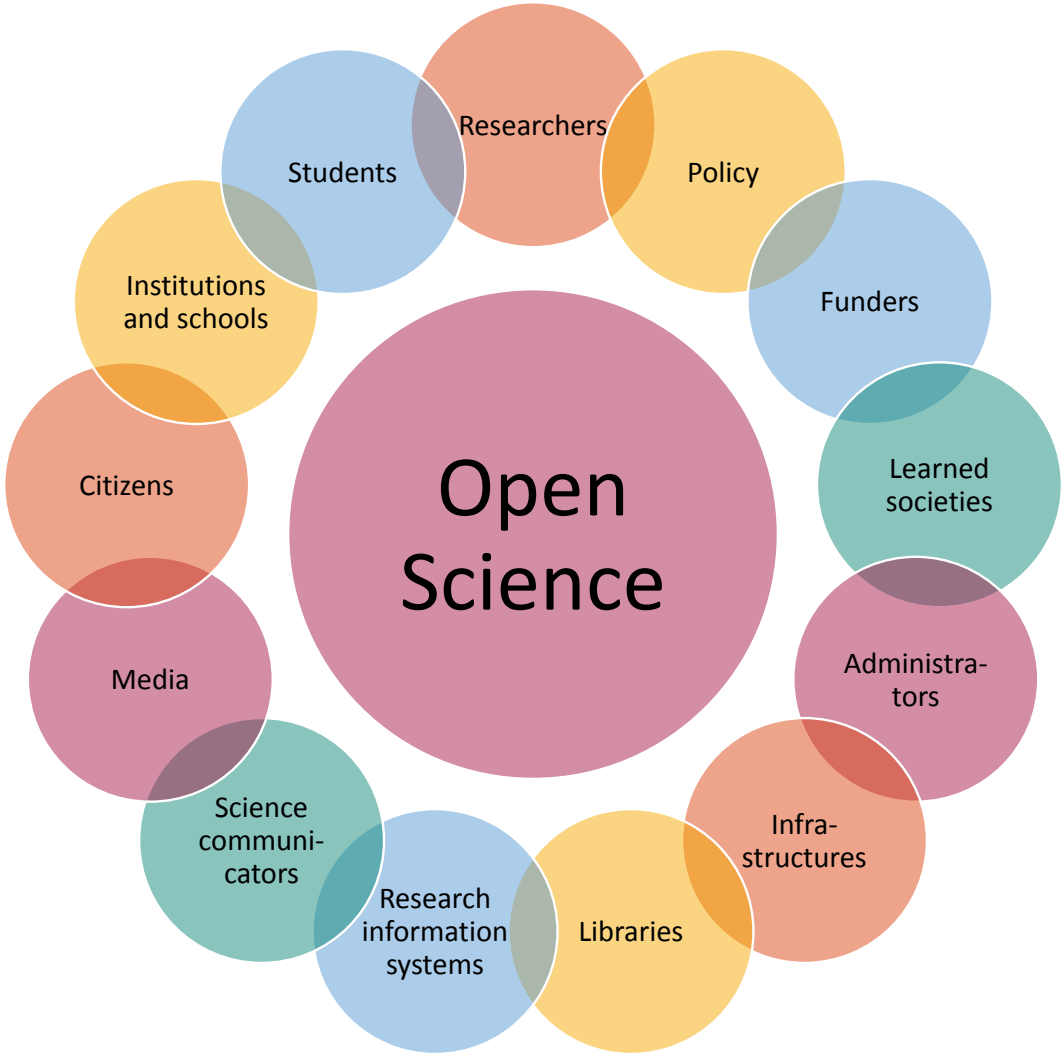
DOING SCIENCE INVOLVES MANY STAKEHOLDERS



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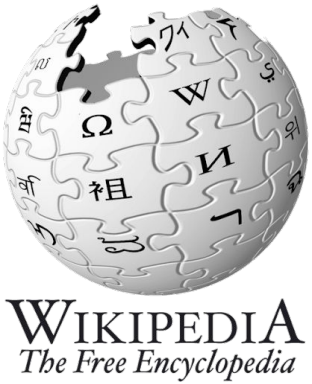
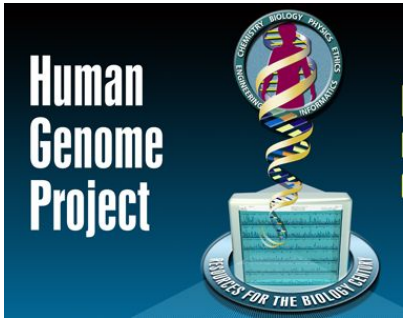
The Knowledge Commons …

Are intentionally shared resources of information, data, and knowledge that are accessible to all, allowing collective use, contribution, and management. Such resources are often curated, maintained, and governed by communities to ensure accessibility, quality, and ethical use.

Examples:





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Open Science in Europe: Now the Norm…

- **Horizon Europe**
  - Open Access to publications is **mandatory**
  - Data must follow **FAIR principles** (*as open as possible, as closed as necessary*): findable, accessible, interoperable and re-usable

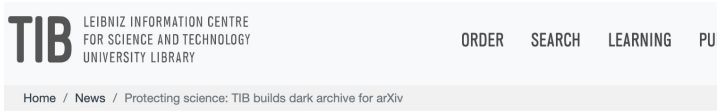
- **EOSC (European Open Science Cloud)**
  EU-wide infrastructure for sharing and reusing research data

- **Plan S / cOAlition S**
  Publicly funded research must be in **Open Access** venues

- **OpenAIRE & Open Research Europe**
  Tools and platforms to help researchers comply

→ **Open Science is no longer optional – it is built into funding, infrastructures, and evaluation.**

Openness under attack….



TIB LEIBNIZ INFORMATION CENTRE FOR SCIENCE AND TECHNOLOGY UNIVERSITY LIBRARY

ORDER SEARCH LEARNING PU

Home / News / Protecting science: TIB builds dark archive for arXiv

Protecting science: TIB builds dark archive for arXiv

Long-term protection for international research content

Science is international – and free access to the latest research findings is a key requirement for scientific progress. The arXiv.org platform plays a very important role here: a globally used online platform for so-called preprints – i.e. pre-publications of scientific papers that have not yet been peer-reviewed. Since 1991, arXiv has been an essential part of scientific communication, especially for the fields of physics, mathematics and computer science.

Although arXiv is operated by Cornell University in the USA, it is financed internationally. Together with the Helmholtz Association of German Research Centres (HGF) and the Max Planck Society (MPG), the TIB – Leibniz Information Centre for Science and Technology provides the German share of funding for the service.

TIB takes responsibility for arXiv data

The TIB has now set up a so-called dark archive for the arXiv content in order to be able to make the

https://www.tib.eu/en/news/details/protecting-science-tib-builds-dark-archive-for-arxiv

OI	FUNDER	DIRECT
arXiv	National Science Foundation (NSF)	$4,966,530
Dataverse	National Institutes of Health (NIH)	$1,752,129
Open Science Framework (OSF)	National Science Foundation (NSF)	$1,498,214
Dryad	National Institutes of Health (NIH)	$1,380,325
Zenodo	National Institutes of Health (NIH)	$1,301,638
Knowledge Commons	National Endowment for the Humanities (NEH)	$500,000
2i2c	National Aeronautics and Space Administration (NASA)	$362,875
Total		**$11,761,711**

https://investinopen.org/blog/the-potential-impact-of-federal-funding-instability-in-the-united-states/

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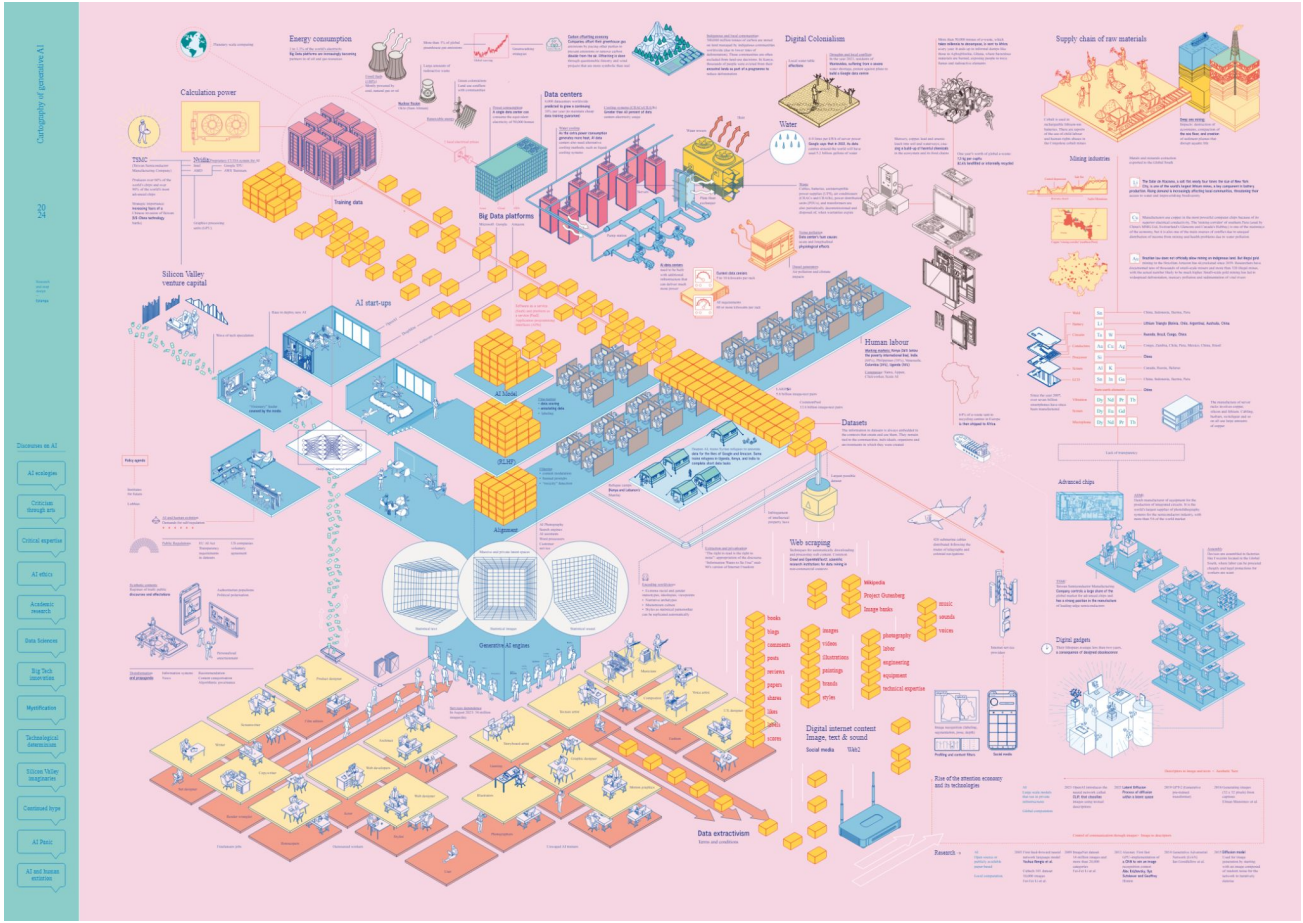
Example:

GenAI And LLMs Training



ESTAMPA (2023) https://cartography-of-generative-ai.net/

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What Is a Large Language Model (LLM)?

An **LLM** is an AI system trained on massive text datasets to predict the next word (or token) in a sequence. By repeating this prediction billions of times, the model learns grammar, facts, styles, and reasoning patterns.

How It Works

- **Input:** A prompt (question or text).
- **Processing:** The model uses learned probabilities to generate the most likely continuation.
- **Output:** Human-like text — answers, stories, summaries, translations, etc.

LLMs are the **backbone of modern chatbots**. Chatbots = **LLM + dialogue interface + fine-tuning** → making the model conversational, safe, and user-friendly.

→ LLMs don't *think* — they **predict text based on patterns** in their training data.

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Training Data for AI (Large Language Models)

Large collections of text, images, or code used to teach AI systems to recognize patterns and generate outputs. They are the **backbone of large language models (LLMs).**

Most Common Sources

- **Web crawls:** e.g. *Common Crawl*
- **Encyclopedic sources:** e.g. *Wikipedia*
- **Books & literature:** e.g. *Project Gutenberg*, academic corpora
- **Image-text pairs:** e.g. *LAION* datasets
  Code repositories: e.g. *The Pile*, GitHub scrapes

Controversial?

Datasets often mix high-quality with low-quality or harmful content.

Example: *LAION-5B* (an open image-text dataset) was found to include links to **child sexual abuse material**, triggering scandals and debates about safety, legality, and accountability in open dataset curation.

→ Training datasets are **vast, powerful, and risky** — they shape what AI knows, but also carry forward biases, errors, and harmful content.

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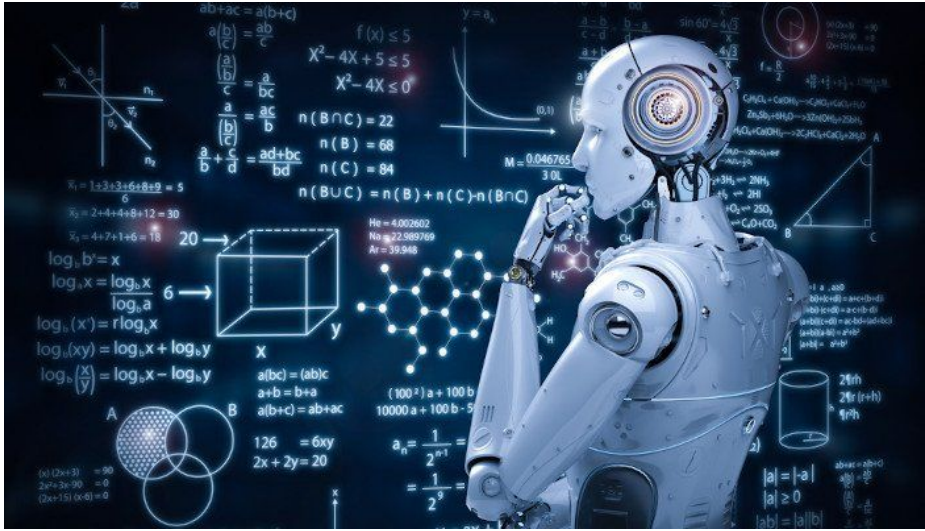
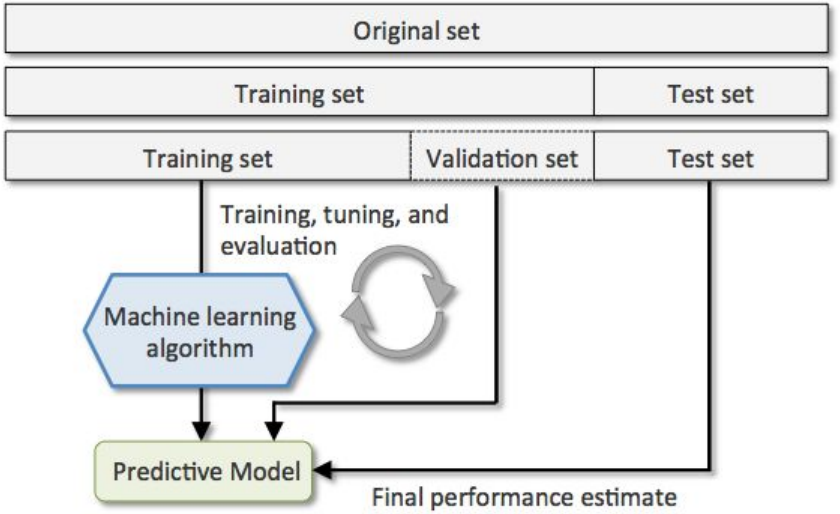
Training data

A **training dataset** is a collection of examples (also called target variables) used to help the algorithm **learn patterns and relationships** within the data. The algorithm is adjusted based on this training dataset — in other words, it **learns from this data**.





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AI stack

is a layered system of technologies, infrastructures, and tools that work together to collect data, build models, and deliver AI applications to users. It operates across two dimensions:

Vertical Axis:

Layers of the AI Stack

1. **Data Layer**
   – Collection, storage, processing, and governance of data
   – Foundation for training and evaluating models
   – Databases, data cleaning tools, data pipelines
2. **Model Layer**
   – Algorithms and models that learn from data and make predictions
3. **Infrastructure Layer**
   – Physical and cloud-based computing resources to support model development
   –GPUs, servers, cloud platforms (e.g., AWS, GCP), containerization (Docker, Kubernetes)
4. **Application Layer**
   – Interfaces where users interact with AI systems (e.g., apps, chatbots, APIs)
   – Front-end tools, UI/UX, integration platforms

Horizontal Axis:

Cross-Cutting Tools & Frameworks

- **Programming Languages**: Python, R
- **Machine learning frameworks** (e.g., TensorFlow, PyTorch), LLM libraries (e.g., Hugging Face)
- **Data Management Systems**: MongoDB, SQL, vector databases (for embeddings)
- **Cloud Services**: AWS, Azure, GCP
- **Monitoring & Evaluation Tools**: MLFlow, Weights & Biases
- **Deployment Tools**: Docker, CI/CD pipelines
- **LLM Frameworks & APIs**: OpenAI, Hugging Face, Cohere
- **Governance & Ethics Tools**: model cards, datasheets, fairness audits

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The open foundations of Generative AI

Open Source

Open source licenses ensure that software can be freely shared, modified, and used by anyone, with source code access and without discrimination, while remaining adaptable across technologies.

Frameworks like TensorFlow, PyTorch, platforms for code and data sharing, collaboration and evaluation (GitHub, Kaggle, Hugging Face, …)

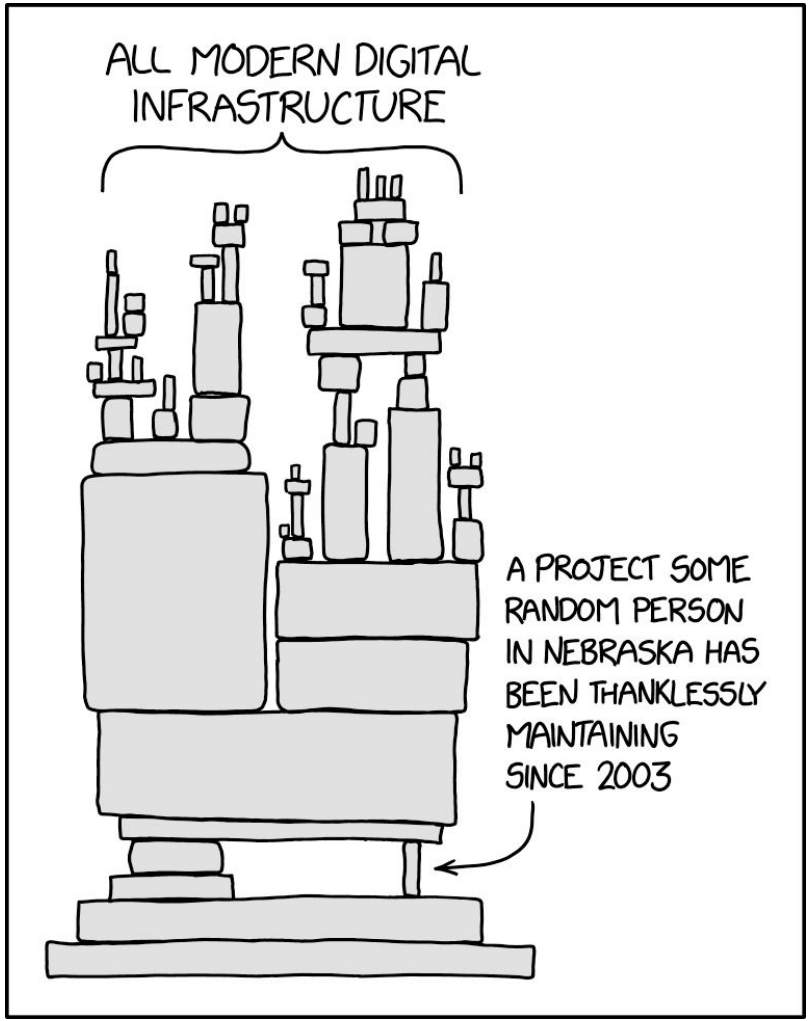
Open Science

Open science promotes free access to research publications, data, and methods, encouraging transparency, collaboration, and inclusivity in knowledge production for the benefit of society.

Open access repositories for research papers, data and model cards (arXiv, Zenodo…), open educational resources

See also the recently published definition of Open Source AI: https://opensource.org/ai

Dependencies and supply chains….



https://xkcd.com/2347/

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A group exercise / challenge

Investigate LLM Training….

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Mini-Exercise: Studying Apertus (15 min)

Apertus = a Swiss initiative for an **open, transparent LLM**
Question: *What does it do differently?*

Explore (10 min)

- ➢ Go to https://www.swiss-ai.org/apertus
- ➢ In pairs/small groups, explore the website

Look for information on:
Training data – what do they say about sources?
Openness & governance – how is it organized?
Energy and Sustainability - what is said about energy use?
Values – what principles guide the project?

Share and Reflect in the plenum

- Each group names 2–3 findings
- Collect keywords on the board/flipchart
- How does this connect to **digital humanism**?
- Why do knowledge commons matter for **open science & AI**?

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Wikipedia as important AI knowledge base

- **Not "facts" but *facts about facts***: content must be **sourced**, not based on editor credentials.
- **Verification shift**: from *who says it* → to *what reliable source says it*.
- **Openness works**: anyone can edit, but claims must cite **noteworthy & reliable sources**.
- **Resilient & scalable**: enables collaboration across strangers, reduces disputes, supports global access.
- **AI training ground**: Wikipedia's open, structured, source-linked content makes it a cornerstone for **language model training**.

→ *A knowledge commons built on verifying sources, not gatekeeping expertise.*

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Challenges of Openness in the Age of AI

- **Commons are essential**: Wikipedia, open data, open code fuel today's LLMs
- **But models are closed**: Training data, methods, and weights often undisclosed
- **Hidden labor**: Low-paid data workers (often in the Global South) clean and label data
- **Copyright & ethics**: Content reused without consent, authors unpaid
- **Power concentration**: A few corporations extract public resources to build private empires

→ **Openness empowers—but also exposes.**

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Paradox of Openness: Two Faces of Open

- **Empowering Challenge**
  Openness disrupts monopolies—empowering public knowledge, peer production, free access, and cultural commons (e.g. Wikipedia, open data, OERs).

- **Unintended Enabler**
  The same openness can reinforce concentrated power—platforms (think Big Tech) exploit open resources while keeping control, embracing platform logic over open values.

Core Tension

Open equals freedom—but not protection.
Open content flows easily—but often into corporate “walled gardens” that monetize, restrict, or reframe it. The original emancipatory intent is co-opted.

https://openfuture.eu/publication/the-paradox-of-open/

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To reclaim openness as a truly public value, we must:

Redefine Open: Focus on public-benefit-centered sharing—balancing transparency with equity, privacy, and governance.

Build Alternatives: Invest in open infrastructure—not just unilateral access tools, but public digital spaces resilient to platform power.

This paradox of openness sits at the heart of *digital humanism*:
Openness alone isn't enough. We need **more attention to infrastructural politics** to ensure open knowledge remains democratic, just, and resilient.

https://openfuture.eu/publication/the-paradox-of-open/

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AI Knowledge Commons

… are socio-technical infrastructures that need resources, curation and community governance!

- Open Datasets
- Model Repositories
- Computational Infrastructure
- Open-Source Frameworks and Libraries
- Knowledge and Educational Resources
- Ethics and Policy Guidelines
- Community-Driven Language and Cultural Resources
- Collaborative Research Networks and Projects

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Open Science: What Can We Do for the (gen)AI Knowledge Commons?

- **Open Datasets** → publish research data with good metadata; contribute to FAIR repositories for training data; improve open data sources (e.g. Wikidata)
- **Model Repositories** → share trained models; document them clearly (datasheets, model cards, energy scores)
- **Computational Infrastructure** → advocate for shared HPC access on infrastructures controlled by community; join cooperation pilots (e.g. EOSC, national clusters); build smaller AI; study how to better design federation and interoperability
- **Open-Source Frameworks & Libraries** → contribute code, bug reports, or tutorials; help to monitor and maintain
- **Knowledge & Educational Resources** → create open teaching materials, share lecture slides, write explainers/blogs; use knowledge commons in teaching (contribution and care)
- **Ethics & Policy Guidelines** → join consultations; reflect on openness vs. responsibility in your projects; discuss political economies, governance and merit of openness;
- **Community-Driven Language & Cultural Resources** → help build knowledge together with underrepresented languages/cultures and make sure they benefit their communities;
- **Collaborative Research Networks** → participate in open workshops, share preprints, join citizen science, initiate interdisciplinary conversations

→ These examples show: **Open Science is a set of daily practices where each of us can contribute.**

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Photo: Climate Camp Ireland

Socio-technical Infrastructures as Sites of Intervention for the AI Knowledge Commons

Enhancing Digital Humanism with an Infrastructural Lens…..

Dr. Katja Mayer, 8 Sept 2025

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Socio-technical system

A socio-technical system is an interconnected network of social and technical elements that interact and influence each other. This concept is central to sociology and science and technology studies (STS), where it is used to analyse how human actors, social practices, organizations, and technological infrastructures co-evolve and shape one another. The focus is on understanding the mutual dependencies between society and technology, recognizing that neither operates in isolation but rather as part of a complex, integrated whole.

See also: Hughes, T. P. (1987). The Evolution of Large Technological Systems. In Bijker, W. E., Hughes, T. P., & Pinch, T. (Eds.), The Social Construction of Technological Systems (pp. 51-82). MIT Press.

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The infrastructural lens….

… promotes openness (not just transparency) and to address the foundational systems—entanglements of technological and social components—that shape access, equity, and control in the digital realm, ensuring that (more than) human-centered values are embedded not just in applications, but in the very structures enabling digital interaction - politically, materially, culturally, …..

It is not just about creating and developing socio-technologies, it is about maintaining, regulating and governing them.

→ help establish these **AI Knowledge Commons**—shared, accessible resources for data, models, and tools—ensuring they are collectively managed to promote open collaboration, equitable innovation, and public good in AI development.

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Conclusions….

Digital Humanism and Open Science

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Digital Humanism

supports open, responsible research and innovation (far beyond AI development) by advancing a balanced approach that values human agency alongside technological development, countering techno-solutionism and fostering research that is scientifically sound, ethically grounded and socially responsive.

- What would responsible AI or open science infrastructures look like?
- What tensions emerge between openness, accountability, and care?
- How do we avoid extractive or exploitative openness?

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Initiatives in action…. in need for reliable knowledge

Advocacy for Open-Source AI Models: Promoting open-source development to democratise AI access, enabling broader participation and innovation.

Ethical AI Development Frameworks: Establishing guidelines for fairness, transparency, and accountability to align AI with societal values. Ensuring diversity in AI development to prevent bias and promote equity.

Policy Advocacy and Regulation: Pushing for safeguards against consumer risks, harmful biases, privacy violations, and misuse of AI to protect citizens and ensure AI systems are trustworthy and transparent.

Environmental Justice: Highlighting the environmental impact of AI, advocating for sustainable practices and transparency around energy use; the rise of the GreenAI industry is dedicated to minimising AI's carbon footprint and reducing other resource dependencies.

Labor Rights and Fair Compensation: Exposing exploitation in AI workforces, demanding fair compensation for creators, transparency in AI-driven workplace surveillance.

Publicly Governed AI Infrastructures: Calls to establish publicly governed AI resources, like language models, to ensure that powerful AI tools serve the public good and are not solely controlled by private interests. Establish benchmarks for evaluation.

Digital Humanism by action, not by title…..

TRUTH IN TECH

THESE WOMEN TRIED TO WARN US ABOUT AI

Today the risks of artificial intelligence are clear — but the warning signs have been there all along

By LORENA O'NEIL
Photographs by Gioncarlo Valentine
AUGUST 12, 2023

Timnit Gebru, Rumman Chowdhury, Safiya Noble, Seeta Peña Gangadharan, and Joy Buolamwini (from left)
https://www.rollingstone.com/culture/culture-features/women-warnings-ai-danger-risk-before-chatgpt-1234804367/

Individuals or initiatives embodying the principles of DH such as prioritising ethical technology development, inclusivity, and social responsibility — without explicitly using the term.

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Digital Humanism in Action: Reclaiming knowledge…..

1. **Deepening the understanding of the intricate social and technical entanglements within infrastructures,** recognizing that societal values, power dynamics, and technology are interwoven and shape each other in complex ways, influencing how knowledge and agency are distributed
2. **Defending Openness Against Extremist Politics:** Openness in science, technology, and knowledge commons supports democratic values by fostering transparency, collaboration, and an informed society. Authoritarian regimes often resist openness as it challenges their control over information and undermines censorship.
3. **Supporting Open Science for Critical Inquiry:** Open Science is not only about public access but also empowering science to examine and hold AI and other technologies accountable. This access allows researchers to scrutinise socio-technologies, identifying biases, ensuring ethical standards, and protecting public interest.
4. **Building Infrastructures for an Inclusive Knowledge Commons:** Digital Humanism can advocate for building and sustaining inclusive, shared infrastructures to democratise AI and technology. Open AI knowledge commons enhance public access, equitable innovation, and collective governance.