The use of Artificial Intelligence in Open Science.
Opportunities, limitations, and ethical considerations

FPSE – Journal Club - Unige

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Artificial Intelligence in Open Science - Opportunities, limitations, and ethical considerations

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21/11/2025

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START-UP

Best practices

Institutional tools

Copilot

UNIGE Practical Guide

septembre 2024

GUIDE À L'INTENTION DE
LA COMMUNAUTÉ UNIVERSITAIRE
V1.0 - septembre 2024

INTELLIGENCE ARTIFICIELLE GÉNÉRATIVE →

UNIVERSITÉ DE GENÈVE

[Acces to guide on-line](#)

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Institutional Position Statement

`1er juillet 2024`

Principles for Using Generative AI

- Liability

- Legality

- Academic integrity and transparency

- Economy and Ecology

Link to the official position statement

Role of faculties and interfaculty centres.

Faculties and interfaculty centres are responsible for determining how AI is integrated into their teaching activities and for defining specific conditions for the use of generative AI tools in research, teaching, and learning..

Liste des recommandations facultaires (blog CIEL)
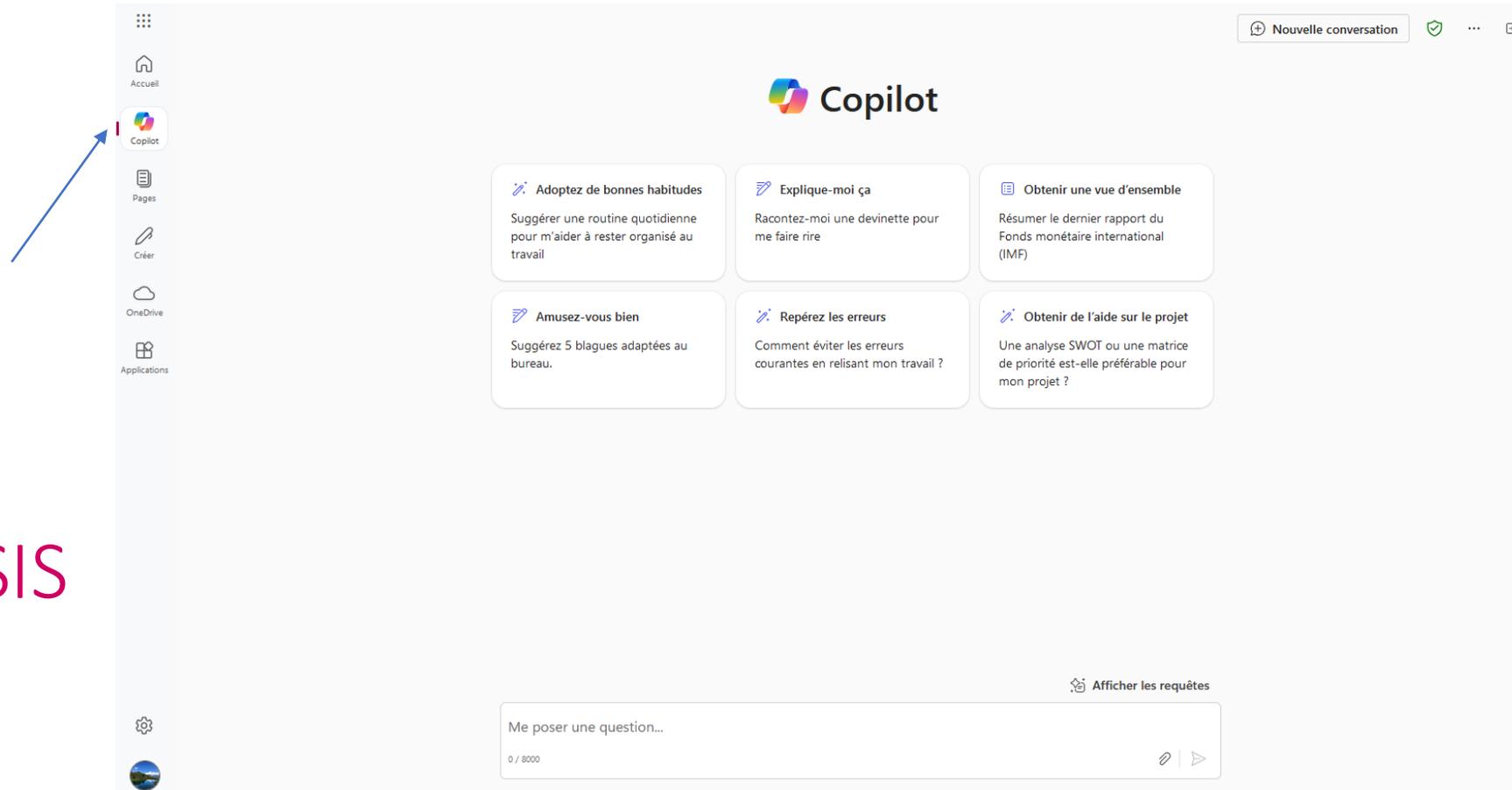
Prise de position sur l'intelligence artificielle

L'Université de Genève (UNIGE) soutient l'évolution de l'intelligence artificielle (IA) et est favorable à son utilisation. Elle y voit surtout une opportunité, partant du principe que les risques qui y sont liés peuvent être minimisés par une approche responsable. L'UNIGE est consciente du fait que l'IA ne se limite pas à un changement technologique, mais engendre aussi des transformations importantes dans presque tous les domaines. Ces conséquences exigent une réflexion globale et interdisciplinaire pour permettre à l'UNIGE de répondre au mieux à ces enjeux dans le cadre de ses missions.

VISION POUR L'INTELLIGENCE ARTIFICIELLE

PRINCIPES D'UTILISATION DE L'INTELLIGENCE ARTIFICIELLE GÉNÉRATIVE

RÔLE DES FACULTÉS ET CENTRES INTERFACULTAIRES

How to connect to Copilot?

login ISIS
UNIGE

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Other ways to log in

- https://m365.cloud.microsoft/

- https://copilot.microsoft.com/

- https://bing.com/chat
(switching to a professional account)

- Unige credentials: email + password / ISIS

- For further information
  - https://plone.unige.ch/distic/pub/microsoft-365/microsoft-copilot-chat

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Recommendations

Unige library / Publishers

Unige Library Guide to Reference use of AI
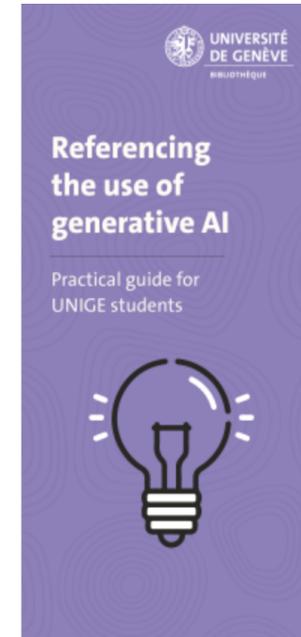
Guide: referencing the use of GenAI

The use of Generative Artificial Intelligence (GenAI) tools such as ChatGPT to support the completion of work carried out at university is increasingly common.

In the context of certain courses, the use of GenAI may be authorized by the teaching staff to carry out certain tasks such as generating a work plan, a summary, to find document references linked to a thematic or for translations. In this case, the contribution or use of these tools must be clearly identified and referenced in the work, whether in the body of the text, in a footnote or even in complete form in the bibliography which can be found at the end of the document.

In order to help students correctly reference the use of generative AI in their study work, the UNIGE Library has developed a practical guide **"Referencing the use of generative AI"**.

UNIVERSITÉ DE GENÈVE
BIBLIOTHÈQUE

Referencing the use of generative AI

Practical guide for UNIGE students

Guide_Referencing_GenAI.pdf

https://www.unige.ch/biblio/en/news/archive/2024/guide-iag/

https://www.unige.ch/biblio/index.php/download_file/10807/4662/

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Unige Library Guide to Reference use of AI

When do you need to reference the use of GenAI?

* = Required

Copy and paste all or part of a GenAI output

⇒ * Cite/credit the relevant excerpt (for text, between quotation marks) in accordance with the citation standard followed
⇒ Include the content of the conversation with the GenAI in an appendix
⇒ Specify, for example in a table, the use of GenAI

Paraphrase, reformulate or edit the output of a GenAI

⇒ * Cite/credit the relevant excerpt in accordance with the citation standard followed
⇒ Include the content of the conversation with the GenAI in an appendix
⇒ Specify, for example in a table, the use of GenAI

Paraphrase, reformulate or edit the contents of **several outputs of one or more GenAI** and/or **translate** your text or a quotation

⇒ * Cite/credit the relevant excerpt in accordance with the citation standard followed
⇒ Specify, for example in a table, the use of GenAI

Use a GenAI to generate the **outline** of the work and/or to **get feedback** on your text

⇒ Specify, for example in a table, the use of GenAI

Use a GenAI to find **ideas** (before writing) and/or to find **references** and/or to **translate a reading**

⇒ No credit required

How to **credit** GenAI outputs

When the context does not allow GenAI outputs to be considered as sources, it is possible to credit the use of GenAI, for example:

1. Insert a **footnote** after the relevant passage in the text, specifying the use of GenAI
2. In the **"Acknowledgements"** section
3. In the **"Methods"** section

In this case, these sources are not included in the bibliography at the end of the document.

How to **cite** GenAI outputs

Depending on the curriculum followed and the requirements of the teaching staff, students may be required to follow a particular bibliographic style. The MLA style, for example, provides the following recommendations for formatting a citation:

In the text: ("Describe the symbolism")
In the bibliography:
"Describe the symbolism of the green light in the book *The Great Gatsby*" prompt. *ChatGPT*, 13 Feb. version, OpenAI, 8 Mar. 2024, chat.openai.com/chat.

Information on other styles can be obtained from librarians:
unige.ch/-/library/subject

An overview table

A table of this type can be a solution for crediting the use of one or more GenAI tools in your academic work:

GenAI tools used for the work	Type of use	Prompts used or link to conversations	Part(s) of work concerned or page no.

This table can be displayed in an appendix, but with a link to it in the body of the document.

Should you include your conversations with GenAI?

Readers should be able to consult a conversation with GenAI cited in the text. However, GenAI tools don't always offer a permanent link to a conversation, and the sustainability of these integrated or complementary services is uncertain. It is therefore recommended to **copy into an appendix of your work** any conversation with GenAI that is cited in the bibliography of your work.

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https://www.unige.ch/biblio/en/news/archive/2024/guide-iag/
https://www.unige.ch/biblio/index.php/download_file/10807/4662/

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Publishers Guide to Reference use of AI

Frequently Asked Questions

ACM Policy on Authorship

Can I use generative AI software tools to prepare my manuscript?

Yes, the use of such tools is permitted, subject to the following requirements:

- That these systems do not plagiarize, misrepresent, or falsify content in ACM submissions.
- That the resulting Work in its totality is an accurate representation of the authors' underlying work and novel intellectual contributions and is not primarily the result of the tool's generative capabilities.
- That the authors accept responsibility for the veracity and correctness of all material in their Work, including any computer-generated material.

If I use generative AI software tools, under what conditions must I disclose their use in my Work?

Today's generative AI software tools perform different tasks and it is reasonable to expect that their use and use cases will expand and become more robust over time. Whether disclosure in your published ACM Work is necessary depends on how you utilize these tools. The following guidelines should be followed when determining whether and to what extent disclosure must be provided in your Work.

- If you are using generative AI software tools such as ChatGPT, Jasper, AI-Writer, Lex, or other similar tools to generate new content such as text, images, tables, code, etc. you must disclose their use in either the acknowledgements section of the Work or elsewhere in the Work prominently. The level of disclosure should be commensurate with the proportion of new text or content generated by these tools.
- If entire sections of a Work, including tables, graphs, images, and other content were generated by one of these tools, you should disclose which sections and which tools and tool versions you used to generate those sections by preparing an Appendix or a Supplementary Material document that describes the use, including but not limited to the specific tools and versions, the text of the prompts provided as input, and any post-generation editing (such as rephrasing the generated text). Authors
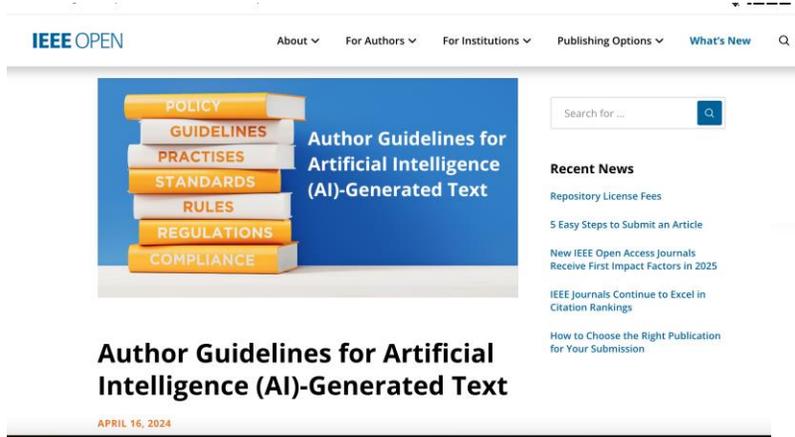
CAREER RESOURCE

Lifelong Learning

ACM offers lifelong learning resources including online books and courses from Skillsoft, TechTalks on the hottest topics in computing and IT, and more.

acmqueue

https://www.acm.org/publications/policies/frequently-asked-questions

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Author Guidelines for Artificial Intelligence (AI)-Generated Text

APRIL 16, 2024

The use of content generated by artificial intelligence (AI) in an article (including but not limited to text, figures, images, and code) shall be disclosed in the acknowledgments section of any article submitted to an IEEE publication. The AI system used shall be identified, and specific sections of the article that use AI-generated content shall be identified and accompanied by a brief explanation regarding the level at which the AI system was used to generate the content.

The use of AI systems for editing and grammar enhancement is common practice and, as such, is generally outside the intent of the above policy. In this case, disclosure as noted above is recommended.
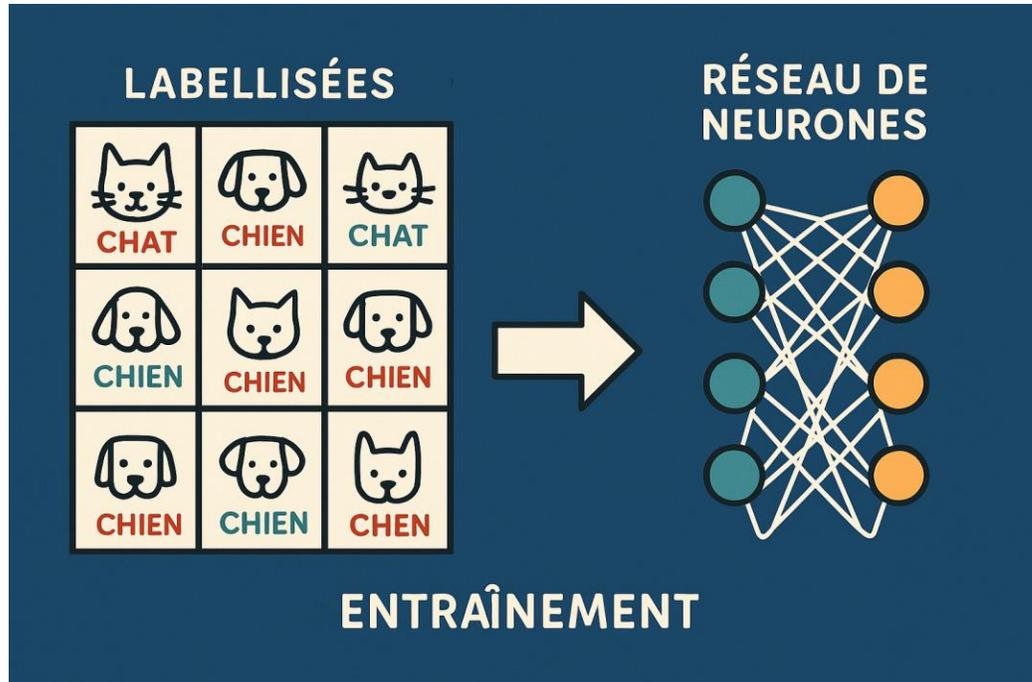
https://open.ieee.org/author-guidelines-for-artificial-intelligence-ai-generated-text/
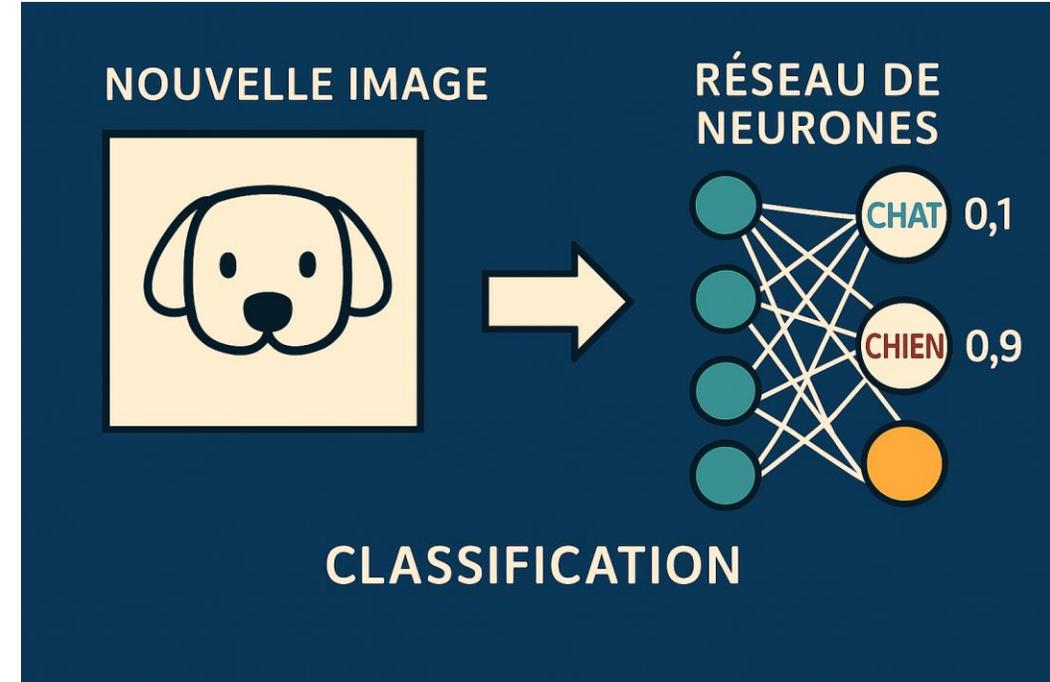
Operating Principles

Machine Learning / Deep Learning

Impact

Machine Learning / Deep Learning
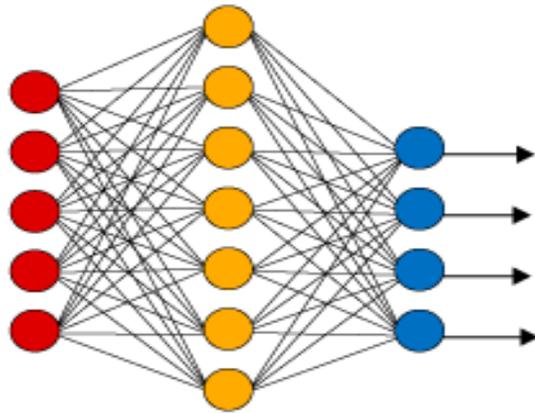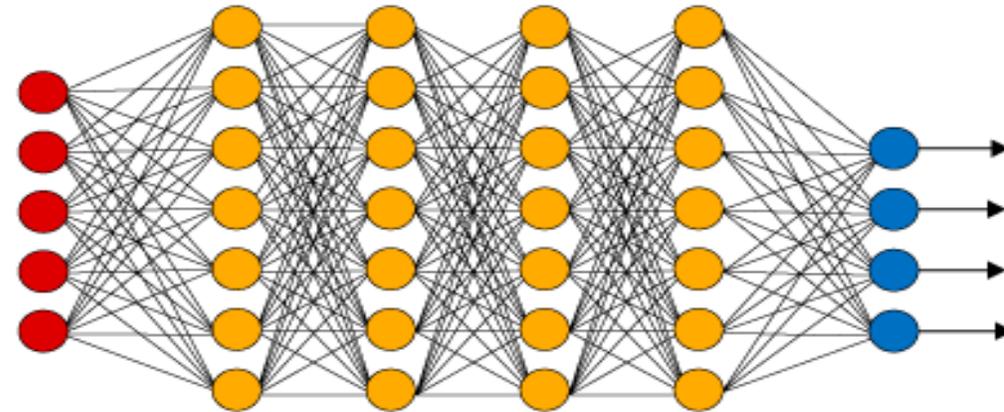

Generated by Copilot

Generated by Copilot

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Deep neural networks and their impact

Simple Neural Network / Deep Learning Neural Network

● Input Layer ● Hidden Layer ● Output Layer

Source: https://towardsdatascience.com/mnist-vs-mnist-how-i-was-able-to-speed-up-my-deep-learning-11c0787e6935

See: https://www.youtube.com/watch?v=aircAruvnKk

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Impact

Reliability of results: statistical, not necessarily reproducible

Explainability: many layers, billions of parameters

Training: which data?, copyright, bias

Retraining: new version, different results

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ETHICS

Ethical principles

Practical considerations

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Why discuss ethics in IA?

Influence on research

Present across all disciplines

Alters data collection, analysis, and interpretation

Can reshape scientific conclusions

Risk of bias

Models may reproduce or amplify inequalities

Training data may contain stereotypes or errors

Findings can be distorted if biases are not addressed

Regulatory requirements

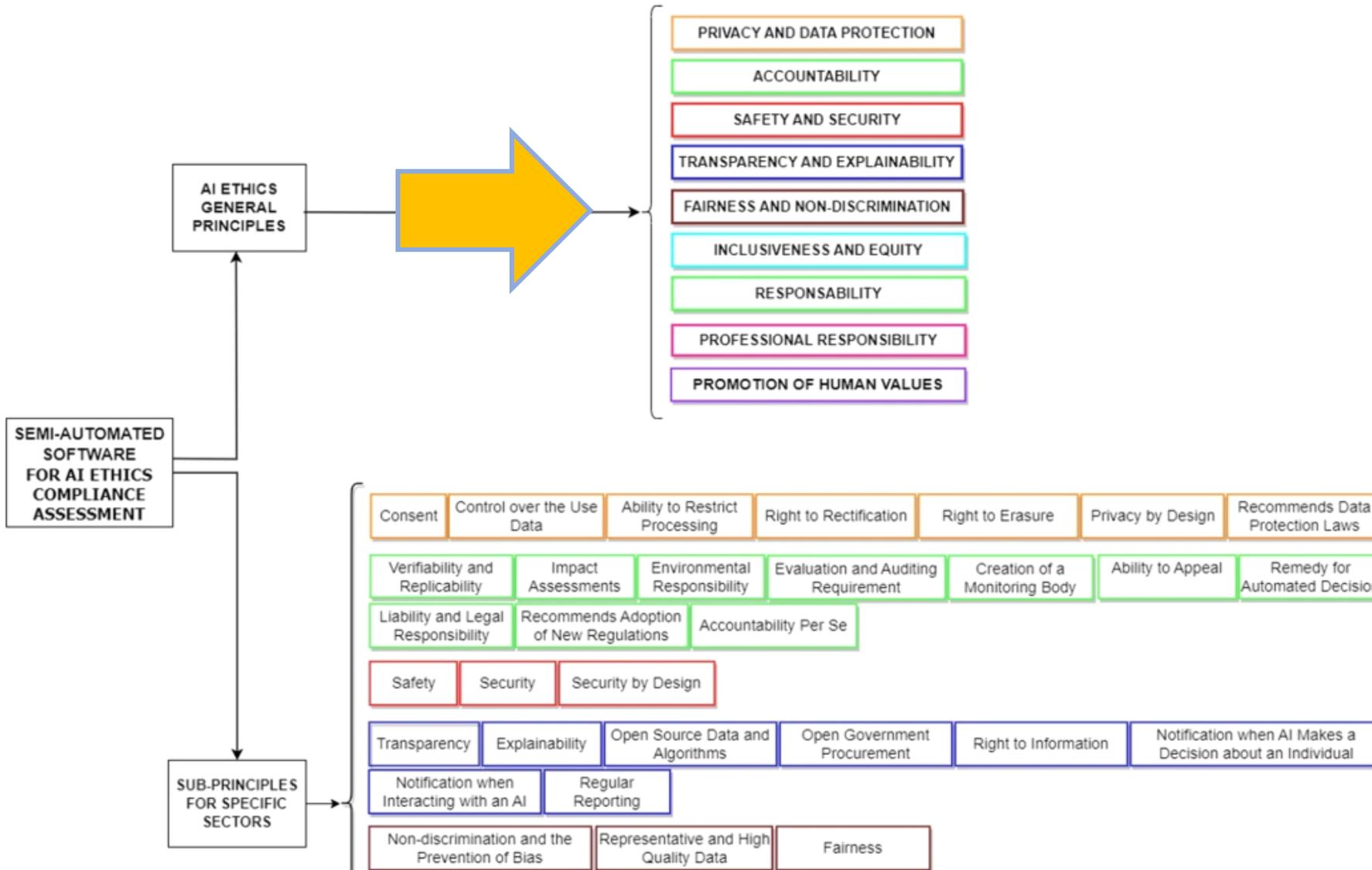Mandatory transparency regarding training and data

Scientific responsibility for generated outputs

Compliance with ethical principles and legislation

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Ethical and Regulatory principles for AI

Level	Source	Key ethical and normative principes
International	**UNESCO – *Recommendation on the Ethics of Artificial Intelligence* (2021)**	Transparency; accountability; fairness and non-discrimination; respect for human dignity and fundamental rights; environmental sustainability; equitable access to AI.
Européen	***Regulation (EU) 2024/1689 – EU AI Act*** ***EU Commission, guidelines on prohibited AI Practices* (February, 2025)**	Risk-based approach; obligations for high-risk systems; national and European supervisory authorities; penalties for non-compliance..
Suisse	***Overview of AI Regulation* (2025)**	Pragmatic, sector-specific approach; application of data-protection law (LPD) to AI systems; required transparency and documentation; prevention of discriminatory decisions.

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Ethical and Regulatory principles for AI

Cappelli, M.A., Di Marzo Serugendo, G. A semi-automated software model to support AI ethics compliance assessment of an AI system guided by ethical principles of AI. *AI Ethics* 5, 1357–1380 (2025). https://doi.org/10.1007/s43681-024-00480-z

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Beyond Copyright: Practical Ethical Challenges

Data provenance

➡️ Who produced the data, and under what conditions?

Copyright compliance

➡️ EU AI Act: public summary of training data.

Protection of individuals

➡️ Privacy, sensitive data, consent.

Bias and discrimination

➡️ Risk of reinforcing and amplifying inequalities.

Impact social

➡️ Reliability of scientific results derived from opaque models

OPEN SCIENCE

Importance

AI and Open Source

Why is Open Science important in the context of AI?

Enable verification, reuse, and reliability of results

➡ Example: sharing code and data allows other teams to reproduce the performance of a medical AI model.

Support interdisciplinary collaboration

➡ Example: AI researchers and clinicians can work together using shared public datasets.

Reduce dependence on proprietary "black-box" systems

➡ Example: access to open models and open formats makes it possible to understand, adapt, and audit algorithms according to research needs.

How to make your AI research genuinely open?

Applying the FAIR principles to AI

Findable

Assign a DOI to your datasets and models.
Include complete metadata: description, authors, date, version.

Accessible

Deposit your resources on open platforms (Zenodo, Hugging Face).
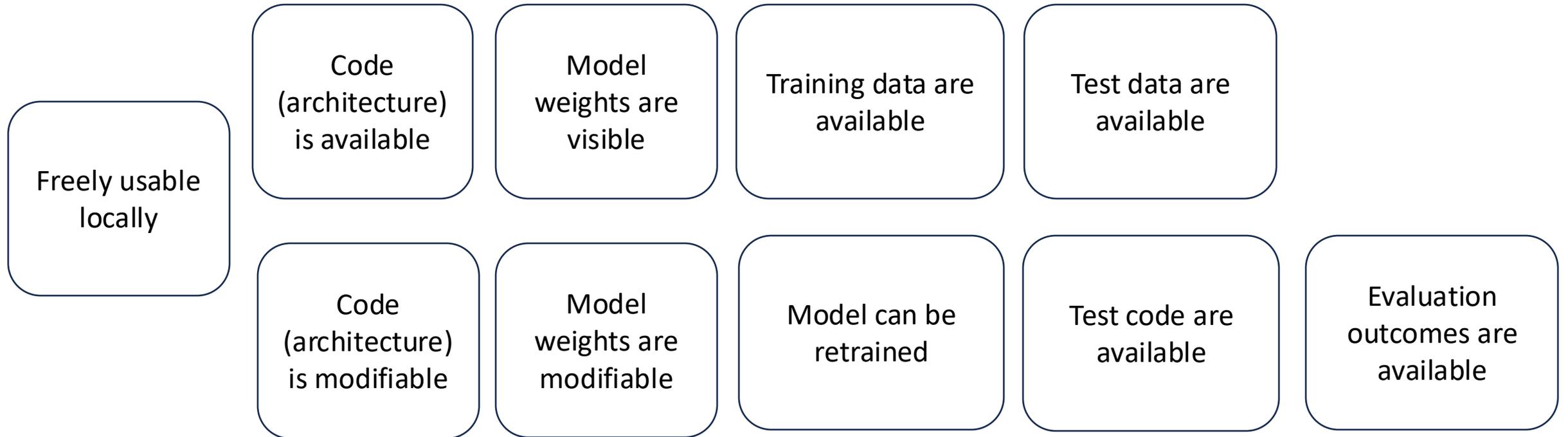Specify a clear usage licence.

Interoperable

Use simple, widely compatible formats (CSV, JSON, etc.); avoid closed formats.

Reusable

Provide full documentation, including requirements, usage examples, and known limitations.
Enable other researchers to reproduce and adapt your work.

➡️ FAIR ≠ **FULLY OPEN**

L'IA / LLM et "Open Source"

Freely usable locally

Code (architecture) is available

Model weights are visible

Training data are available

Test data are available

Code (architecture) is modifiable

Model weights are modifiable

Model can be retrained

Test code are available

Evaluation outcomes are available

Misused term: "freely usable" is not equivalent to open source
Open source in AI is more complex than in traditional software
No clear, established definition exists

https://arxiv.org/abs/2403.13784

https://opensource.org/osd

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Open source

- Watch out for versions
  - Same architecture – different versions → different results
- Hactar @ CUI (Unige)
  - Internal GPU node with 40+ open-source LLMs
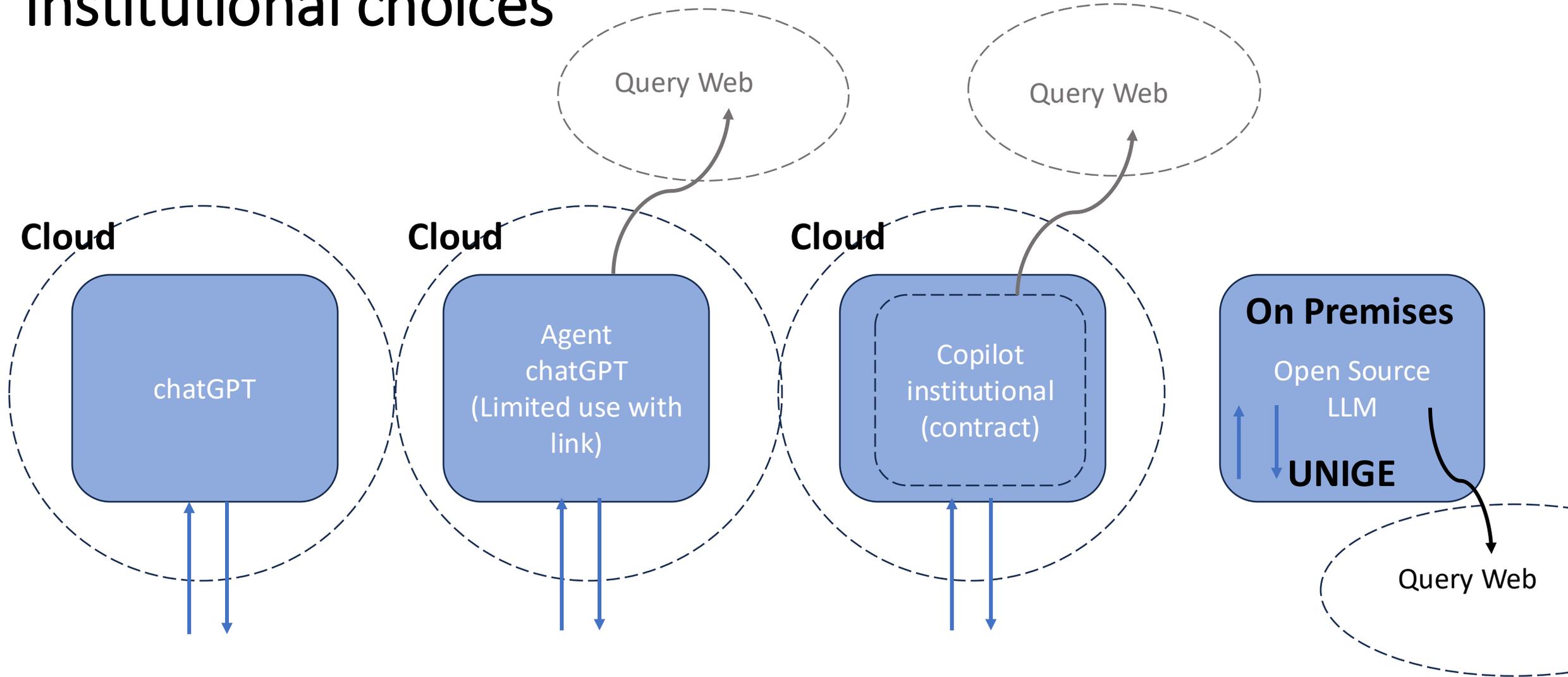 - Pretrained LLMs available

Apertus

- **First large-scale Swiss model**, a collaboration between EPFL, ETH Zurich, and the Swiss National Supercomputing Centre (CSCS)
- **Fully open source**: architecture, model weights, training data, code, intermediate checkpoints are all publicly available
- Training data **exclusively from public sources**
- Two **versions:** Apertus-8B, Apertus-70B
- Relatively **"small"**: Apertus-70B – 64 layers, 70 billion parameters
- Compliant with the EU AI Act

https://www.swiss-ai.org/apertus

Institutional choices

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REPRODUCTIBILITY

Reproducibility badges (FAIR)

Impact of AI on reproducibility

Artifacts and reproducibility badges

Reproducibility Badges

- Artifacts Available (2,000)
- Artifacts Evaluated & Reusable (1,147)
- Artifacts Evaluated & Functional (1,086)
- Results Reproduced (425)
- Results Replicated (14)

Goal - Promoting

- Integrity of research
- FAIR (**Findable, Accessible, Interoperable, Reusable**)
- <u>Repeatability</u> (Same team, same experimental setup)
- <u>Reproducibility</u> (Different team, same experimental setup)
- <u>Replicability</u> (Different team, different experimental setup)

➢ Digital artifact - review

https://www.acm.org/publications/policies/artifact-review-and-badging-current

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How generative AIs works?

Aspect	Description	Example
Statistical models	Models do not apply explicit rules; they learn patterns.	*A diagnostic model recognises an infection after seeing thousands of records, without an explicit medical rule.*
Dependence on training data	Slight changes in the data strongly affect results.	*Removing 5% of images from a hospital dataset → 10% drop in radiology accuracy.*
Dependence on prompt phrasing	The way a question is asked influences the answer.	*"Summarise this article" ≠ "Give a 3-line summary".*
Stochastic learning	Same code + same data → slightly different results.	*Two trainings of the same network → different predictions (random initialisation).*
Sensitivity to data	Bias or noise strongly influences model behaviour.	*A facial recognition system trained mostly on light-skinned faces poorly recognises dark-skinned faces.*
Black box / lack of explainability	The model does not show why it plans.	*A model flags a scan as "abnormal" without indicating the affected area.*
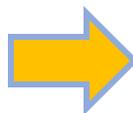
➡️ **Reproducibility of AI results is challenging**

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How to promote reproducibility of AI results?

Role of the researcher

Document every step

➡️ Record software versions, parameters, and data sources used.

Test with variations

➡️ Slightly change the prompt or an element of the dataset to check if results remain stable.
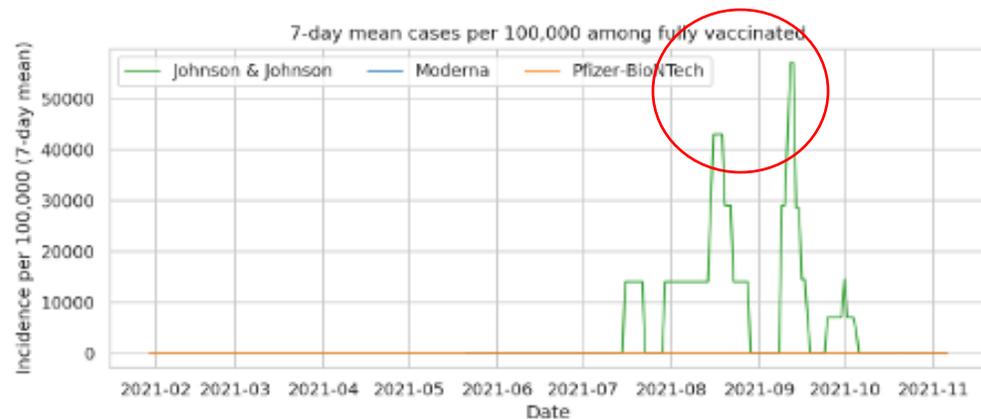
Report uncertainties and limitations

➡️ Specify when results depend on a small sample or a specific context.
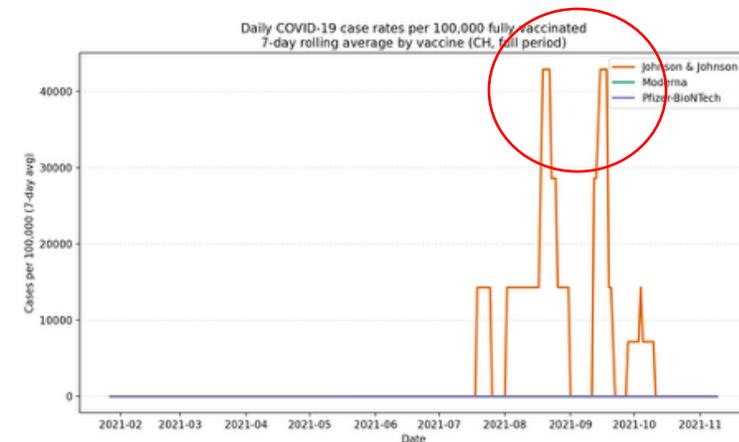
Check consistency and stability before publication

➡️ Repeat analyses multiple times to ensure results do not vary.

Exemple - Covid Data (1)
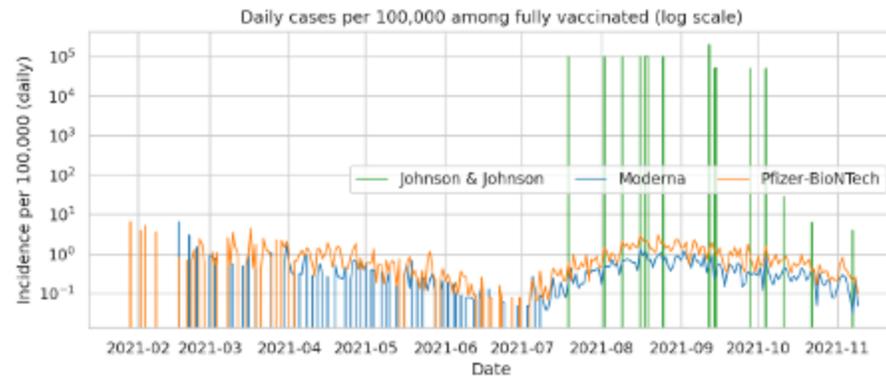
Tests - Sept 4th 2025
(Copilot with chaptGPT5 activated)

Tests – Nov 14th 2025
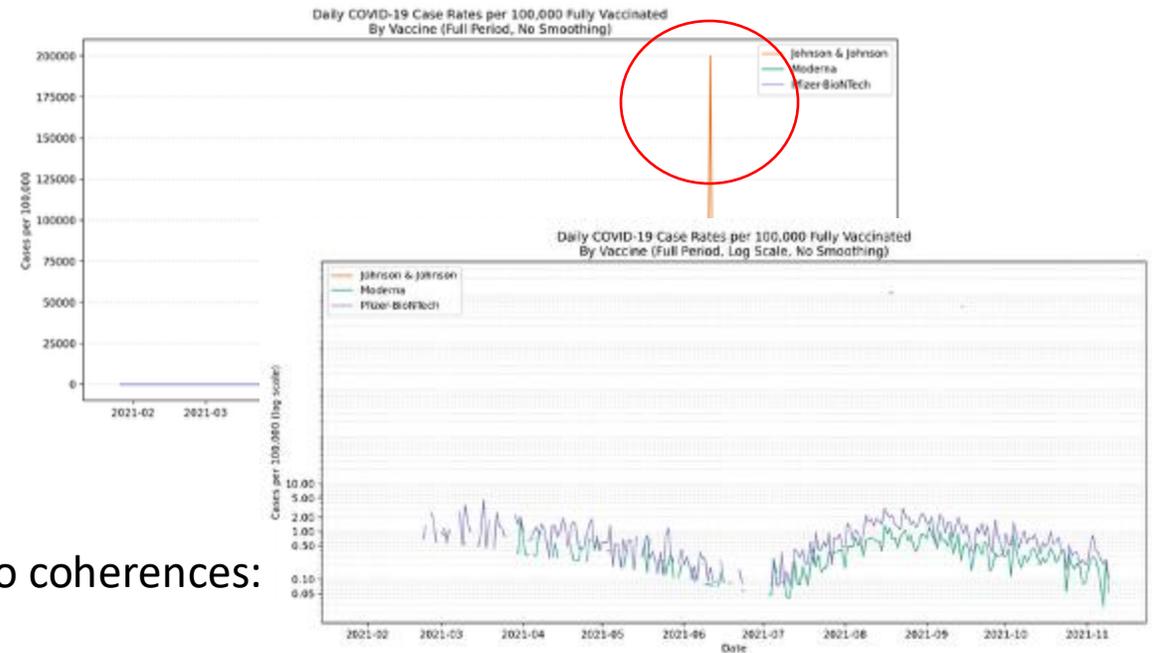(Copilot with chaptGPT5 activated)

Exemple - Covid Data (2)

Tests - Sept 4th 2025
(Copilot with chaptGPT5 activated)

Tests – Nov 14th 2025
(Copilot with chaptGPT5 activated)

No coherences:

Ultimately...

- Not the same discussion sequence

- Not the same charts

- Difficult to reproduce

- New version of Copilot?

- Statistical effects

- See files: *EssaisCovid.doc* et *EssaisCovid-Reproductibilite.doc*

CONCLUSION

Key points to remember

Reminder – Key points to consider

- **Transparency in AI usage**
  - Consult best practice guides

- **Reliability**
  - Bias
  - Hallucinations

- **Reproducibility is difficult or even impossible**
  - Statistical effects
  - Version changes

- **Data protection**
  - Be aware of the framework (cloud, on-premises, institutional contract, etc.)

- **Ethical principles are not always guaranteed**
  - Bias, copyright issues

References

- Cappelli, M.A., Di Marzo Serugendo, G. A semi-automated software model to support AI ethics compliance assessment of an AI system guided by ethical principles of AI. *AI Ethics* 5, 1357–1380 (2025). https://doi.org/10.1007/s43681-024-00480-z

- European Union. (2024). *Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act)*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1689

- Federal Council of Switzerland. (2025). *Overview of Switzerland's regulatory approach to artificial intelligence,* https://share.google/WUvjpN7nEquil8VNa

- UNESCO. (2021). *Recommendation on the Ethics of Artificial Intelligence* (UNESCO General Conference, 41st session, 23 November 2021). UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000381137

- Recommandation bibliothèque Unige: https://www.unige.ch/biblio/en/news/archive/2024/guide-iag/

- Prise de position Unige: https://www.unige.ch/universite/politique-generale/prise-de-position-sur-lintelligence-artificielle/

- Guide de l'IA Unige: https://www.unige.ch/numerique/ia-generative-guide-unige

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