

Semantic Computation

Microteaching by Alina and Manuel
Connected Thinking Week 07, 09.06.2025

Interruptions have priority!
You can always leave the room.
You can always ask questions.



COLLECT

Input on Semantic Computation

Semantic Computation

Semantic Computation

Calculations

Algorithms

Semantic Computation

Computers

Math

Calculations

Algorithms

Semantic Computation

Computers

Math

Language

Calculations

Interpretation

Algorithms

Semantic Computation

Context

Computers

Understanding

Math

Language

Calculations

Interpretation

Algorithms

Semantic Computation

=

Context

computation concerned with meaning

Understanding

Math

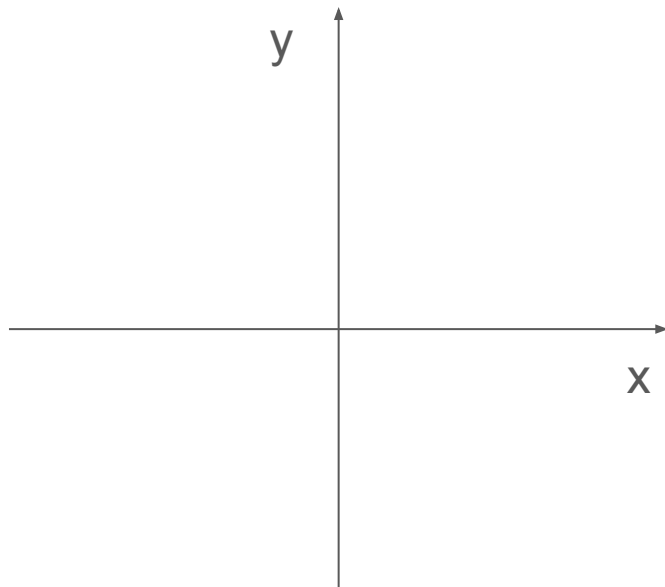
Computers

Activity #1 🤸

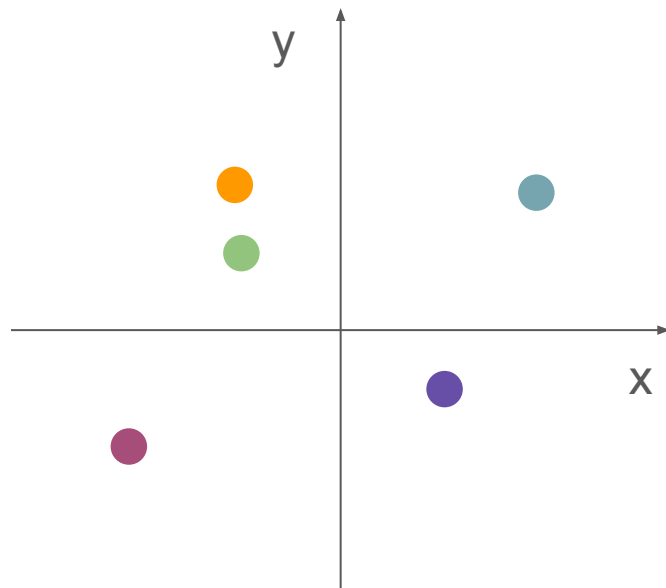
Explain what you see!

Activity #1: Explain what you see!

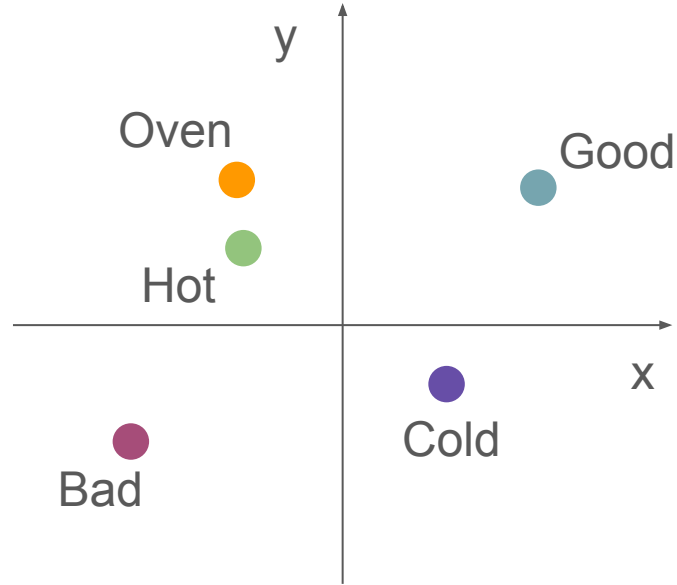
Activity #1: Explain what you see!



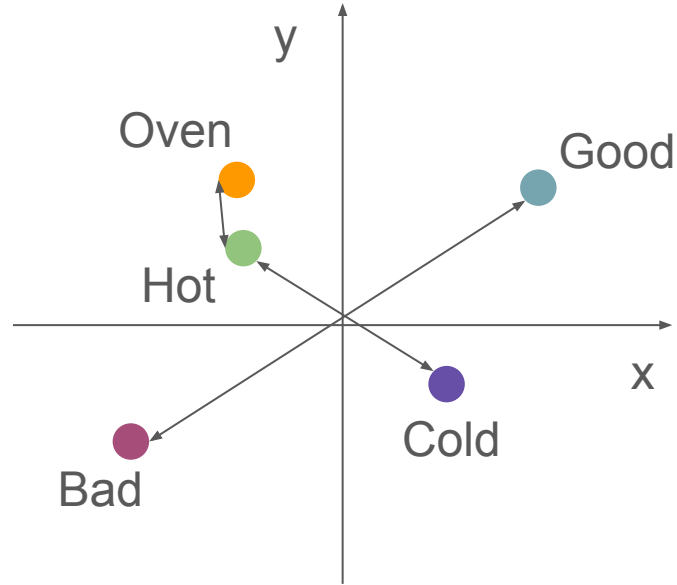
Activity #1: Explain what you see!



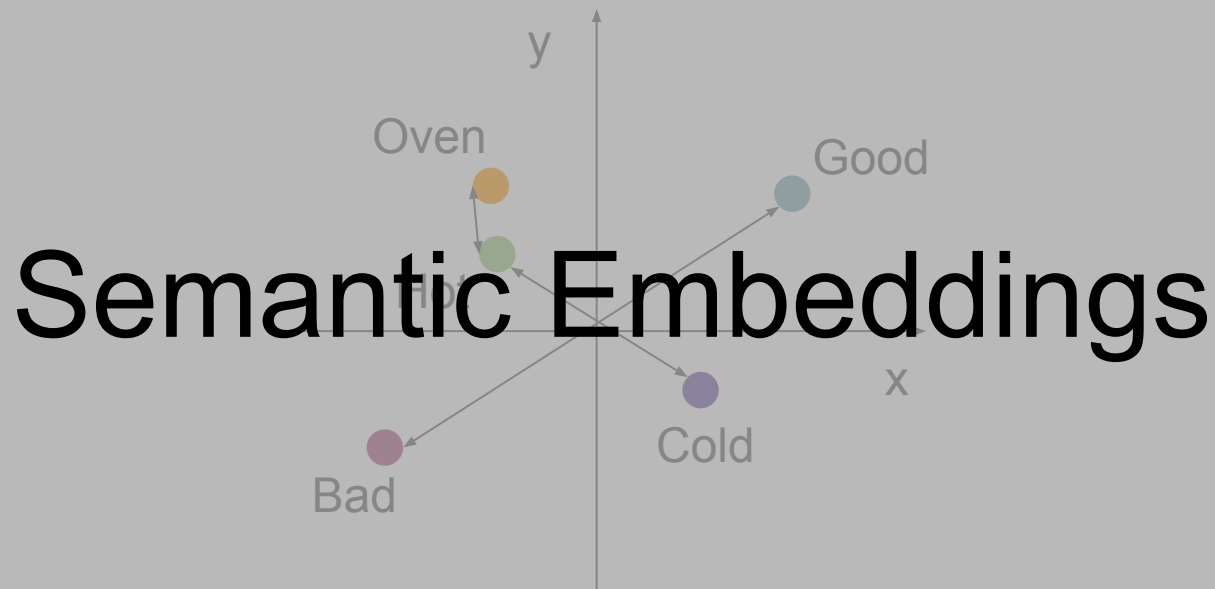
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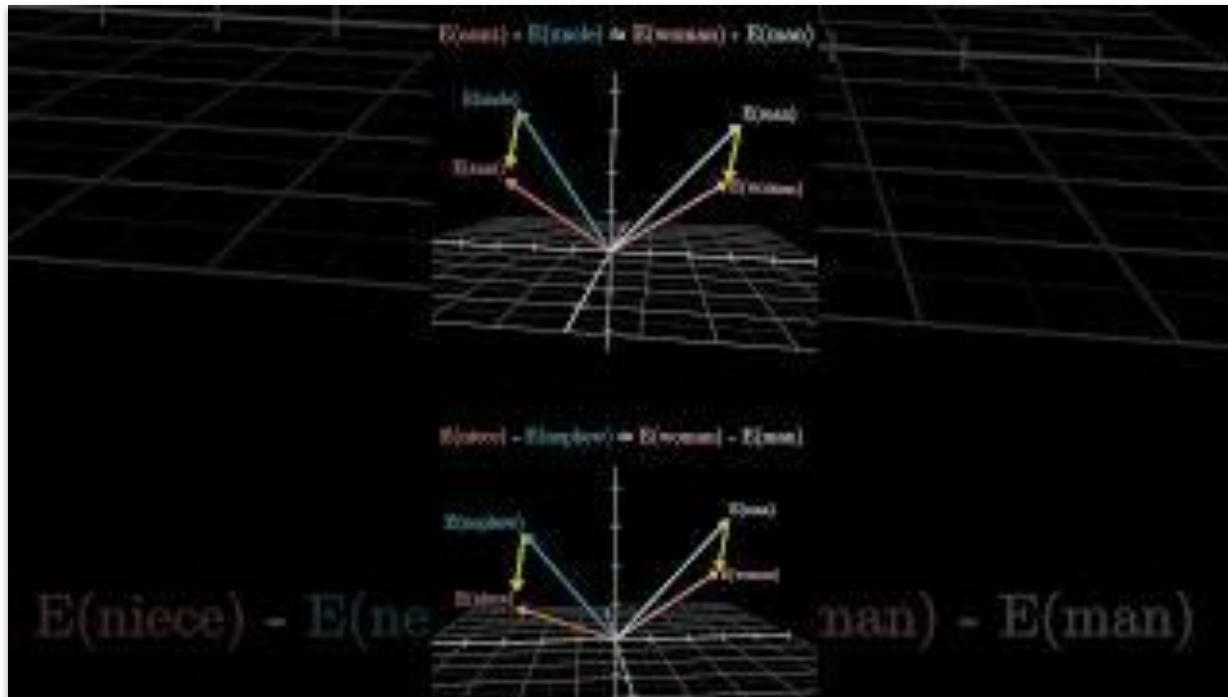


Activity #1: Explain what you see!



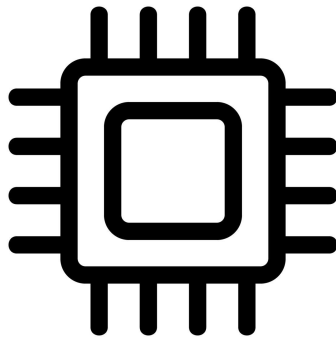
Activity #1: Explain what you see!





<https://www.youtube.com/shorts/FJtFZwbvkl4>

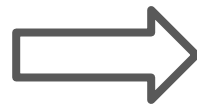
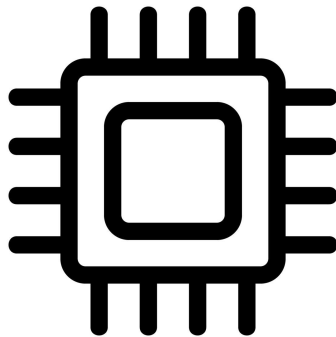
Text Space



Mathematical Space

[0.8,0.2,0.4,0.1 ...]

Text Space



Mathematical Space

[0.4,0.2]

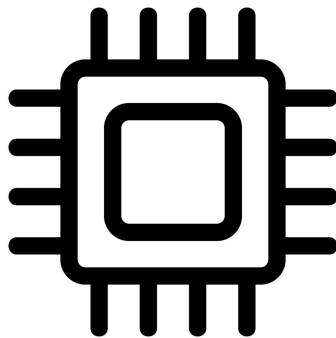
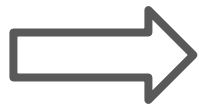
[0.8,0.1]

[0.3,0.5]

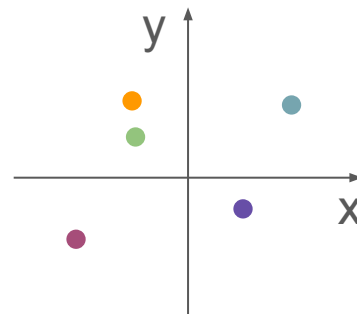
[0.6,0.2]

[0.8,0.2]

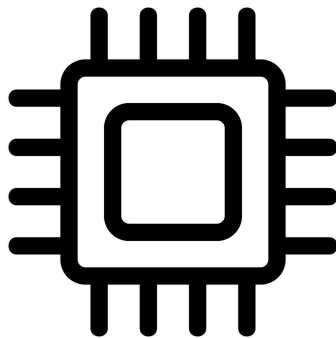
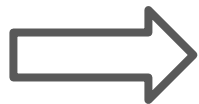
Text Space



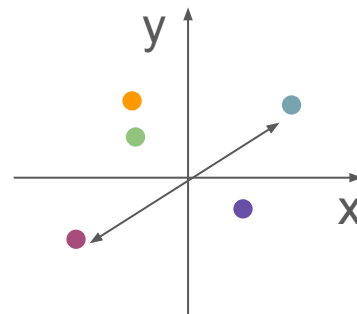
Mathematical Space



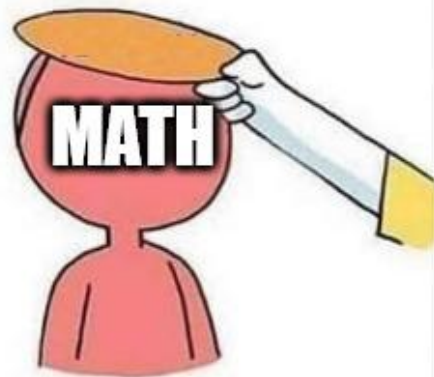
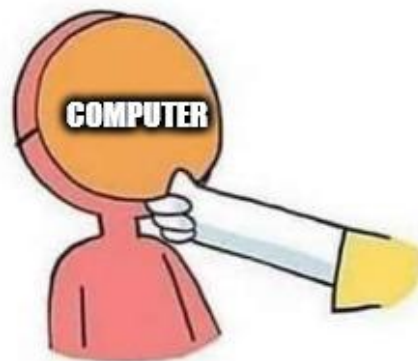
Text Space



Mathematical Space



HEY **COMPUTER** WHY
DO YOU ALWAYS
WEAR THAT MASK?



LET'S KEEP
THIS ON.



Useful Tasks for Text Similarity

- *Search*: How similar is a query to a document in your database?
- *Spam filtering*: How close is an email to examples of spam?
- *Content moderation*: How close is a social media message to known examples of abuse?
- *Conversational agent*: Which examples of known intents are closest to the user's message?

Source: <https://stackoverflow.blog/2023/11/09/an-intuitive-introduction-to-text-embeddings/>

Context-Aware PKM

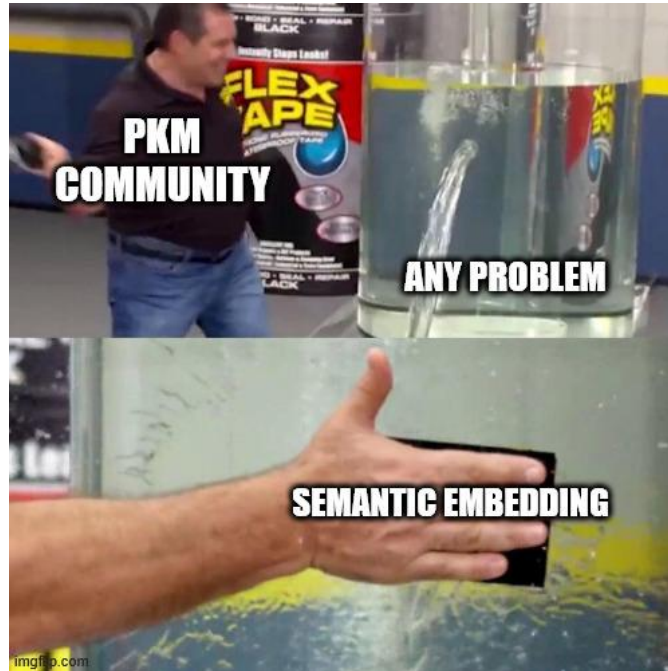
Linking notes through meaning, not just keywords

Activity #2

>>> Call for ideas <<<

Activity #2

What applications do you imagine for context-aware PKMs?





CURATE

Integration of large language models in Obsidian

searching

- allows you to search your notes based on meaning, not just keywords
- helps you find relevant discussions, definitions, and case studies across your vault

 what is machine learning?

2025/06/04 10:36:12

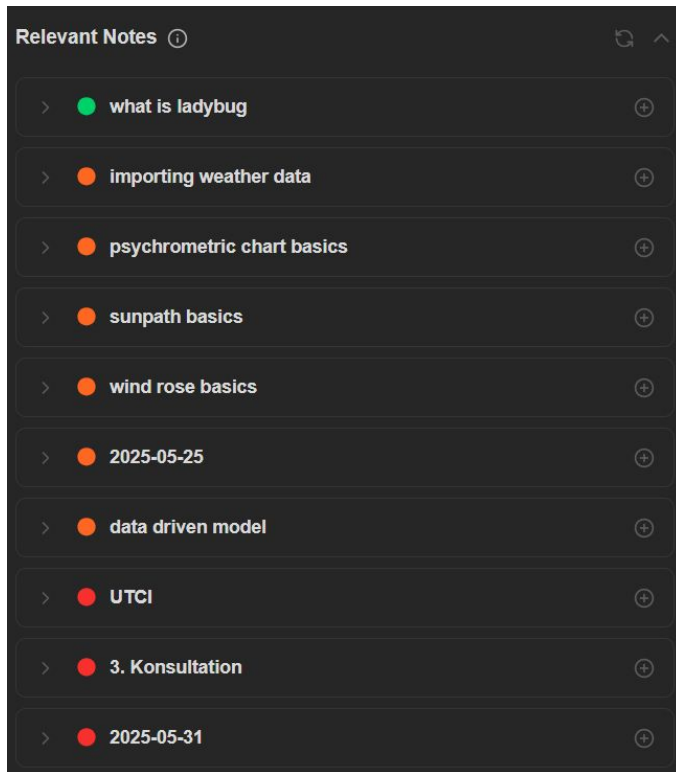
 Machine learning is a method that relies on historical data to learn relationships between input, internal, and output variables, offering a flexible and adaptable approach to modeling systems. Unlike physics-based models, machine learning does not require extensive prior knowledge of the system; instead, it learns patterns and relationships directly from the data itself. This makes it especially useful for complex systems where explicit modeling is difficult or impossible. Machine learning is widely used in various fields, such as natural language processing, image recognition, and energy optimization. However, it is important to note that because machine learning models learn from historical data, they can also inherit and perpetuate biases present in that data. For example, as shown in studies like [caliskan-IslamSemanticsDerivedAutomatically2016](#), machine learning models trained on large language corpora can reflect and even amplify human biases, such as racial or gender stereotypes, present in the data. In summary, machine learning is a data-driven modeling approach that enables systems to learn from experience (data) rather than relying on predefined rules or physical laws. Its flexibility and adaptability are powerful, but careful attention must be paid to the quality and representativeness of the data used for training to avoid unintended consequences like bias.

▼ Sources

- [data driven model](#)
- [bibliography](#)
- [caliskan-IslamSemanticsDerivedAutomatically2016](#)

related notes

- concepts are often fragmented across many notes
- semantic embedding can automatically suggest related notes, even if the explicit connection isn't made



understanding context

- technical terms often have multiple meanings or are used in different contexts
- semantic embedding can help disambiguate by clustering notes based on context



what does DF stand for

2025/06/04 06:19:56



In the context of atomic notes on [waltherSimulationStudyRelocated2021](#), DF stands for daylight factor. This is confirmed by the statement:

"To fulfill the requirements a target daylight factor $DT > 2$ %, a minimum target daylight factor $DT_M > 0.7\%$..."

...

"We observe that near surroundings reduce the DF from 3.0 % (without site context) to 2.6 %. In the following simulations, the spaces are evaluated within site context."

So, DF = daylight factor, a metric used to assess the amount of natural daylight available inside a building relative to the available outdoor light.

► Sources

2025/06/04 06:20:04

avoid duplication

- semantic embedding can suggest relevant existing notes, highlight gaps, and help you avoid duplication
- it can also surface related research or definitions, making your PKM more robust



do i have a note on how to achieve climate targets?

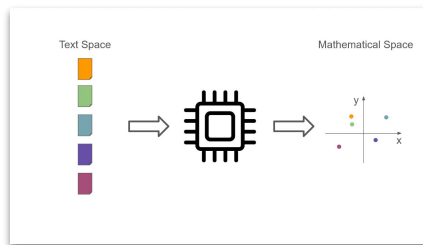
2025/06/04 10:33:10



Based on the provided context, there is no note specifically dedicated to "how to achieve climate targets." However, there are related notes and tasks that touch on aspects relevant to climate targets, such as:

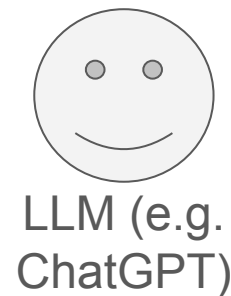
- **2025-05-31**: Contains tasks and reviews on topics like "Critical life cycle assessment of the innovative passive nZEB building concept 'be 2226' in view of net-zero carbon targets," "Bio-based building material solutions for environmental benefits," and "Low-tech passive solar design concepts and bio-based material solutions for reducing life cycle GHG emissions of buildings." These topics are closely related to strategies for achieving climate targets in the building sector.

Retrieval Augmented Generation (RAG)



Embeddings

Retrieval Augmented Generation (RAG)



Activity #3

>>> Call for ideas <<<

Activity #3

What prompts do you find useful?



<https://m18.uni-weimar.de/pad/p/conn-thin-semantic-computation>



discussion and takeaways

Evaluation

semantic bias

- neural networks using semantic representations can develop hidden biases (e.g., job screening AI, political profiling)
- semantic embeddings are not neutral
- they inherit and amplify the logic of the data they're trained on

dealing with semantic bias:

- Bias must be evaluated in context — not all associations are harmful
- Removing bias may reduce meaning or distort nuance
- Awareness is better than pretending models are neutral

thinking is linking?

one could argue connecting notes *should* be a manual process

... or that linking should be automated or assisted by semantic embeddings

thinking is linking?

one could argue connecting notes *should* be a manual process

... or that linking should be automated or assisted by semantic embeddings

Activity #4 

Battle of Theories

Learning Activity: Battle of Theories

- form two teams (pessimists and optimists)
- in your groups you will defend one of these statements:

The Pessimists:

linking notes *should* be a
manual process

The Optimists:

linking should be automated
or assisted by semantic
embeddings

Your Task:

In preparation:

- think about arguments that support your statement
- agree on an opening statement

The debate:

- each group presents their argument
- we discuss
- after the debate we vote on the most convincing argument



Automation or augmentation?

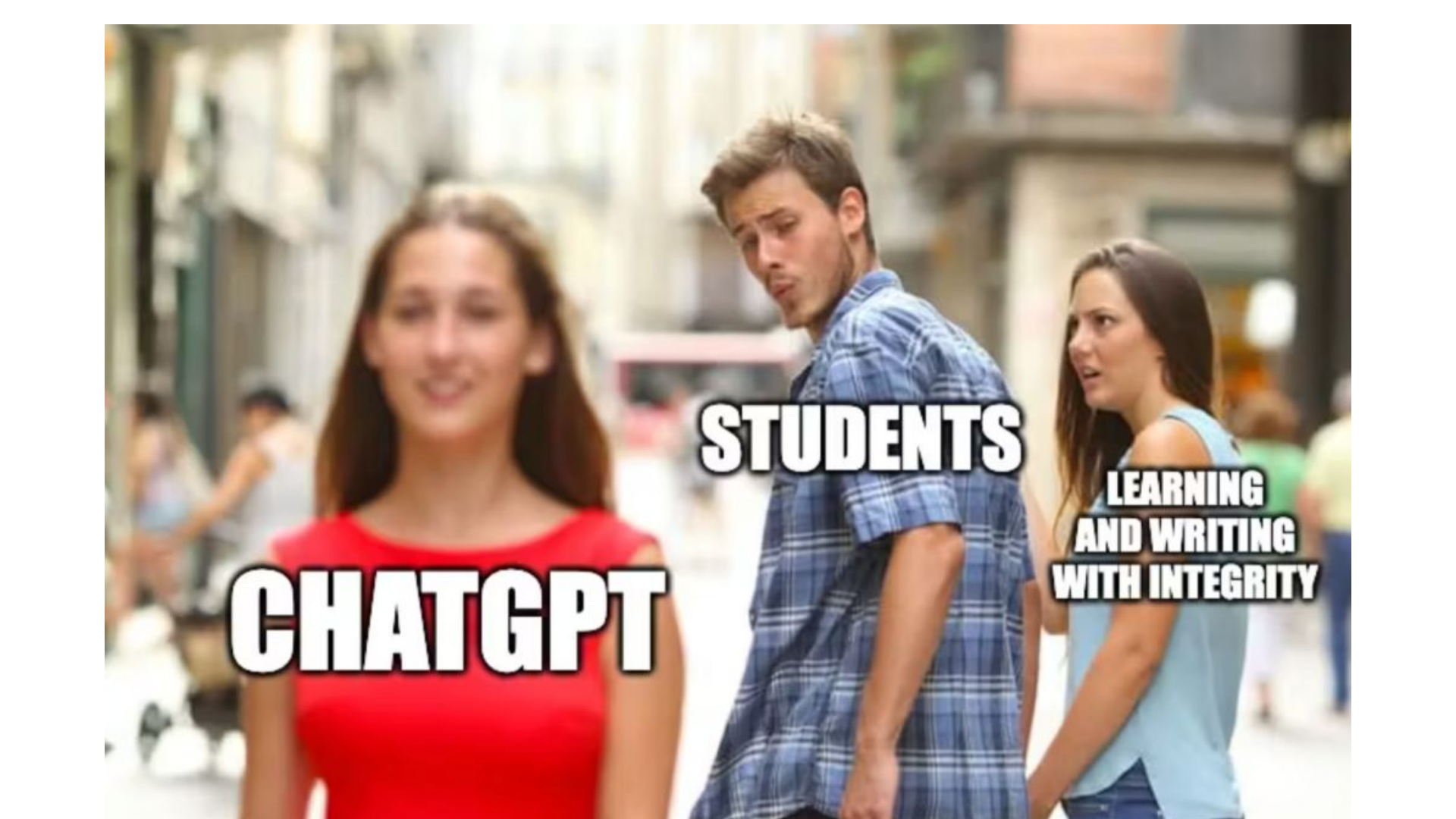
why linking should be manual:

- Thinking happens while linking
- You decide what matters
- Context beats similarity
- Curation keeps it meaningful
- Avoids semantic noise
- Links shape understanding
- Automation can't know your goal

why linking can be automated:

- Faster than manual linking
- Surfaces hidden connections
- Expands your thinking scope
- Reduces cognitive load
- Builds richer knowledge graphs
- Helps when memory fails
- Finds links you'd never consider

In conclusion ask yourself:
Are you outsourcing or reflecting?



CHATGPT

STUDENTS

**LEARNING
AND WRITING
WITH INTEGRITY**

Thank you for your attention!

References

<https://www.wikidata.org/wiki/Q124354>

<https://www.wikidata.org/wiki/Wikidata:Introduction>

Caliskan-Islam, Aylin, u. a. Semantics Derived Automatically from Language Corpora Necessarily Contain Human Biases. August 2016.

Jarrahi, Mohammad Hossein, u. a. „Artificial intelligence and knowledge management: A partnership between human and AI“. Business Horizons, Bd. 66, Nr. 1, Januar 2023, S. 87–99. ScienceDirect, <https://doi.org/10.1016/j.bushor.2022.03.002>.

Shah, Milind, und Nitesh Sureja. „A Comprehensive Review of Bias in Deep Learning Models: Methods, Impacts, and Future Directions“. Archives of Computational Methods in Engineering, Bd. 32, Nr. 1, Januar 2025, S. 255–67. Springer Link, <https://doi.org/10.1007/s11831-024-10134-2>.

<https://universalprior.substack.com/p/making-of-ian>