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Search Engines, Neural Networks, and the Difficulty of Identifying the Sources

Why don't AI systems disclose the origin of their information?

1. Intro

AI systems – one might think – have nothing to do with search engines at first glance. Both are designed for different purposes and are used differently. And yet, despite these differences, there is a connection that is truly interesting from a media studies perspective:

Search engines refer to specific ***sources***, to documents that users can then access, view, check, and possibly reuse. AI systems also start with documents, a huge amount of documents that were used to train the AI systems; in many cases, these will even be the same texts available on the internet. Starting from there, AI systems are able to generate answers to questions independently, which is certainly spectacular.

However, as soon as you ask AI systems to reveal the sources on which they base their statements, they fail just as spectacularly. There are many complaints that the systems hallucinate, especially when it comes to source references; the systems invent sources that do not exist or name sources that do not contain the information in question. Anyone who wants to work seriously with these machines will quickly encounter clear limitations.

But how can this be? How can this difference, this crucial weakness, arise? Let's take a closer look from a media studies perspective:

2. Search Engines

Search engines are created by sending out programs that collect every text they can find on the internet and return it to the search engine. These programs are called 'crawlers.' A program then converts the texts into an 'index', i.e. a huge database which, in simple terms, records two pieces of information: An entry is made for each keyword found in the texts, and the respective location (the web address (URL), the link) is noted for each of these keywords. This process is fully automated and is repeated at regular intervals to keep the database up to date.

When the user now asks a question, the search engine no longer accesses the texts themselves, but only the index. The output is a list of links that a complex algorithm attempts to rank according to relevance; the user selects a link and jumps to the corresponding source.

3. AIs

Current AIs work differently. In terms of their technical basis, they rely on so-called Neural Networks. In this case, too, a crawler is sent out to collect a vast amount of text, but these texts are processed in a different way: Here, a ***vector database*** is created instead of an index, and this makes all the difference.
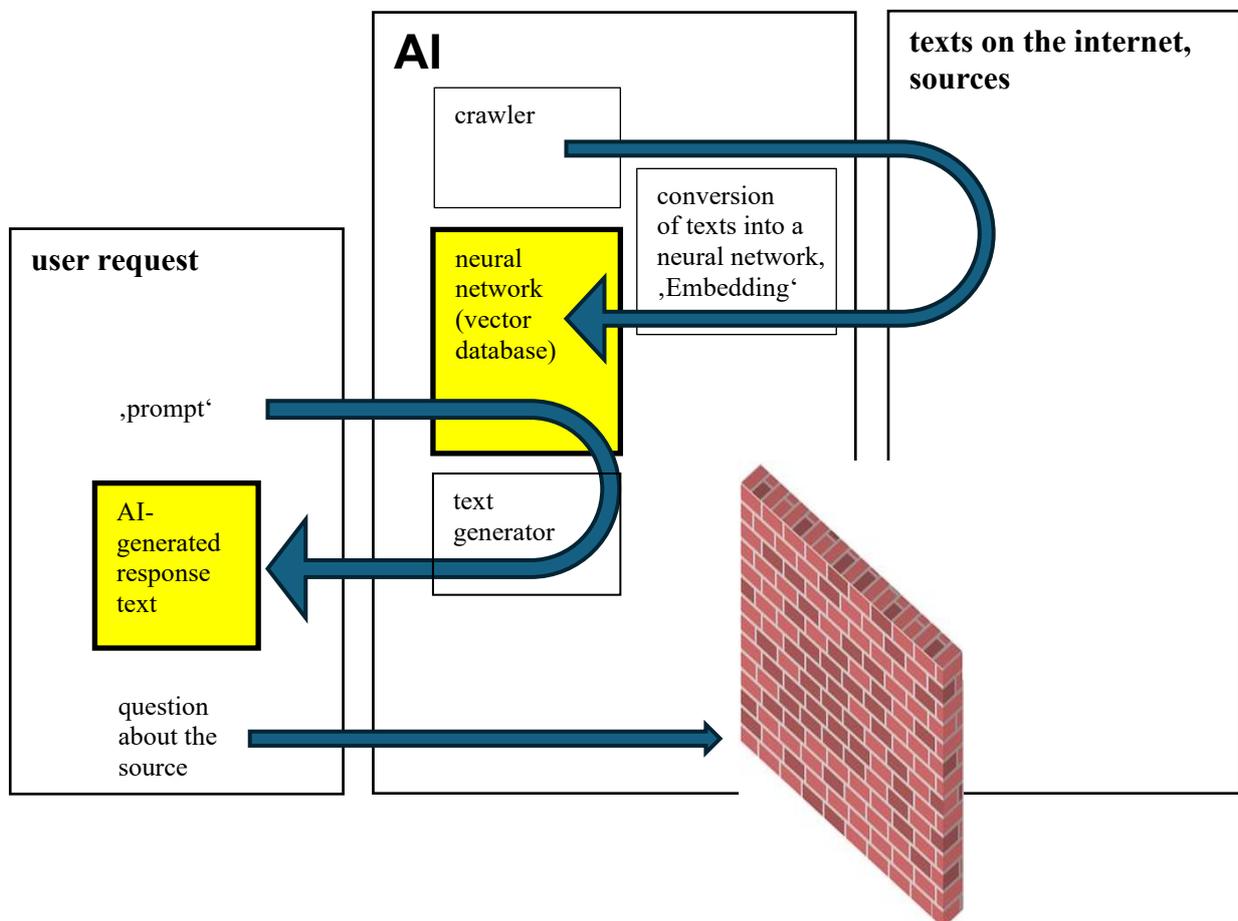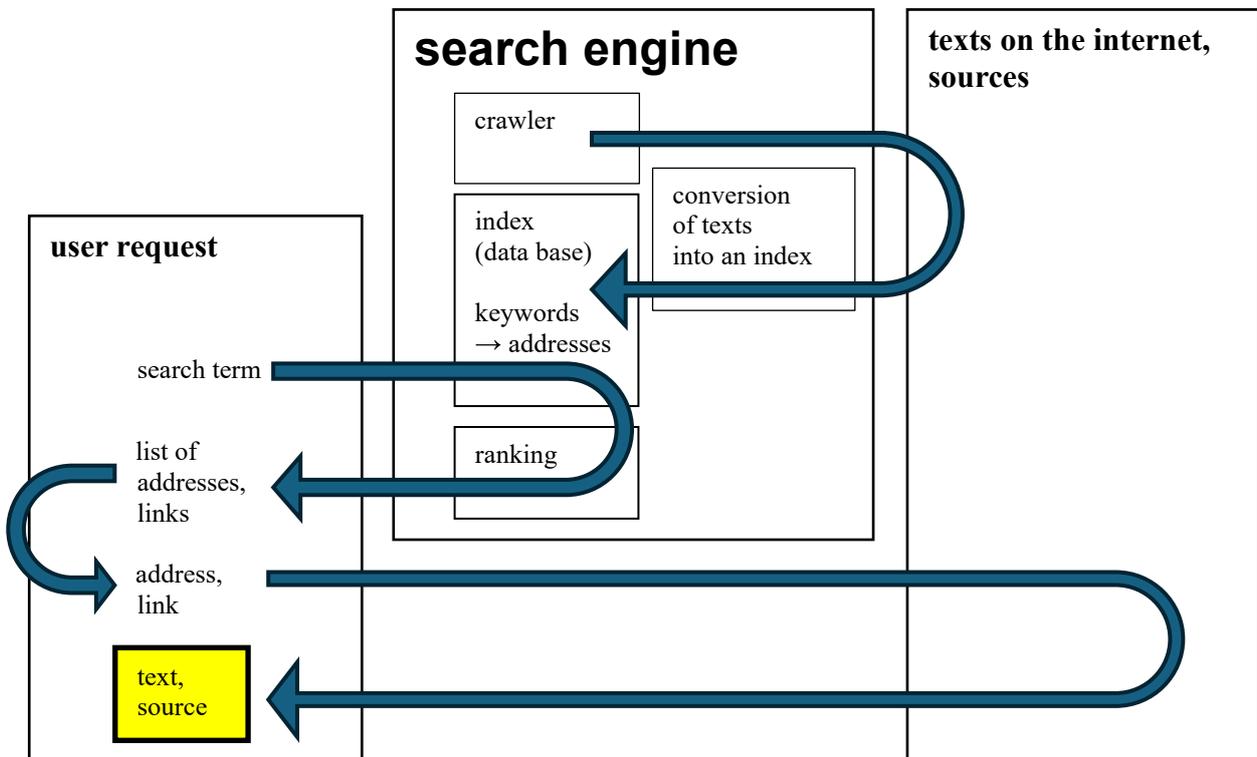
Neural networks /vector databases, as I have described elsewhere,[1] aim to represent the ***relationships*** that exist between different words. The individual texts are examined to determine the specific context in which the individual words appear, and a network of references is built up, to which different weights are assigned depending on whether the reference is more or less important. This creates a qualified ***structure***. These networks are called 'neural' because they imitate – albeit roughly – similar functions of association formation, engraving, and reinforcement in the human brain.

Once created, these networks can be used to generate natural language texts. From the totality of the references of varying strength, it is possible to deduce the probability with which a particular word follows another. And the algorithms are now so good that they deliver texts and even translations that, while not flawless, are acceptable within certain limits.

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[1] https://homepages.uni-paderborn.de/winkler/Winkler--Neuronale-Netze.pdf – sorry, the text is available only in German…

4. The Difference

If you want to compare AIs and search engines, the following outline may help:

search engine   **texts on the internet, sources**

crawler

conversion of texts into an index

index (data base)

keywords → addresses

user request

search term

list of addresses, links

ranking

address, link

text, source

AI   **texts on the internet, sources**

crawler

conversion of texts into a neural network, ‚Embedding'

neural network (vector database)

user request

‚prompt'

AI-generated response text

text generator

question about the source

5. 'Condensation'

The answer to the initial question is surprising: It is the vector database itself that obscures access to the original sources. Neural networks devour discourses/texts and transform them into a network of weighted network-relations. Afterwards, they only contain the relationships. The original texts have been dissolved in this structure. And with them, their wording and addresses.

In my text on neural networks, I described this transition as a 'condensation' and proposed the formula that AIs 'forget the texts into the structure'.

6. Historical media

What is interesting from a media studies perspective – in my view – is that AI systems behave in exactly the same way as certain historical media did before them. This is most evident in the case of spoken language: We witness an infinite number of linguistic events or utterances, and we remember only a tiny fraction of them verbatim. However, this does not mean that these speech acts do not influence us in some way, or that they do not change our image of the thing in question or the world as a whole, our semantic inventory, and our linguistically organized knowledge, however slightly. Here, too, we 'forget into the structure' the vast majority of the utterances we witness.

It is this forgetting that organizes the relationship between discourse and the semantic system, and on which the construction of our entire knowledge, our worldview, and our language and media competence depends. Speech turns into language; discourse into system.[2]

Neural networks thus claim exactly the same systematic position that the system of language occupies in relation to the practices of speech.

7. Conclusion

Accordingly, it is not – keyword: neural networks – the function of our biological nervous system that AI systems imitate, but rather this general and immensely productive forgetting.

The price is that there is no way back to the sources, to the individual texts.

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[2] I have argued in various texts that 'condensation' and 'forgetting into the structure' are among the most important media functions. If you would like to know more, you can find the relevant texts here:
…/Winkler--Condensation.pdf