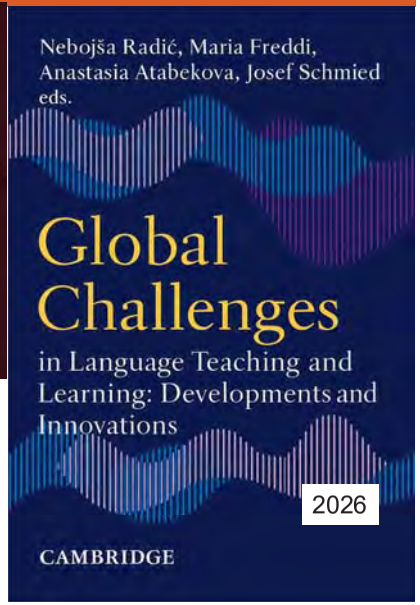
Academic Writing for Doctoral Research, focus on Digital Humanities
Modena, 19/11/25

Recent Developments in GenAI: From Large to Multiple and Small Language Models? Applications for PhD Students

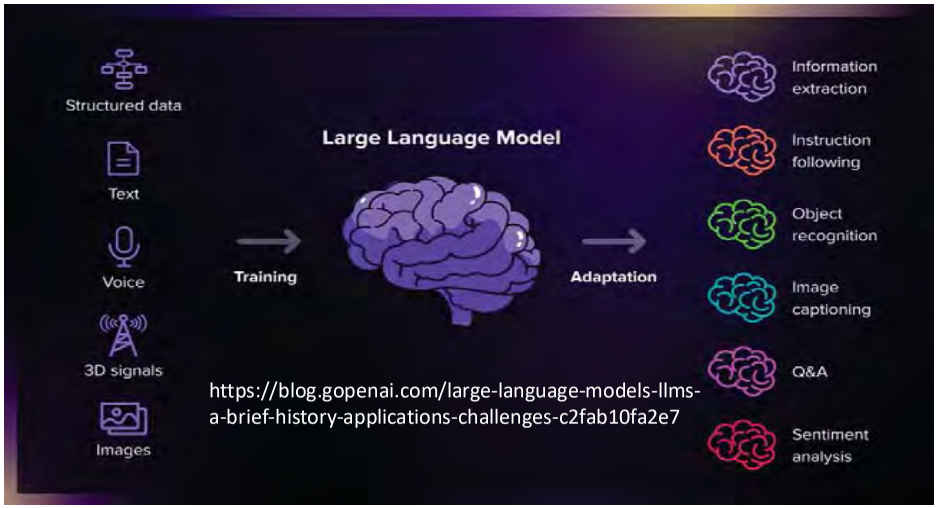
Josef Schmied
English Language & Linguistics
Chemnitz University of Technology
https://www.tu-chemnitz.de/phil/english/sections/ling/presentations_js.php
josef.schmied@phil.tu-chemnitz.de
http://tinyurl.com/Josef-Schmied

Introduction: 20 Years of Research in Academic Writing



Ken Hyland, The "Other" English: Thoughts on EAP and Academic Writing, p. 34
Philip Shaw, Text Purpose, Text Effects, Text Power: English for Specific Purposes, p. 39
Maurizio Gotti, Creating a Corpus for the Analysis of Identity Traits in English Specialised Discourse, p. 44
Michael Hoey, Clumsy English, p. 48

2. Large Language Models: Principles

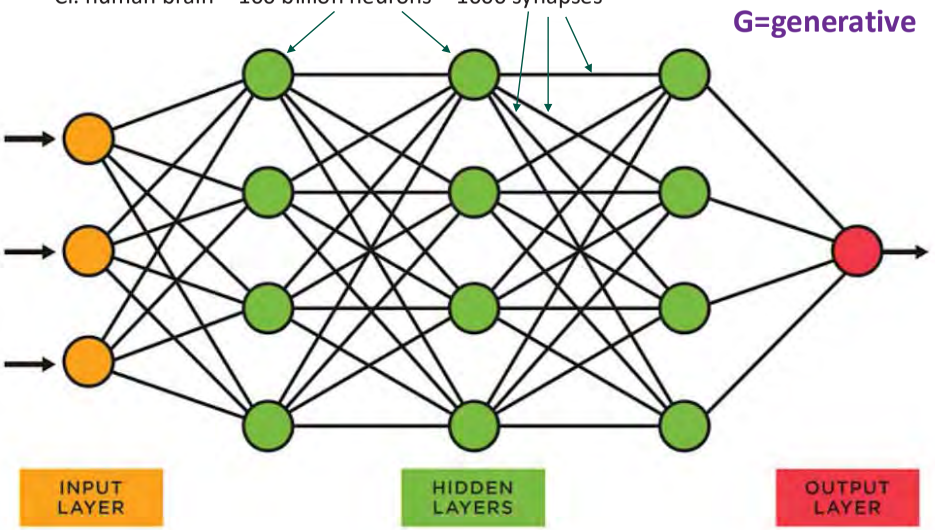


https://blog.gopenai.com/large-language-models-llms-a-brief-history-applications-challenges-c2fab10fa2e7

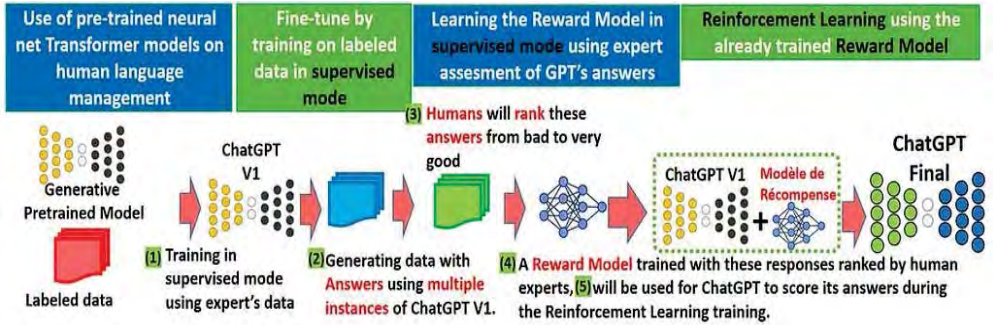
2. Large Language Models: G=Neural Network

Cf. human brain = 100 billion neurons * 1000 synapses

G=generative



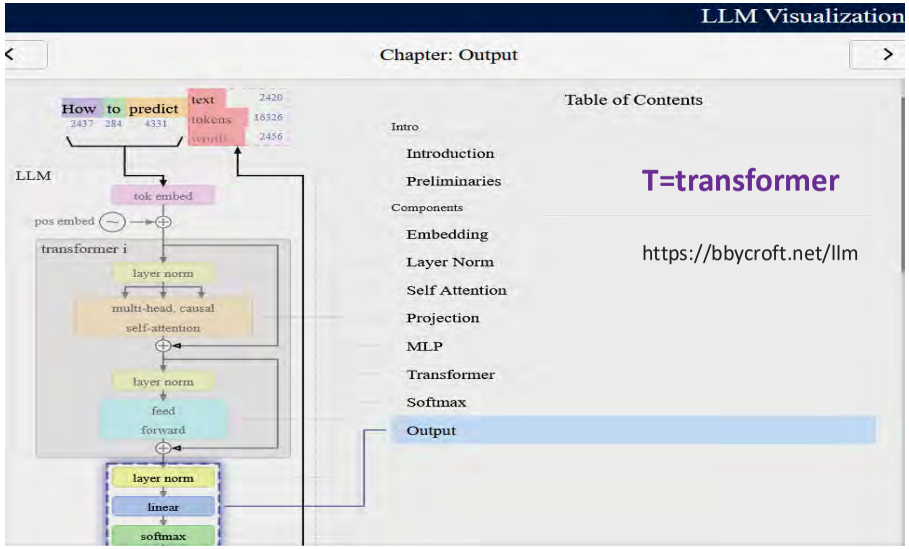
2. Large Language Models: P=Reward Model Training



The training of LLMs has become controversial when it is outsourced to "clickworkers" with low wages (e.g. to detect „toxic language"):
https://time.com/6247678/openai-chatgpt-kenya-workers/
https://www.hopeforthefuture.at/en/clickworkers-exploited-for-artificial-intelligence/
Generally, all users are asked to give Feedback on (alternative) LLM answers (ChatGPT opt-in):
e.g. Gemini asks: Good Answer Bad Answer Adapt Answer

P=pre-trained

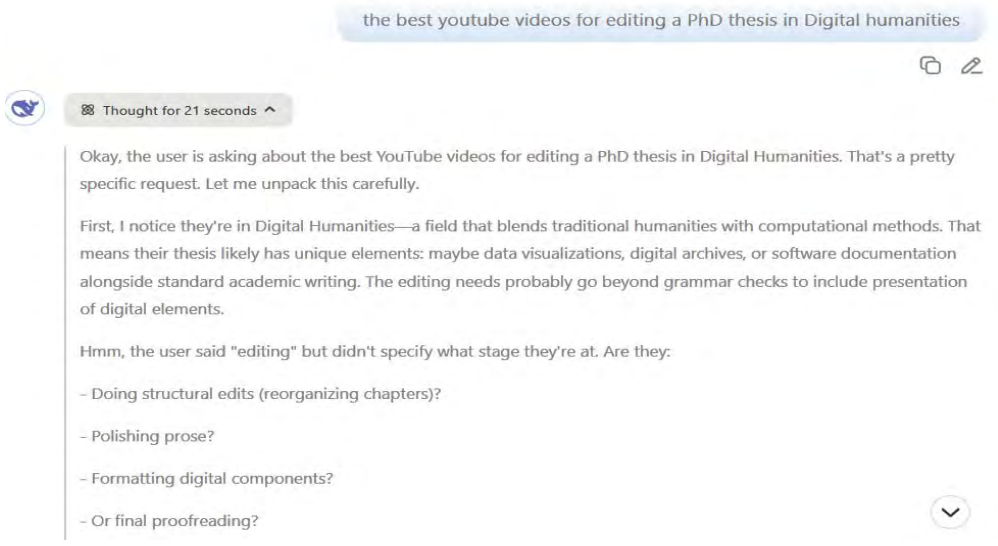
2. Large Language Models: T=Transformer Visualisation



T=transformer

https://bbycroft.net/llm

2. Large Language Models: Reasoning (Mistral: recherche/reflexion?)



2. Large Language Models: Visualisation

https://www.theguardian.com/technology/ng-interactive/2023/nov/01/how-ai-chatbots-like-chatgpt-or-bard-work-visual-explainer

2. Large Language Models: Linguistic calculations

The words, and in some cases parts of words, such as the plural marker "s" or the prefix "un-", are stored in the model as `tokens`. Each `token` is represented not as a sequence of letters, but as a `vector`, a sequence of numbers.

A transformer is a mathematical process that recalculates the vectors for each token, that is, it assigns new distances between each pair of tokens, based largely on what other tokens are in its utterance. If you ask "What is a tidy thing to eat pasta with?" and in a different chat ...) "What is a nice thing to eat pasta with?" the LLM will start typing its answer.

The basic predictive text in SMS apps, in contrast, only really has one dimension; what is the word which most commonly, in all scenarios, comes next. But crucially an LLM is still, deep down, only figuring out what word - or sequence of words - is most likely to come next. It can do so much better than predictive text for two related reasons: "transformers" and "attention".

2. Large Language Models: Linguistic calculations

What is a **tidy** thing to eat pasta with?

A tidy thing to eat pasta with is

What is a **nice** thing to eat pasta with?

A nice thing to eat pasta with is

What is a **tidy** thing to eat pasta with?

A tidy thing to eat pasta with is a fork.

What is a **nice** thing to eat pasta with?

A nice thing to eat pasta with is pesto.

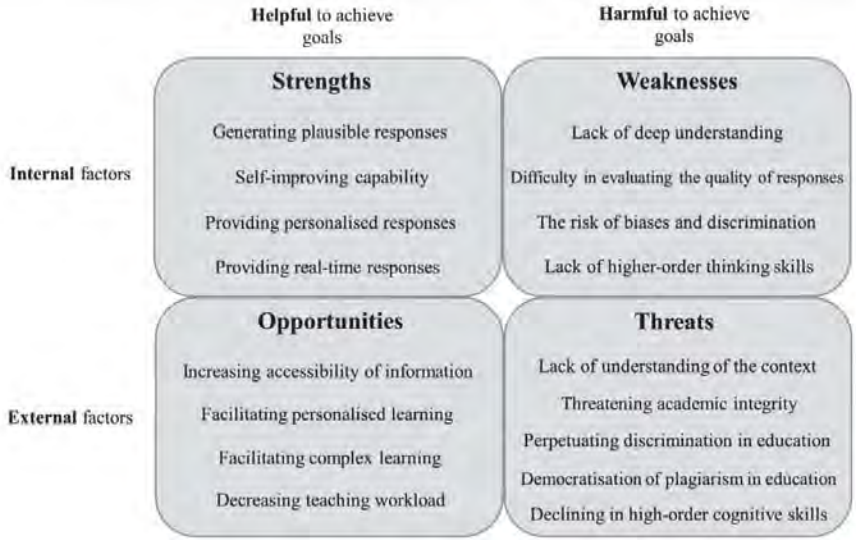
First the LLM weights all the relationships between all the words it knows, in thousands of dimensions, based on its immense corpus of training data. But then, crucially, it looks at what words have come before and reweights those associations. It is possible that within the model's computations, "Tidy" has a close relationship with "utility" and "tools" and that informs the output. . Indeed the word "with" itself will be reweighted by the preceding terms to lie closer to one set of its alternatives, such as "using", "by means of". In the second sentence "nice", it seems, has relationships with "taste" and "flavour" and the word with gets reweighted to lean closer to its other alternative, "accompanied by".

2. Large Language Models: Linguistic Principles „MI“

https://www.english-corpora.org/mutualInformation.asp

2. Large Language Models: Linguistic Principles „collocates“

2. Large Language Models: SWOT Analysis ChatGPT in education



Farrokhnia et al. 2024: 468

3. Brainstorming: Ask Gemini ethical issues

Large Language Models (LLMs) are powerful tools, but their use in research articles raises some ethical concerns. Here are some key areas to consider:

Authorship and Credit: Who gets credit for research findings when an LLM helps generate content? Should the LLM be a co-author? How much human oversight is needed? These are open questions that can blur the lines of traditional authorship. Oxford study on LLM responsibility [invalid URL removed]

Transparency and Reproducibility: Research relies on being able to repeat and verify findings. If an LLM is involved in data analysis or literature review, how can researchers ensure transparency about the LLM's role and limitations? Can others replicate the research if they don't have access to the same LLM?

Bias and Accuracy: LLMs are trained on massive amounts of data, which can reflect societal biases. These biases can be unknowingly incorporated into research articles, leading to skewed or inaccurate findings. Researchers need to be aware of these potential biases and take steps to mitigate them.

Overtrust and Misinformation: It's easy to be impressed by an LLM's ability to generate text. However, LLMs can still produce factually incorrect or misleading content. Researchers need to critically evaluate the LLM's outputs and avoid uncritically accepting them as truth.

These are just some of the ethical considerations surrounding LLM use in research. As this technology continues to develop, researchers and publishers will need to grapple with these issues and develop best practices for ethical and responsible LLM use.

3. Brainstorming: Ask ChatGPT4 ethical issues

Using Large Language Models (LLMs) for research articles raises several ethical considerations that researchers should carefully address. Here are some key ethical issues:

1. Bias and Fairness
2. Plagiarism
3. Authorship and Attribution
4. Privacy and Confidentiality
5. Manipulation and Misinformation
6. Impact on Academic Publishing
7. Environmental Impact
8. Equitable Access

Addressing these ethical issues requires a combination of **awareness, transparency, accountability, and proactive measures** to mitigate potential risks and promote responsible use of LLMs in research articles.

4. Research applications: Specialized writing

„Artificial Intelligence“

social media „Office“

chatbots **Large Language Models (LLMs)**

Teacher **Researcher for Ac. Writing (+critical thinking)**

NOT Data Processing & Analysing, Outreach, etc.
(cf. Ray 2023, Farrokhnia et al. 2024)

Lecture Planning	**Skills Practice**	**Specialised**	**Publishing**	**Academic**
Course-	**„Rules“, etc.**	**Concepts**	**Conventions**	**Style**
Curriculum-	**Translation**		abstract title key words	metadiscourse

4. Research: GPT4 Research Article Structure

Research articles in digital humanities typically follow a structure that combines traditional humanities scholarship with innovative digital methodologies and tools. While the specific structure may vary depending on the nature of the research and the preferences of individual researchers or journals, here's a prototypical structure commonly used in digital humanities research articles:

1. Title Page
2. Abstract
3. Keywords
4. Introduction
5. Literature Review
6. Methodology
7. Case Study or Analysis
8. Discussion
9. Conclusion
10. References
11. Appendices (if applicable)

https://token.ujk.edu.pl/volumes/volume-16/
TOKEN 16 (2023)
Special issue: Patterns of Language Variation and Change in Academic Writing
Guest editors: Josef Schmied (*Chemnitz University of Technology*), Marina Bondi (*University of Modena and Reggio Emilia*), Olga Dontcheva Navratilova (*Masaryk University*) and Carmen Pérez-Llantada (*University of Zaragoza*)

This structure provides a framework for organizing research articles in digital humanities, integrating traditional humanities scholarship with innovative digital methodologies and technologies. Researchers should **adapt and refine this structure to fit the specific requirements** and conventions of their discipline, as well as the aims and scope of their research projects.

4. Research Publishing: the Art of Prompting

1. Title
Suggest a title for this research journal abstract
2. Abstract
Suggest a 300 word abstract for this title: Using large Language Models to write Research articles
3. Keywords
Suggest 5 keywords for this research journal abstract
4. Introduction
Write an (historical?) introduction for this research journal abstract
5. Literature Review
Write a literature review for this research journal abstract
6. Methodology
Which methodologies can I use for this article?
7. Case Study or Analysis
Find 3 case studies for this issue
8. Discussion
9. Conclusion
Which conclusions may I arrive at in this article?
10. References
Which 10 references are crucial for this article?

4. Research Applications: ask GPT to “improve it”??

1. Structural Overhaul (Advanced Clarity) https://www.instagram.com/reel/DKfWueNuPVr/?igsh=Z3dnZWNrb3l0MWNr
“Rewrite the following content using a layered structure with clear headings, subheadings, and concise bullet points. Emphasize logical flow, prioritize clarity, and ensure seamless readability across complex or technical concepts.”
Instructional Style: Modular formatting, high-level coherence.
2. Tone Optimization (Intent-Driven Refinement)
“Revise this content to elevate its tone to suit a [choose: professional | conversational | persuasive | emotional | humorous | luxury] audience. Enhance vocabulary and sentence rhythm while preserving clarity, intention, and brand alignment.”
3. Audience Alignment (Persona-Tailored Rewrite)
“Refactor this content to directly address [insert audience personal. Adjust language style, emotional resonance, and specificity of examples to match the reader’s pain points, desires, and level of awareness.”
4. Persuasion Amplifier (Conversion-Driven Enhancement)
“Strengthen this content using persuasive frameworks
-add urgency, scarcity, proof, and emotional triggers to improve conversions. Optimize calls-to-action and psychological anchors for buyer readiness.”
5. Brand Voice Deepening (Signature Style Matching)
“Revise this text to reflect [insert brand]’s distinct voice. Match its pacing, phrasing, and tone. Infuse storytelling and consistent brand energy while preserving the original intent.”
6. SEO & Discoverability Enhancer (Search-Optimized Rewrite)
“Revise this content to improve searchability and discoverability across platforms. Integrate high-intent keywords, optimize for algorithmic relevance (Instagram, TikTok, YouTube, or Google-specify one), and ensure the language aligns with trending queries while maintaining natural readability.”

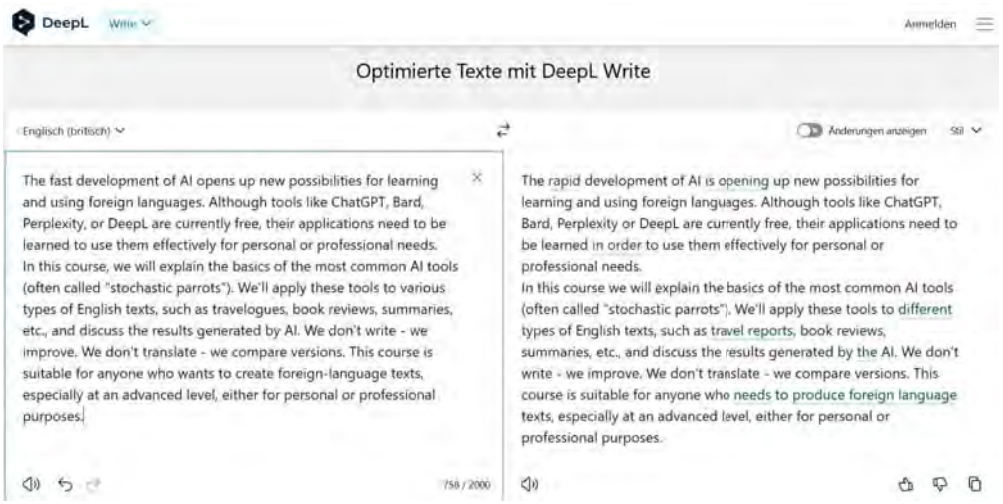
4. Research Publishing: GPT4o Conclusions (without analysis?)

Based on the findings from the case studies and the literature review, several conclusions can be drawn regarding the utilization of Large Language Models (LLMs) in research article composition:

1. **Enhanced Writing Efficiency and Productivity**:
   - LLMs offer researchers a powerful tool for streamlining the writing process, leading to increased efficiency and productivity.
   - Researchers using LLMs can generate coherent and contextually relevant text more quickly, enabling them to produce research articles in a more timely manner.
2. **Facilitated Interdisciplinary Collaboration**
3. **Improved Writing Creativity and Exploration**
4. **Ethical Considerations and Challenges**
   - The use of LLMs in research article composition raises important ethical considerations related to bias mitigation, plagiarism prevention, and authorship attribution.
   - Ethical guidelines and safeguards are essential to ensure responsible use of LLMs and mitigate potential risks associated with bias, plagiarism, and data privacy.
5. **Opportunities for Future Research and Development**

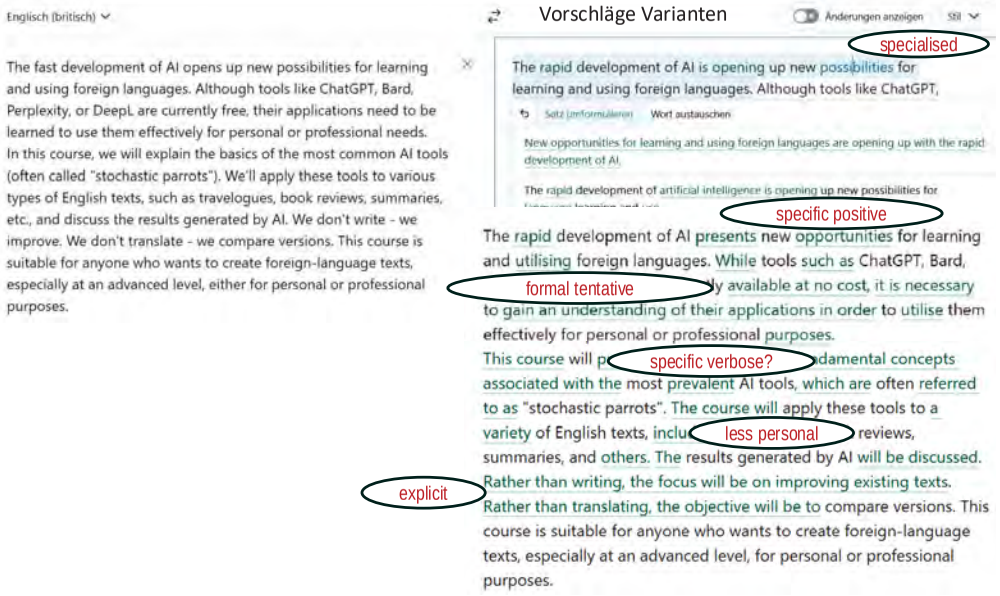
In conclusion, the integration of LLMs into research article composition holds immense potential for enhancing writing efficiency, promoting interdisciplinary collaboration, and fostering creativity in the scholarly community. However, it is crucial for researchers to navigate the ethical considerations associated with LLM-assisted writing responsibly and transparently. By critically evaluating the opportunities and challenges of LLMs in academic writing, researchers can harness their transformative potential to advance knowledge and scholarship in the digital age.

4. Research Publishing: Improve AI Proposals



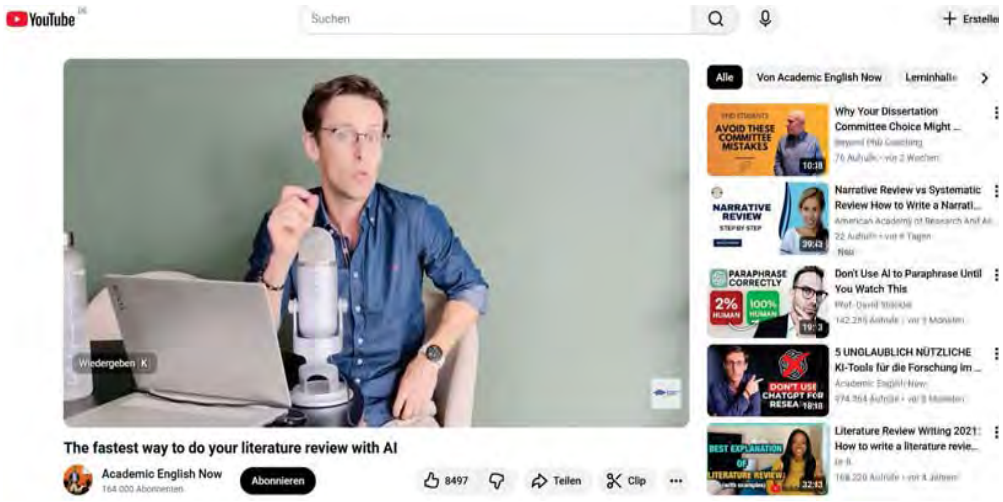
4. Research Publishing: Evaluate AI Proposals

Style academic!



4. Research Applications: hype on Social Media, Youtube, etc

https://www.youtube.com/watch?v=O60Ha2woAZI



4. Research

4. Researc

4. Research Applications: "Literature Review"

https://www.instagram.com/p/DQhghePAkLs/?igsh=MTVwbGxreDNvNmM5MA%3D%3D

Finding papers	Undermind, Litmaps, Bohrium
Reading papers	enago Read, scholarcy
Writing literature review	grammarly, Paperpal, Overleaf
Data extraction	SciSummary, EvidenceHunt
Data Analysis	NVIVO, Julius, myra
Managing references	Mendeley, zotero, EndNote X9
Critical analysis	Connected Papers, scite_, Research Rabbit
Create First Draft	AnswerThis., ResearchPal
Find references	Google, arXiv, PubMed
Proofread your paper	Review It, thesify., TRINKA
Select relevant journal	Journal Finder, Elsevier, Sage

4. Research Applications: "recommended AI tools" PhD

PhD life is tough, but the right AI tools can save you HOURS of stress and effort. From writing and coding to organizing and analyzing, these 7 hottest PhD-friendly AI tools are absolute game changers!

[1] Litmaps - Literature Discovery & Visualization
https://www.litmaps.com/
This helps Ph.D students map out a research landscape and find key, often missed, papers quickly.

[2] Consensus - Evidence-Based Search & Synthesis
https://consensus.app/
An AI-powered academic search engine that instantly finds evidence-based answers from peer-reviewed scientific papers.

[3] SciSpace - All-in-One Research Platform
https://scispace.com/
AI Copilot to explain and implity complex text in papers, AI-powered writing assistance, and tools for literature review and citation generation.

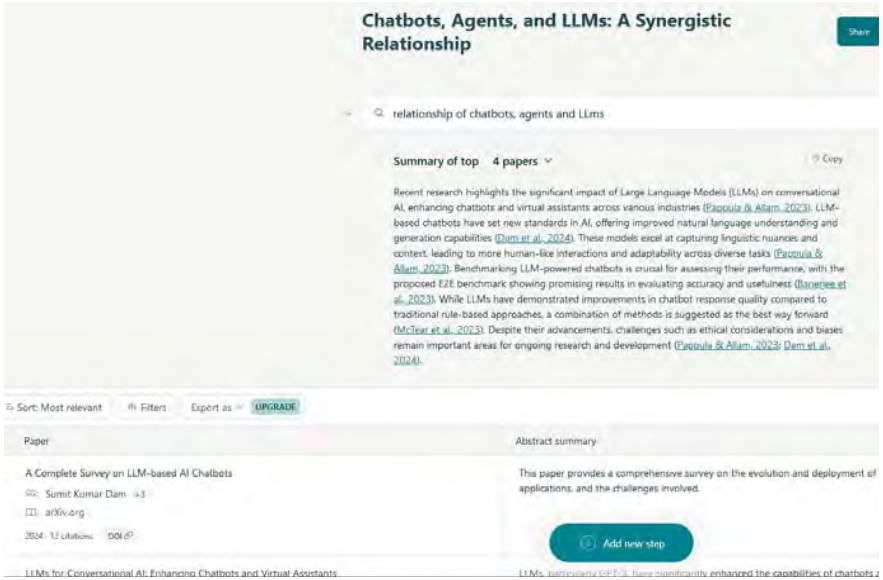
[4] Jenni AI - Academic Writing & Drafting
https://jenni.ai/
It helps structure content, autocompletes text and provides real-time feedback and citation management in over 2,600 styles.

[5] NotebookLM - Source-Grounded Research & Synthesis
https://notebooklm.google/
Works exclusively with your uploaded sources. It generates insights, outlines and summarises from your own documents.

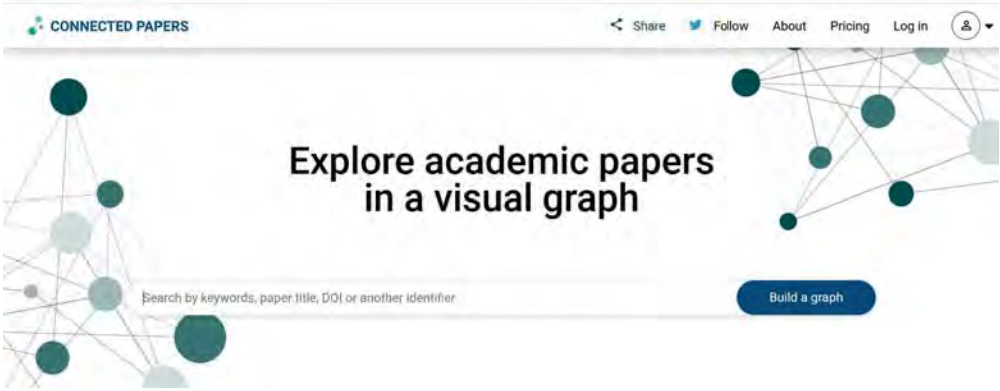
[6] Julius AI - Data Analysis & Scientific Insight
https://julius.ai/
Perform statistical analysis, qualitative coding, and
create visualizations using natural language prompts, eliminating the need for complex coding.

[7] Paperpal - Academic Editing & Submission Prep
https://paperpal.com/
It offers advanced grammar and paraphrasing checks, an AI writing assistant, essential submission check to increase the chances of publication success.

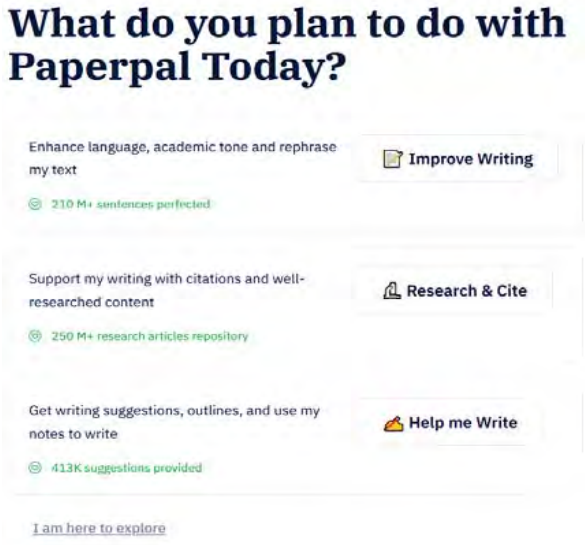
4. Research Applications: clarification of concepts



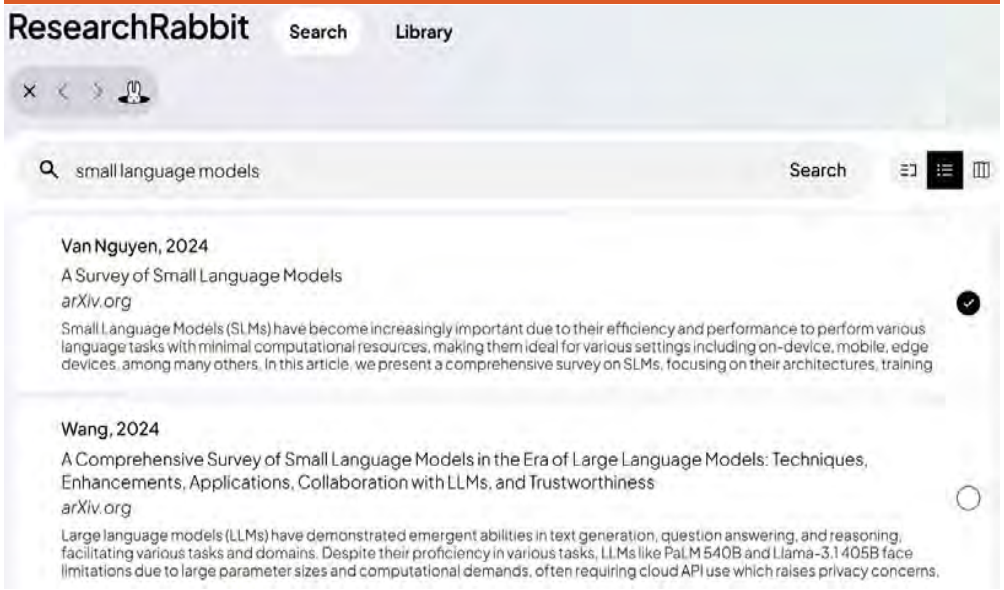
4. Research Applications: concept development



4. Research Applications: improve writing



5. Developments: Small Language Models?



5. Developments: Small → Tiny Language Models?

TinyStories: How Small Can Language Models Be and Still Speak Coherent English?

Ronen Eldan, Yuanzhi Li

Language models (LMs) are powerful tools for natural language processing, but they often struggle to produce coherent and fluent text when they are small. Models with around 125M parameters such as GPT-Neo (small) or GPT-2 (small) can rarely generate coherent and consistent English text beyond a few words even after extensive training. This raises the question of whether the emergence of the ability to produce coherent English text only occurs at larger scales (with hundreds of millions of parameters or more) and complex architectures (with many layers of global attention).

In this work, we introduce TinyStories, a synthetic dataset of short stories that only contain words that a typical 3 to 4-year-olds usually understand, generated by GPT-3.5 and GPT-4. We show that TinyStories can be used to train and evaluate LMs that are much smaller than the state-of-the-art models (below 10 million total parameters), or have much simpler architectures (with only one transformer block), yet still produce fluent and consistent stories with several paragraphs that are diverse and have almost perfect grammar, and demonstrate reasoning capabilities.

We also introduce a new paradigm for the evaluation of language models: We suggest a framework which uses GPT-4 to grade the content generated by these models as if those were stories written by students and graded by a (human) teacher. This new paradigm overcomes the flaws of standard benchmarks which often requires the model's output to be very structures, and moreover provides a multidimensional score for the model, providing scores for different capabilities such as grammar, creativity and consistency.

We hope that TinyStories can facilitate the development, analysis and research of LMs, especially for low-resource or specialized domains, and shed light on the emergence of language capabilities in LMs.

Subjects: **Computation and Language (cs.CL)**; Artificial Intelligence (cs.AI); Machine Learning (cs.LG)
Cite as: arXiv:2305.07759 **[cs.CL]**
(or arXiv:2305.07759v2 **[cs.CL]** for this version)
https://doi.org/10.48550/arXiv.2305.07759

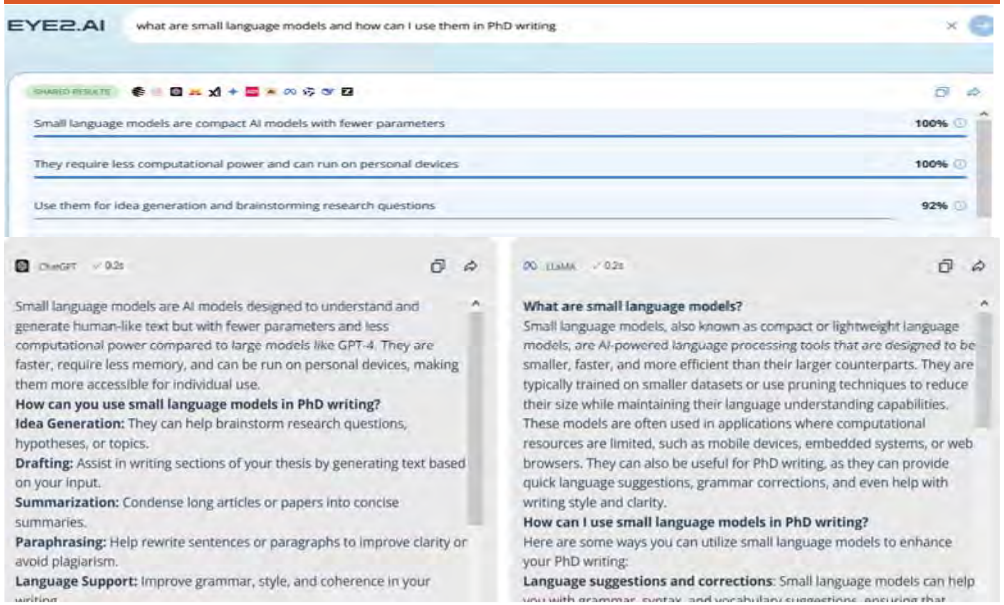
5. Developments: a chain of tools?

https://www.instagram.com/reel/DPK5NvQEebl/?igsh=MWhpN3F2bW4xdXJwaA%3D%3D

Search topic in Perplexity → sources
→ Copy top 20 links into Notebook LM
→ Customize Video Overview + Define your Learning Goals
→ Creates a video course with all slides

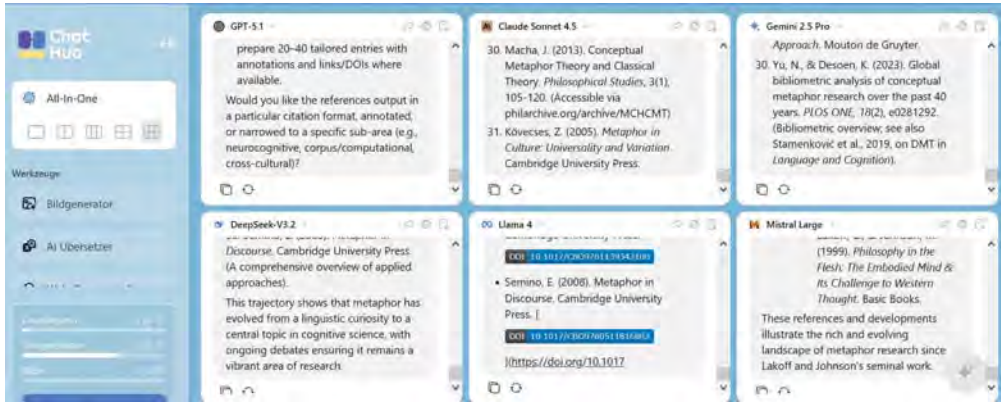
Small Language Models to avoid energy/overuse
vs.
Multiple Language Models to avoid hallucinations and biases

5. Developments: compare shared results of 11 LLMs

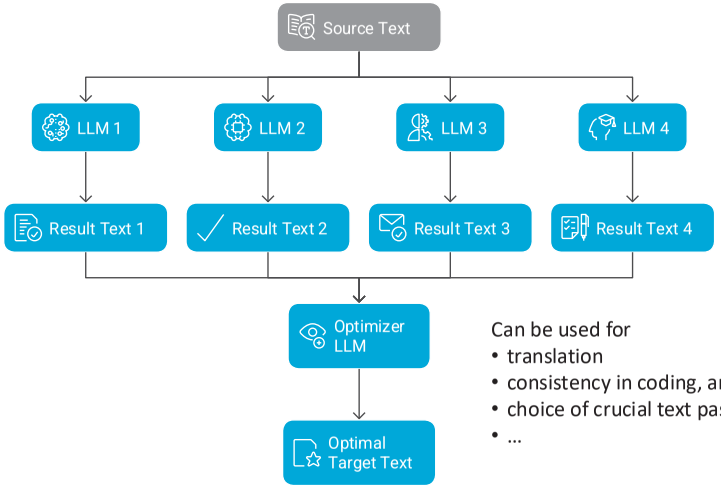


5. Developments: compare shared results of 6 major LLMs

Example: Lmarena,
app.chathub.gg
“the developments of the concept of metaphor since the seminal work by Johnson/Lakoff with 30 references” brings good results:



5. Developments: creating LLM choices for LLM Optimizer



Can be used for
- translation
- consistency in coding, annotation, etc.
- choice of crucial text passages,
- …

6. Conclusion: Ethical and legal issues

In the end, the AI user decides – and is responsible!

- Copyright issues are still unclear?
  https://noyb.eu/en/chatgpt-provides-false-information-about-people-and-openai-cant-correct-it
- In academic writing and publishing, all aids and resources used must be specified clearly!

e.g.
https://stm-assoc.org/document/recommendations-for-a-classification-of-ai-use-in-academic-manuscript-preparation/

What you do not have to reveal!

	Use of AI in the preparation of academic manuscripts (*)	Description of the activity	Examples of the activity	Activity does NOT include
1	**Refinement, correction, editing or formatting the manuscript to improve clarity of language (**)**	Machine tools were used to suggest language improvements within the manuscript	Using spell checkers, grammar checkers, and similar tools (such as Microsoft 365's inbuilt editing tools) to refine text written primarily by humans	Using AI tools to generate text from prompts or generate summaries of text; using AI tools to analyse or summarise textual documents as part of the research process

What you do not do!

9	**Presentation of any kind of content generated by AI tools as though it were original research data/results from non-machine sources (***)**	AI tools were used to create data, text, images, graphs, spectra, or other content that is presented as though it were original research data/results collected or analysed from other, non-machine sources	Any content generated wholesale by AI tools without any basis in original research data/outputs, presented as though it is based on original data/results	Using AI tools to visualise original research data/results (activity 6); carrying out research on the outputs of generative AI (in which case outputs generated by the AI being studied can be considered research data)

References

Aktay, S., S. Gök, D. Uzunoğlu (2023). ChatGPT in education. *Türk Akademik Yayınlar Dergisi (TAY Journal)* 7(2), 378-406.

Claude AI (2024). How to write a research paper with Claude AI. https://claudeai.uk/how-to-write-a-research-paper-with-claude-ai/

Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2024). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International* 61(3), 460–474. https://doi.org/10.1080/14703297.2023.2195846

Johannesson, P. (2024). *Writing Your Thesis with ChatGPT. Research, Scholarship and Academic Writing in the Age of Generative AI.* https://writingyourthesiswithchatgpt.wordpress.com/.

Skrabut, St. (2023). *80 Ways to Use ChatGPT in the Classroom: Using AI to Enhance Teaching and Learning.* StanSkrabut.

Schmied, J. (2026). Specialised Discourse with Agents? Beyond ChatGPT in Academic English. Olga Dontcheva-Navratilova; O. and R. Povolná (eds.). Analytical Perspectives on Text Analysis. Palgrave Macmillan.

Schmied, J., Atabekova, A., Freddi, M., Radić, N. (2026). Conceptualising Innovations and Developments in Language Teaching and Learning: The Way Forward. Radić, N., et al.

Schmied, J., M. Bondi, O. Dontcheva Navratilova, & C. Pérez-Llantada (eds.) (2023). Patterns of Language Variation and Change in Academic Writing. Special Issue. *TOKEN: A Journal of English Linguistics 16. https://token.ujk.edu.pl/volumes/volume-16/*

Suriano, R., Plebe, A., Acciai, A., & Fabio, R. A. (2025). Student interaction with ChatGPT can promote complex critical thinking skills. *Learning and Instruction,* 95, 102011.

Academic Writing for Doctoral Research, focus on Digital Humanities
Modena, 19/11/25

Recent Developments in GenAI: From Large to Multiple and Small Language Models? Applications for PhD Students

Josef Schmied
English Language & Linguistics
Chemnitz University of Technology
https://www.tu-chemnitz.de/phil/english/sections/ling/presentations_js.php
josef.schmied@phil.tu-chemnitz.de
http://tinyurl.com/Josef-Schmied