Responsible Use of AI Tools at the Department of Mathematics

Guidelines for Students*

TECHNISCHE UNIVERSITÄT DARMSTADT

Fachbereich Mathematik

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AI tools can be invaluable for handling routine tasks, allowing us to focus on the deeper, more insightful aspects of mathematical questions. However, it is crucial to ensure that these tools do not take away the opportunity for students to gain key insights on their own, which are essential in their development as mathematicians. Inappropriate use of AI tools may also give an unfair advantage, and it may be considered cheating and have legal consequences.

This document aims to give general orientation on how to, and how not to, use AI tools[2] in written assignments such as homework exercises, seminar papers, and BSc/MSc theses. The responsible use of AI tools can be broadly summarized by the following guiding principle.

Essential work that is central to your task or assignment may not be delegated to AI tools.

Ultimately, the determination of whether a particular use of AI tools adheres to this principle, and is therefore permissible, lies with the examiner of the course or supervisor of the thesis.

1 Legal background

The following parts of the General Examination Regulations (APB) of the TU Darmstadt [1] pertain to the use of AI tools in examinations.

> APB §22 (7): “In written papers (*schriftliche Arbeiten* – such as seminar paper, homework assignment, project work) and theses (*Abschlussarbeiten*) completed without proctoring/monitoring (*ohne Aufsicht*), the candidates must identify all sources used, including sources found on the Internet, and any other aids used. [...]"

> APB §38: “(1) If candidates are found to have attempted or committed a deception or an administrative offence during an examination, the examination is to be declared “insufficient”. The respective examiners are to decide in such cases, together with the relevant examination board in case of doubt.
> (2) An attempt to deceive will also be deemed to have been made if a false declaration has been made in accordance with §22 (7) or if another work, an adaptation of another work, a redesign of another work is reproduced in whole or in part in the written examination, written paper or thesis

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[2]AI tools include text generators (ChatGPT, Claude, Gemini, Grok, Llama, etc), image generators (DALL-E, MidJourney, Stable Diffusion, etc), programming assistants (GitHub Copilot, Codex, etc), and translators (DeepL, Google Translate, etc).

without this having been cited (plagiarism in accordance with §22 (7)).
(3) Candidates who do not follow the instructions regarding working materials and aids or are otherwise guilty of deception will be excluded from further participation by decision of the examiners.
[...]"

The Principles for Safeguarding Good Scientific Practice (GSP) at TU Darmstadt [2] provide the following guidelines.

> GSP §1 (1): " Technical University (TU) Darmstadt defines rules of good scientific practice and commits to these principles. In particular, the principles include working lege artis, i.e., working methodologically appropriate, maintaining strict honesty in attributing one's own contributions and those of others, rigorously questioning all findings, and permitting and promoting critical discourse within the research community. Individual researchers are responsible for ensuring that their own conduct complies with the standards of good research practice. Likewise, the members of TU Darmstadt assume a share of responsibility for maintaining scientific standards in their own subject community and in the university as an organisation."
>
> GSP §12 (1): "Researchers at TU Darmstadt document all information relevant to the production of a research result as clearly as is required by and is appropriate for the relevant subject area to allow the result to be reviewed and assessed. This includes the information necessary to understand the research
> a) regarding the research data used or generated, the methodological, evaluation and analytical steps taken, and, if relevant, the development of the hypothesis,
> b) to ensure that citations are clear, and, as far as possible, to enable third parties to access this information."

Other aspects to be considered when working with AI tools include copyright issues, plagiarism, and general data protection regulations.

2 General recommendations

Written assignments are crucial for developing core competencies. It is essential to ensure that the use of AI tools does not undermine these learning objectives. The responsible use of AI tools is often comparable to relying on the assistance by other individuals in a responsible fashion. Key considerations in this regard are:

- The judgement on the use of AI tools lies with the examiner/supervisor.
- Tools must not take over tasks central to the assignment.
- AI-generated content is not a primary source, and therefore cannot be used as evidence in academic work; instead, reliable, verifiable sources must be cited.
- Students are responsible for checking content generated by AI tools for correctness.
- Students are responsible for plagiarism in AI-generated content.
- It is advisable to avoid the direct adoption of AI-generated text. However, if such text is used, it must be clearly marked as a quotation, and the source must be properly cited (see Section 4).
- If AI tools significantly contributed to a thesis, beyond specific images or statements and without their exact contribution being clearly identifiable, they should be mentioned in the acknowledgments, similar to assistance from other individuals.

3 Examples of (in)appropriate applications

Ex 1 *Asking an AI tool for a proof that is part of an exercise.*
This is generally not permitted and clearly undermines learning objectives.

Ex 2 *Asking an AI tool for a proof of a well-known mathematical fact.*
This is probably not permitted if finding the proof is part of an exercise question. For the purpose of self-study such a use of an AI tool is perfectly fine, provided the resulting proof is carefully verified.

Ex 3 *Asking an AI tool for examples of functions with certain properties for an exercise.*
This is probably not permitted if finding such an example is central to the exercise. It might be permitted[3] in more advanced courses if the focus of the exercise lies on the idea what properties are needed rather than finding a specific example.

Ex 4 *Asking an AI tool for the name of a theorem (e.g., the theorem that states that if a function is continuous on a closed interval, it takes every value between its values at the endpoints of the interval).*
This might be permitted[3] in order to recall the name when applying the theorem to solve an exercise, but is generally not permitted if the task is precisely to remember this name.

Ex 5 *Using an AI tool to generate a presentation from a research paper for a seminar.*
This is generally not permitted and clearly undermines learning objectives.

Ex 6 *Asking an AI tool for LaTeX or TikZ syntax (e.g., how to draw a complete graph on five vertices).*
This is probably permitted[3]. Note that it is, of course, generally not permitted to ask for a specific sketch that is part of an exercise.

Ex 7 *Using an AI tool to produce illustrations for a thesis or seminar presentation.*
This is probably permitted[3]. It is recommended to annotate generated images with a proper citation (see Section 4).

Ex 8 *Using an AI tool to implement an algorithm in C++ for an exercise.*
This is probably not permitted if the intended learning outcome is familiarizing oneself with the algorithm and/or with C++.

Ex 9 *Using an AI tool to translate an algorithm from Python to C++ for an exercise.*
This might be permitted[3] if the intended learning outcome is to familiarize oneself with the algorithm rather than with C++. The responsibility for the correct implementation lies with the student.

Ex 10 *Using an AI tool to implement an algorithm for an empirical evaluation in a thesis.*
This might be permitted[3]. It is recommended to mention in the thesis that and how the programming assistant was used. The responsibility for the correct implementation lies with the author of the thesis.

Ex 11 *Using an AI tool to translate a German exercise text to English.*
This is perfectly fine. However, the student is responsible for the correctness of the translation.

Ex 12 *Using an AI tool to reformulate individual sentences or a translation tool to translate a German sentence to English when writing a thesis.*
This is probably permitted[3] to some extent as long as the content of the sentences is original. It is crucial to consult with the supervisor on how/whether the AI tools need to be mentioned in the thesis. The author of the thesis is responsible for any errors or plagiarism in reformulation or translation.

[3] The judgement lies with the examiner or supervisor.

Ex 13 *Using an AI tool for interactive tutoring on mathematical concepts or for general guidance in writing a thesis.*
This is perfectly fine. Depending on the extent of AI tool usage, it may be appropriate[3] to mention them in the acknowledgments.

4 Direct adoption of AI-generated content

While it is reasonable to use AI tools to improve or reformulate text without significantly altering its semantics or to generate images, it is generally advisable to avoid directly adopting text that is entirely AI-generated. Only in rare instances it may be appropriate to include AI-generated text verbatim.

When adopting AI-generated content such as text or images, the following guidelines should be adhered to:

- Clearly mark the text (e.g., using quotation marks or a LaTeX-quotation environment).
- Indicate any slight edits or omissions (e.g., using "[edited text]" or "[...]").
- Accompany the text or image with a proper citation and include a bibliography entry that specifies the AI tool and the date of generation.
- Provide the prompt and full response (e.g., in the text, in an appendix, or within the bibliography entry).

Here is an example of an appropriate citation of a response generated by ChatGPT [3]:

> "Students should use AI tools to enhance their understanding and efficiency, focusing on deepening their insights, while avoiding reliance on these tools to perform the essential intellectual work that is central to their academic growth."

References

[1] General Examination Regulations of Technical University of Darmstadt, 7th Amendment, Oct 5, 2023.

[2] Statutes – Principles for safeguarding good scientific practice at Technical University Darmstadt, Aug 22, 2022.

[3] ChatGPT 4o, response to the prompt "Please formulate a single sentence that expresses elegantly how students should and should not use AI tools in their studies.", Aug 29, 2024.