Usage of Artificial Intelligence by ESO Telescope Users

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With the increasing integration of artificial intelligence (AI) and large language models (LLMs) into various fields, it is crucial to understand their capabilities and usage within the scientific community. This study explores the adoption and impact of these technologies among astronomers using ESO telescopes, specifically in the context of proposal preparation and review. We shared a survey with the ESO telescope users to investigate this further. We received 827 responses and found that around 20–30% of the participants use LLMs when preparing proposals and about 3% of the participants use them when reviewing proposals. We also found that there is a divide in how the usage of AI is perceived when proposals are prepared/reviewed, pointing to the need for ESO to establish clearer guidelines. These guidelines will be released for the next period.

Motivation for the survey and its outcome

Artificial intelligence (AI) is used commonly in all areas of science. A few years ago, the use of large language models (LLMs) in problem-solving tasks became relatively common by the release of ChatGPT and, following that, other similar conversational models such as Google Gemini and Claude. This has transformed the way that we approach research, coding, and potentially preparation for observing proposals. Therefore, it is important for ESO, as one of the forefront organisations in building and operating ground-based telescopes, to investigate the use of LLMs in proposal preparation and review, and, if necessary, establish policies regarding this. In this article, we report the results of a survey that we shared with the ESO telescope users to shed light on the current usage of AI in proposal preparation and review. This is part of the ongoing efforts at ESO (i.e., the STARS@ESO[a] working group; Jerabkova et al., 2024) to better understand the effect of AI on proposal preparation and review.

Survey demographics and AI usage

The survey on AI (in this context mostly LLMs) usage by the ESO community in writing proposals was open for around four and a half months. We contacted around 2300 PIs who had submitted a proposal in the last ten semesters and got 827 responses (about 36%). Figure 1a presents a summary of the career stages of the survey participants. The collected distribution and demographics are well representative of the ESO community. Figure 1a also shows how much experience the participants have had of writing proposals. In brief, 55% of the survey participants have faculty positions, 30% are postdoctoral researchers, and 15% are PhD students. Faculty members mostly have more than five years of experience and PhD students mostly have one to two years of experience of writing proposals.

Of the survey participants only about 23% use AI to draft proposals. The usage of AI also correlates with level of seniority, with 33% of PhD students, 27% of postdoctoral researchers, and 18% of faculties using AI when writing proposals. This is illustrated in Figure 1b. Although a smaller portion of the faculty members seem to use LLMs in proposal preparation, given their larger group size it still results in a larger number of faculty members using AI than postdoctoral researchers or PhD students. Of those who use AI (about 190 participants), most did not notice any change in their success rate. More specifically, Figure 1c shows that only around 10% of the participants who use AI across various career stages noticed a positive change in their success rate.

We were also curious about how LLMs are used when drafting proposals. The left panel of Figure 2 shows a summary of what AI is used for. Across career levels, it is mostly used to enhance clarity and readability. After that, it is mainly used for the title of the proposal. Finally, a minority use AI for fact checking, for calculations, and/or for writing an entire abstract. Two participants mentioned that they use AI for writing the entire proposal including suggestions for the science idea. When it comes to reviewing proposals, the right panel of Figure 2 shows that most participants (~97%) do not use AI for this purpose. However, around 3% do use AI when reviewing proposals, which accounts for around 28 of the participants.

Relevant comments

We also asked the participants to provide any relevant comments. From those who provided them, two main general themes emerged. Around 80–90 participants (~10%) expressed their concern regarding the use of LLMs in either preparing the proposals or reviewing them. Some went as far as suggesting banning its use altogether or implementing a procedure to catch those who use LLMs for the
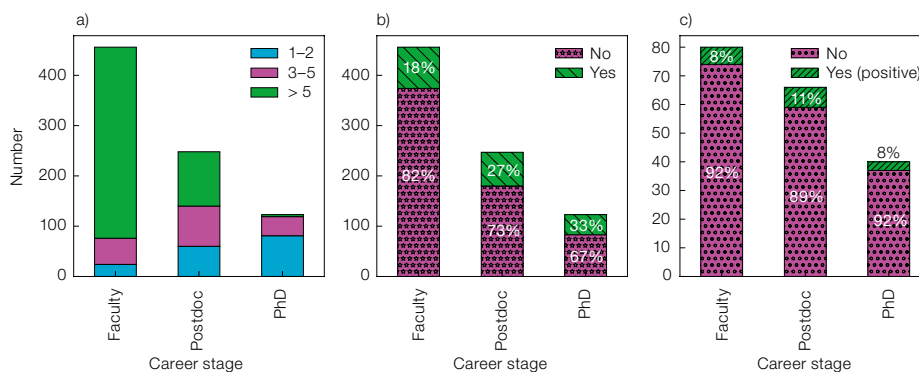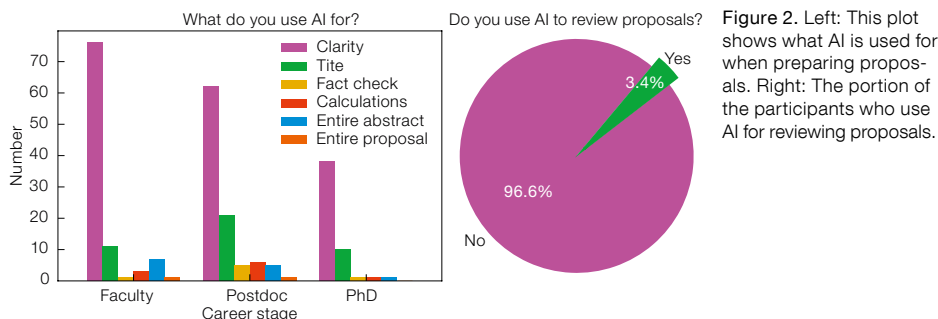

Figure 1. a) Number of participants in different career stages; the colours present the number of cycles for which they have written a proposal for ESO telescopes. b) The result of their answers to the question: Do you use AI when preparing proposals? c) The result of their answers to the question: If you use AI for proposals, have you noticed any change in your success rate?

proposal preparation and disqualify those who use it above a certain threshold. On the other hand, some of those who were concerned did not object to its use in improving the language of the proposal, especially for those who are not native speakers of English. Some of the concerns were related to the ethical aspect, as the large language models (LLMs) are trained on what is the intellectual property of others and therefore proper citations are required; the words "unethical" and "plagiarism" were used in several comments. Another concern that a few participants expressed was related to the decline of creativity and the uniformity of all proposals when using such models. Several participants also pointed to the need to double check what a LLM produces to avoid wrong statements. One person suggested that a negative factor could be the use of AI to make the proposal sound interesting, which may appeal to the younger reviewers, while the proposal may have scientific issues. A few people were also concerned about the energy consumption and carbon dioxide emission when training the LLMs. Some of those with concerns about the use of AI in reviewing proposals particularly mentioned the issue of consent, potentially hinting at the need to have the PIs' agreement for their proposals to be uploaded into LLMs. Some were also suspicious that they received reviewer comments generated by AI and that they were generic and not quantitative. One person was worried that the distributed peer review process might lose its meaning if AI is used in reviewing proposals.

The second theme included participants who were more positive about using LLMs in the preparation of proposals or reviewing them. This group consisted of around 60 participants (~7%) with roughly half of them emphasising the potential of AI in helping non-native speakers of English to produce higher quality text, which can increase the fairness of the process. This more positive group also included participants who are thinking about starting to use AI in proposal preparation and/or review in the future. One person even suggested integrating it into the proposal tool. Another person noted that in the review process, LLMs might have fewer issues with personal conflicts but it has also been suggested that AI may be more

Figure 2. Left: This plot shows what AI is used for when preparing proposals. Right: The portion of the participants who use AI for reviewing proposals.

in favour of proposals written by LLMs (Jerabkova et al., 2024). Although some participants in the other group were worried about declining creativity, one person in this more positive group mentioned the use of AI for inspiration.

Other comments included suggestions to assess proposals in a different way if LLMs are to be used more widely, for example by putting less emphasis on the clarity of the proposals and more on the science idea. A few participants suggested asking for a disclaimer from proposers/reviewers to confirm whether LLMs are used to produce/review proposals. Finally, we also received comments on the shortcomings of our survey. For example, some participants indicated that they use LLMs for coding and making plots, which was not given as an option in the survey. As we wanted to keep the survey short, we avoided asking more in-depth questions on the exact usage of LLMs when reviewing proposals. Therefore, a few participants elaborated on their usage when reviewing the proposals. These included asking AI questions on a subject to learn a topic fast enough to be able to assess the proposals fairly and using LLMs to refine and increase the clarity of their comments.

Closing remarks

To conclude, around 20–30% of the survey participants already use LLMs in the proposal preparation process and there seems to be a divide between those who strictly disagree with the usage of LLMs in proposal preparation and those who are more positive about it and see potential benefits. These findings indicate that ESO likely needs to establish a policy on whether LLMs are allowed to be used in

the proposal preparation and review process and, if so, to what extent they can be employed. Currently, ESO only has a disclaimer at the start of the review process such that the reviewers agree to not share the proposals with third parties. With the implementation of the new Confidentiality Agreement for the Review of the ESO Observing Proposals, stricter measures are now in place to safeguard sensitive information. Reviewers are explicitly prohibited from using automated processing methods, including AI tools such as ChatGPT, Google Gemini, or Claude, to process, analyse or interpret proposal content without prior written consent from ESO. This agreement ensures that confidential information remains secure and emphasises the importance of maintaining integrity and authenticity in the review process. As we move forward in this rapidly evolving technological landscape, ESO acknowledges the need for further specific guidelines and policies to address the ethical and practical challenges associated with AI usage in proposal preparation and review.

References

Jerabkova, T. et al. 2024, arXiv: 2407.02992

Notes

[a] STARS stands for Scientific Text Analysis with RobotS