Using AI to encourage the general public to observe and enjoy observational astronomy

Authors

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Abstract

Deep sky observation is a fascinating activity, but it requires favourable conditions in order to be fully appreciated [1]. Complex equipment, light pollution around urban areas, lack of contextual information often prevents newcomers from making the most of their observations, restricting the field to a niche expert audience. Who knows that hundreds of celestial targets can be observed with equipment accessible to amateurs? How to visually recognize a spiral galaxy, a globular cluster, or a planetary nebula? For people with a minimum knowledge of astronomy, simple observation may be enough; for others, assistance (human or technical) is required.

In this work, we show how combining the usage of smart telescopes with Artificial Intelligence makes the practice of astronomy even more attractive, accessible, and educative [2]. At Luxembourg Institute of Science and Technology, we have conducted the MILAN research project funded by Luxembourg National Research Fund to design and develop a set of AI-driven software to detect and recognize automatically the visible celestial objects – depending on the observation condition (light pollution, weather, etc.). These tools can assist any observer to drive the stargazing sessions and to get contextual information about the observation.

To share our experiences, we have published a number of academic articles in open access and therefore accessible to all, but we have also created YouTube playlists to show videos of galaxy and nebula captures enhanced and annotated by AI. We have showcased the technologies in major outreach events for the public at Luxembourg Greater Region (Expo Sciences 2022 & 2023 organized by Fondation Jeunes Scientifiques Luxembourg, Journée de la Statistique 2022 organized by Luxembourg Science Center and STATEC, Science Festival 2023 organized by Luxembourg National Research Fund) [3]. We organized live or registered demonstrations by showing and processing images captured by smart telescopes. The quality of the night sky is very poor in Luxembourg, the Milky Way is barely visible (except perhaps in the north of the country), and people are not used to being confronted with the night sky. And yet the interest was there!

Most of the participants showed a keen interest in easy-to-use automated telescopes. Furthermore, they saw and understood that AI could radically change the observing experience, even for 'common' targets (for instance, by providing IA-enhanced views of dust in Andromeda Galaxy's arms as well as small apparent planetary nebulae like Ring Nebula). A number of fascinating discussions ensued, notably on the distance of the galaxies and nebulae observed, but also on the current state of discoveries made with space telescopes... as well as on open questions such as "can black holes be observed from a garden"?

In future works, we will continue to develop the technologies and we will participate to other outreach events, in example with the Nature Museum of Luxembourg.

References

[1] Farney, Michael Noble. "Looking Up: Observational Astronomy for Everyone." *The Physics Teacher* 60.3 (2022): 226-228.

[2] Parisot, Olivier, et al. "Improving accessibility for deep sky observation." *ERCIM News* 130 (2022): 2022.

[3] Parisot, Olivier, and Mahmoud Jaziri. "Assisting Observational Astronomy for Public with Smart Telescopes and eXplainable Artificial Intelligence." (2023).