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LEVERAGING ARTIFICIAL INTELLIGENCE FOR ENHANCED LABORATORY RESEARCH AT THE SHARJAH ACADEMY FOR ASTRONOMY, SPACE SCIENCES, AND TECHNOLOGY

Abstract

This paper aims to assess the impact of Artificial Intelligence (AI) on the research laboratories housed within the Sharjah Academy for Astronomy, Space Sciences, and Technology (SAASST). There is no question that the application of AI in the "Meteorite Center," "Radio Astronomy Laboratory," and "Space Weather and Ionosphere Laboratory" is a necessity due to the complexity and volume of data generated in these laboratories. We explore how AI technology has been integrated into implementing processes, enhancing data analysis, and optimizing the decision-making process.

In the Meteorite Center at SAASST, AI-driven image recognition algorithms are being used to automatically identify and classify meteors and filter the data collected by the UAE Meteor Monitoring Network (UAEMMN). Consequently, the data reduction and handling processes have been significantly reduced. Researchers at the Radio Astronomy Lab are using AI algorithms to automate the reduction of data, allowing them to identify the different types of solar radio bursts detected by the lab's "Decametric Radio Telescope."

The Space Weather and Ionosphere Laboratory has been leveraging AI to predict and monitor space weather patterns to understand the dynamics of the ionospheric environment better. As a result of this work, machine learning models have been utilized to analyze historical data, particularly from GNSS

scintillation monitoring receivers, to forecast amplitude scintillation, a crucial factor affecting satellite communication and navigation systems. These advancements underscore the significance of integrating AI techniques into space weather research, facilitating the development of early warning systems essential for ensuring the reliability of satellite communications and navigation in the face of ionospheric disturbances.

The purpose of this paper is to provide insight into the successful integration of AI into these laboratories and to shed light on the challenges encountered during implementation, as well as the ongoing efforts to refine and expand the applications of AI. As a result of the adoption of AI at SAASST, astronomical and space science research at the institute has undergone a paradigm shift that has enhanced the efficiency and precision of experiments. This study contributes to the growing literature about the symbiotic relationship between artificial intelligence and scientific exploration. It provides new insights into the future of space sciences research facilitated by cutting-edge technology.