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LEVERAGING MACHINE LEARNING FOR STREAMLINED METEOR REDUCTION

Abstract

In this study, we propose a forward-looking and focused approach to meteor detection by leveraging the advancements in machine learning technology. We propose to use machine learning algorithms to detect meteors with minimal human intervention, thus streamlining the detection process. The algorithms that will be used include the You Only Look Once (YOLO) mode, the Region-based Convolutional Neural Networks (R-CNN) model, and the VGG-based Convolutional Neural Networks (CNN) model. For a comprehensive study, the UAE Meteor Monitoring Network (UAEMMN) stations located in different parts of the country are selected. Each of these stations faces different levels of light pollution. These stations are strategically positioned to provide a diverse representation of meteor activity and to ensure that the study results represent meteor activity across the country. The three stations will provide a sample of meteor data spanning a period of four years, which will serve as the basis for the analysis. Both of our YOLO models and VGG-based model scored a recall of 98%. Moreover, we will yet explore the R-CNN's capability in meteor detection and compare it with the former models. Integrating such innovative applied concepts into meteor monitoring stations will greatly reduce the time and effort required to analyze the data manually. This will lead to a more efficient and cost-effective approach to meteor detection. Furthermore, using these three stations with different levels of light pollution will provide a comprehensive representation of meteor activity across the country. It will allow for a more accurate assessment of the impact of light pollution on meteor detection. The study also provides a mechanism in which other global meteor monitoring systems can utilize our models for data reduction. Future work includes enhancing our classifications by determining if the detected non-meteor objects are remnants of satellites or boosters from rockets.