

57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE  
ACTIVITIES (D5)

Interactive Presentations - 57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE  
MANAGEMENT IN SPACE ACTIVITIES (IP)

Author: Ms. Büşra Şimşek  
TAI - Turkish Aerospace Industries, Inc, Türkiye

Mr. Said Semih Karadoğan  
University of Turkish Aeronautical Association, Türkiye

Mr. Uzay Tugcular  
TAI - Turkish Aerospace Industries, Inc, Türkiye

Mr. Mehmet Fatih Engin  
University of Turkish Aeronautical Association, Türkiye

Mr. Bugra Aydın  
Turkish Aerospace Industries, Türkiye

Mr. Kemal Usanmaz  
Turkish Aerospace Industries, Türkiye

SPACE WEATHER FORECASTING BY USING ARTIFICIAL INTELLIGENCE

**Abstract**

Space weather can have critical impact on our societies which makes it substantial to forecast. The atmospheric density is highly influenced by solar activity which is crucial for mission-life expectancy and determine the drag force acting on the satellites. Therefore, it is important to estimate the solar activities beforehand. However, it is also very complex from a physical point of view and many physical phenomena are interconnected through scales of several orders of magnitudes, which make it a real challenge for numerical modeling. Artificial Intelligence (AI) has been a useful tool for the various fields of space application and with the advancement of the AI, it will play an indispensable role in space weather forecasting approaches. Neural Networks, a subset of Artificial Intelligence is thus a tool with great potential to improve and deepen our understanding of space weather phenomena as well as to help us forecast with better accuracy events potentially harmful to human space activities.

In this paper, a combination of the two methods which are using the effectiveness of combining Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks for solar activity prediction. The hybrid model uses CNNs to extract features from solar images and LSTMs use physical models to analyze temporal evolution for space weather forecasting purposes.