

FORECASTING SPACE WEATHER USING DEEP LEARNING TECHNIQUES

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Master's Program in Computational Science

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Dedication

to my

Family

with love

FORECASTING SPACE WEATHER USING DEEP LEARNING TECHNIQUES

by

SUMI DEY

THESIS

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Abstract

Solar activity gives rise to various kinds of space weather among which solar flares have serious detrimental effects on both near-Earth space and our upper atmosphere that will have consequent influence in our lives. For example, solar flares can damage satellite infrastructure, hinder power grids, disrupt Global Positioning Systems (GPS) and disrupt long-distance communication. Airplane pilots, cabin crew and astronauts can be affected by the harmful radiation released from the Sun. As a result, there is a need of a methodology to forecast space weather accurately. In this work, we have developed a deep learning architecture to do the short-range prediction of the X-ray flux and particle flux emitted by the Sun in continuous time by making use of time series data. We considered two baselines to evaluate our approach; in one baseline, the latest available flux is used as the prediction; in the other baseline, the average of the previous fluxes with a particular time window is used as the prediction. Our developed model outperforms both of the baselines. Our proposed work consists of extending the prediction methods by exploiting information extracted from sequences of solar images.

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