**Space Weather**

An analysis to understand and predict the solar cycle of the sun.

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**Project objectives**

Produce a study of the sun’s solar cycle by analysing sunspot data using a plethora of statistical methods with the aim of understanding the nature of solar cycles and making forecasts on future solar weather.

The sun, to this day, remains for the most part a mystery. There are many questions which are still not answered. However, the current understanding of the nature of the sun proves useful enough to produce accurate models which help scientists and governments make predictions on the future solar flux. Understanding when the Earth may be subject to strong solar storms allows companies, organisations and governments prepare for the effects which the sun has on modern civilisation. Radio blackouts disrupt specific radio frequencies. Increases solar flux increases the energy in the atmosphere increasing atmospheric drag on satellites and spacecraft. Commercial aircraft are subject to increased amounts of radiation in the upper atmosphere.

**Diary**

09/12/2023

* Began reading on basics of solar cycles e.g., solar cycle ~11 years and descriptions of different solar storms.
* Pulled .json data from NOAA space weather site.
* Tidied up graphs.
* Added README to repository.

11/12/2023

* Implemented Savitzky Golay smoothing.
* Added legend to graphs

13/12/2023

* Tidying up code.

14/12/2023

* Implemented Random Forest Regressor ML prediction method as proof of concept.
* Training only takes a minute or so.
* Forecast fits nicely against test data.

20/12/2023

* Reading a heliophysics paper

21/01/2024

* Exploring Fast Fourier Transform (FFT) algorithm to explore different frequencies of the time-series.

31/01/2024

* Using FFT as a predictor.

02/02/2024

* Wrote function to implement FFT as a smoother.

05/02/2024

* Switched to using static data rather than live data from NOAA database.