A background image of the solar system showing the planet Venus on the left and Earth on the right, set against a dark star-filled space.

NASA SPACE CHALLENGE

DEMO PROJECT

ASTRO ANALYTICS

TEAM MEMBERS

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OBJECTIVE

PREDICT GEOMAGNETIC STORMS

- DSCOVR can measure the strength and speed of the solar wind in space, which enables us to predict geomagnetic storms that can severely impact important systems like GPS and electrical power grids on Earth.
- Our objective is to use Raw data from DSCOVR and build model that can predict the geomagnetic storms .We predicted by model that depends on Kp value($k_p >= 5$ storm occurs with high probability).
- The Data was extracted from the websites that were mentioned in resources
- Links are : <https://www.spaceappschallenge.org/develop-the-oracle-of-dscovr-experimental-data-repository/>
- <https://kp.gfz-potsdam.de/en/data#c222>

WHY WE CHOOSE THIS PROJECT

Impacts of geomagnetic storms:

- Communication disruption with satellites
- Ionospheric expansion can increase satellite drag and make their orbits difficult to control.
- Astronauts and high altitude pilots can be subjected to increased levels of radiation when high storm occurs.
- there are many impacts we mentioned few
- This motivated us to develop prediction model for Geomagnetic storm with given raw data.

DATA PROCESSING

- From given raw data, we took 2022 and 2021 data 1st column is time, next three are fields named x, y, z . rest are fluxes in different range of energy

Dataset of 2022:

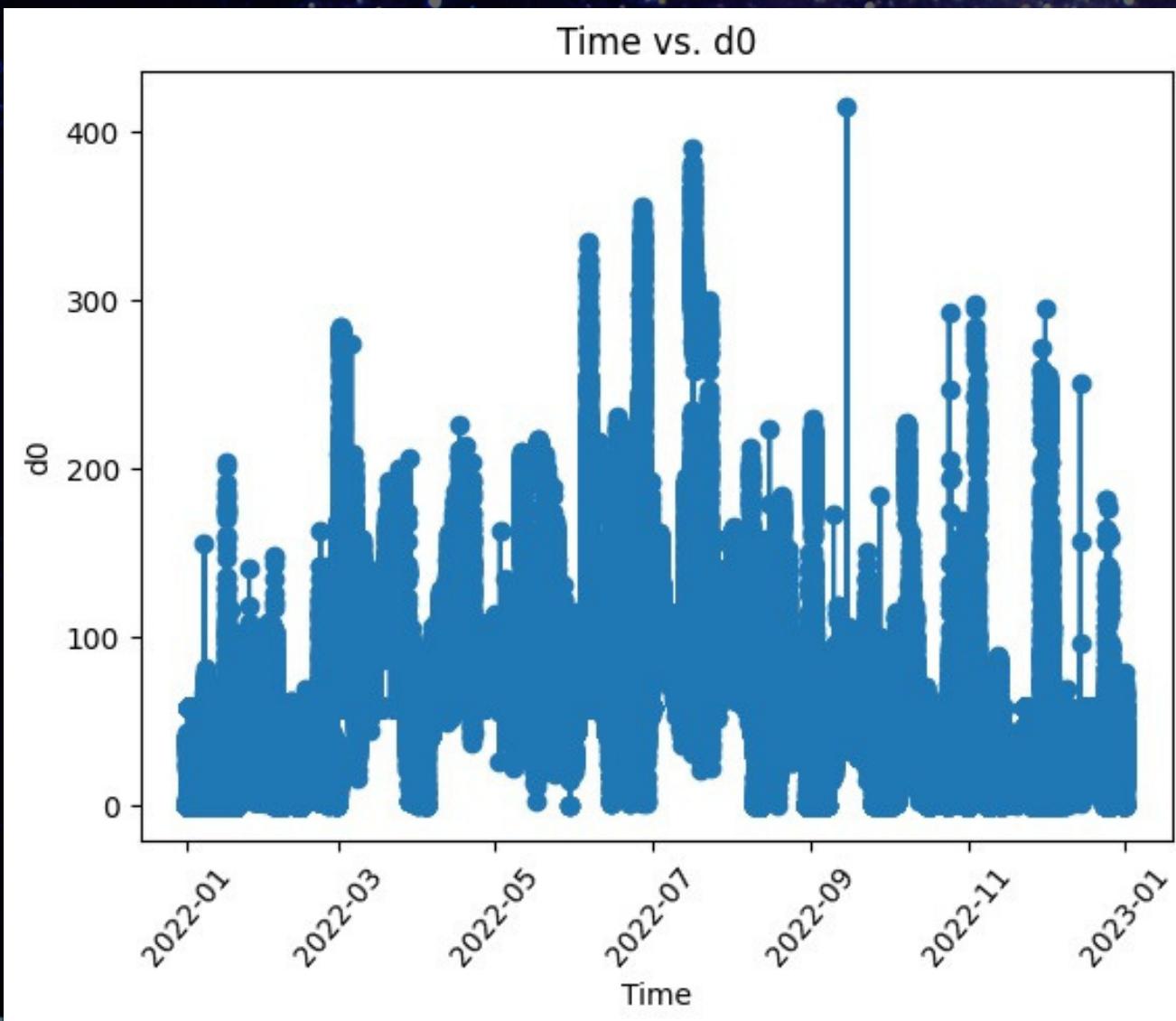
- We dropped d29 to d49 columns with have more then 50% nan values and for x, y, z, d0 to d22 used KNNImputer to predict the nan values for d23 to d28 used interpolate linear method.

Dataset of 2021:

- We dropped d29 to d49 columns with have more then 50% nan values and for x, y, z, d0 to d17 used KNNImputer to predict the nan values for d18 to d28 used interpolate linear method. We stored all data in new csv.
- Note: we used two different process cause KNN took more time to complete. To complete in time we stopped KNN after some extact and preferred interpolate linear method.

DATA PROCESSING

- In pre-processing, took the kp data from <https://kp.gfz-potsdam.de/en/data#c222> for 2022 and 2021 this data has few missing data which are filled by interpolate liner method ,added 2 new columns in the existing dataset named kp_val, geoStorm_01.
- geoStorm_01 is based on kp_val if $\text{kp_val} \geq 5$ then storm occurs else will not.



- Here, do is the one of the flux parameter in given energy range.(in 50 parameters)
- It is the plot of values of d0 in period of time.
- We also did resampling of data for reducing biasness

MODEL

- After pre-processing, to predict we applied neural network modeling to newly developed data.
- It is specifically designed model to predict a binary value for Kp.
- In Regression ,Adam' optimizer was used to optimize and utilized the binary crossentropy as loss function .
- From predicted Binary value if it is 1[Storm will occurs],0[Storm Will not occur] .

**THANK YOU
FOR YOUR ATTENTION**

