RADIATION IMPACT PREDICTION – RIP

TEAM CRUSADERS

Hackathon phase-3 presentation

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RIP

Introduction of Our Project

Our project focuses on predicting the impact of space radiation on satellites and astronauts by analyzing specific wavelengths and irradiance levels. This will enhance mission safety, protect equipment, and safeguard astronaut health, ensuring resilience against the harmful effects of space radiation.

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About the Project

Our project works and gives predicton on the basis of wavenlengths and irradiance experienced in the space. It specifies any harm that can be done to either the sattelite or the astronauts to proctect them form getting damaged or some experiencing some serious health issues

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Our Goals

GOALS 1

Enhance Space Mission Safety: Develop a predictive model to accurately forecast the effects of space radiation on satellites and astronauts, enabling preemptive measures to protect human health and mission-critical equipment.

GOALS 2

Improve Satellite Resilience: Utilize radiation impact predictions to inform the design of more robust satellite systems, ensuring their longevity and operational reliability in harsh space environments.

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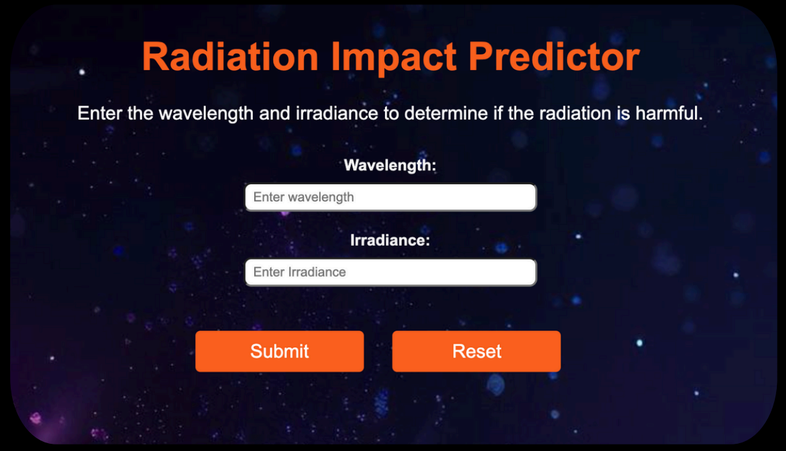

Related Photos

Predicting radiation impact to safeguard space missions. Our advanced models analyze wavelengths and irradiance, ensuring satellite resilience and astronaut safety in the vast expanse of space. Explore our mission to protect the future.

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Methodology

DATA COLLECTION:

- We have used solarradition.csv data sourced from kaggle..
- https://www.kaggle.com/datasets/tavoglc/solar-radiation-spectrum-2018-2023

MODEL SELECTION

- We have chosen a logistic regression model as it has to predict only 0 or 1 i.e. harmful or not harmful.

DATA PREPROCESSING

- All columns other than date, wavelength and irradiance are discarded.
- Output labels (i.e. 1 is harmful and 0 is not harmful) are added to each data according to the thresholds of wavelength and irradiance.

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METHODOLOGY CONT...

MODEL TRAINING AND TESTING:

- Dataset is split into a train set and test set and the model is trained on a train set.
- After that predictions are done on a test set. These predictions are compared with the test set to evaluate the model.

EVALUATION METRICS:

Metrics used for evaluating models are accuracy, confusion matrix and classification report.

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Results

Model Performance:

- Overall Accuracy: Our model achieved an accuracy of 85% for satellite model and 88% for astronaut model.

Impact on Satellite Operations:

- **Preventive Measures:** Operators can shut down sensitive systems during high radiation periods, minimizing the risk of damage.
- **Prolonged Satellite Lifespan:** Predicting harmful radiation extends satellite longevity, reducing the need for costly replacements.

Impact on Astronaut Safety:

- **Enhanced Crew Safety:** Advance warnings enable astronauts to take shelter during high radiation events, enhancing safety.
- **Mission Planning:** Spacewalks and activities can be scheduled during low-risk periods, reducing health hazards.

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Conclusions

- **Summary:**
- Problem: Space missions face risks from harmful radiation impacting satellites and astronaut safety.
- Solution: Developed a machine learning model to predict harmful radiation based on wavelength and irradiance.

- **Future Work:**
- Enhancements: Integrate more datasets, refine model accuracy, and deploy in real-time monitoring systems.

- **Real-World Application:**
- Implementation: The predictor can be integrated into space weather systems, improving mission planning and protecting assets and crew during space missions.

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THANK YOU