Project Overview: Exoplanet Habitability Predictor

Objective

The **Exoplanet Habitability Predictor** is a data science project aimed at predicting whether an exoplanet is habitable based on specific planetary characteristics such as radius, orbital distance from its star, and surface temperature. This project is part of the NASA Space Apps Challenge 2024, under the team **Astro Data Science Collective**.

Project Goals

- Develop a machine learning model that can predict exoplanet habitability.
- Create a user-friendly web application that allows users to input exoplanet data and receive habitability predictions in real-time.
- Visualize planetary data to provide insights into the factors that determine a planet's habitability.

Revised Project Plan for Tight Deadline

Since the project submission deadline is **October 5th**, we've streamlined the plan to focus on essential deliverables:

Focus Areas

1. **Data Collection and Preprocessing** (Day 1–2)
    - Source data from NASA's Exoplanet Archive.
    - Clean and preprocess the dataset quickly (handle missing values and drop unnecessary columns).
2. **Feature Engineering** (Day 2)
    - Create necessary features like **Goldilocks Zone** and **Rocky Planet** using simple logical conditions.
3. **Model Development** (Day 3)
    - Use a pre-built classifier like **Random Forest** (as it requires minimal tuning).
    - Train the model and evaluate it using basic accuracy metrics.
4. **Streamlit Web App** (Day 4)
    - Build a simple UI using **Streamlit**.
    - Add input fields for exoplanet data and integrate the trained model to generate predictions.
5. **Final Testing & Submission** (Day 5)
    - Test the app with various inputs.
    - Deploy the app to **Streamlit Cloud** for public access.
    - Prepare a short write-up or documentation for submission.

Milestones

- **Day 1–2**: Data preparation and preprocessing complete.
- **Day 3**: Model trained and evaluated.
- **Day 4**: Web app built and integrated with the model.
- **Day 5**: Final testing, deployment, and submission.

Roles and Responsibilities

Team Member	Role
Team Lead	Project coordination, data sourcing, final app deployment
Data Scientist 1	Data preprocessing, feature engineering
Data Scientist 2	Machine learning model development and evaluation
Web Developer	Building the front-end UI with Streamlit
Research Specialist	Gathering data on exoplanet features, verifying scientific accuracy

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Tools & Technology

- **Programming Language**: Python
- **Libraries**: Pandas, NumPy, Scikit-learn, Matplotlib
- **Web Framework**: Streamlit
- **Data Source**: NASA Exoplanet Archive
- **Version Control**: GitHub