

# EXOPLANET EXPLORATION

- ALGO ALTAIRS



# WELCOME TO OUR ALTAIR X



The "Altair X" project introduces a groundbreaking approach to analyzing exoplanetary samples in real-time using in-situ methods. The system proposes gas separation techniques and real-time reactions between environmental elements and collected samples, improving mission efficiency and reducing costs by transmitting results back to Earth before the samples return.

This project emphasizes planetary habitability assessment based on chemical interactions, gas analysis, and secure data transmission.



# ABOUT OUR MISSION

Exploring exoplanets for astrobiological potential requires significant effort in sample collection and analysis. Conventionally, physical samples are sent back to Earth for study, which is both costly and time-consuming. The "Altair X" project aims to introduce a system that allows real-time analysis of collected samples and transmits analytical data back to Earth before the sample arrives.

01

**Develop a scalable and cost-effective system for real-time analysis exoplanetary samples.**

02

**Utilize gas separation and chemical reaction techniques for habitability evaluation.**

03

**Enable secure and reliable data transmission between space and Earth.**





# GAS SEPARATION AND REACTION SYSTEM

01

Membrane Filtration

02

Cryogenic Distillation

03

Pressure Swing Adsorption (PSA)





# METHODOLOGY



- 01 **Gas Separation using filtration or distillation techniques.**
- 02 **Sample Analysis by reacting gases with planetary materials.**
- 03 **Data Processing & Transmission through AI that compresses and sends prioritized data back to Earth.**



# CONCLUSION AND FUTURE WORK

01

## Collision Detection and Avoidance

AI-based algorithms ensure real-time satellite collision detection and avoidance, optimizing fuel usage while maintaining mission safety.

03

## Experimental Setup and Simulations

Initial experiments simulate exoplanet environments with atmospheric separation techniques and real-time analysis. Samples were analyzed using Martian soil simulants, confirming the viability of pre-arrival analysis methods.

02

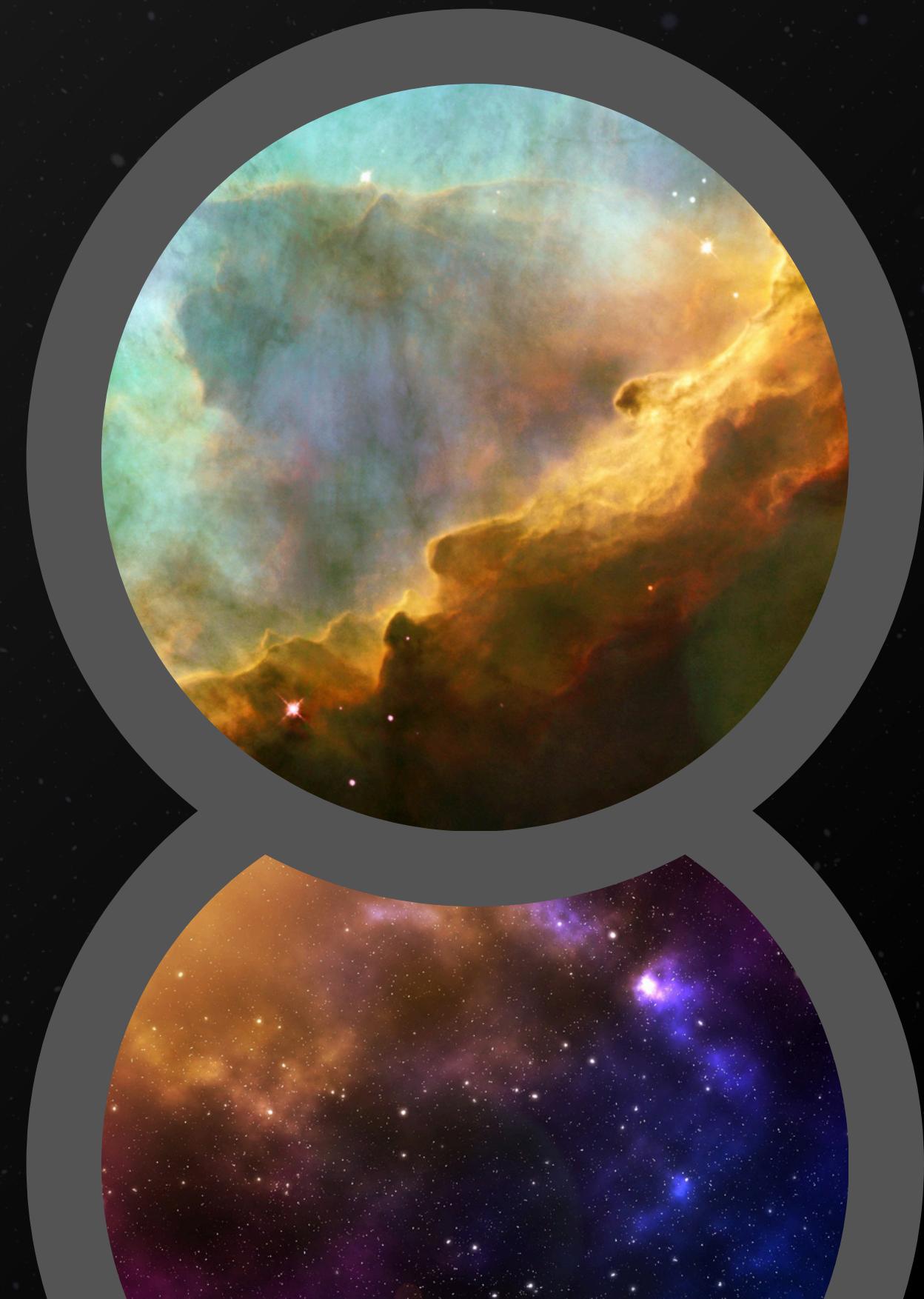
## User Interface & Visualization

Develop a real-time dashboard for visualizing space object positions and alerting operators to potential collisions, using tools like Plotly

04

## Results and Discussion

Promising results from gas separation techniques suggest that real-time habitability analysis can be achieved on exoplanets. Communication systems effectively transmitted data without significant loss, and future improvements in laser-based communication could increase data transfer speeds.



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