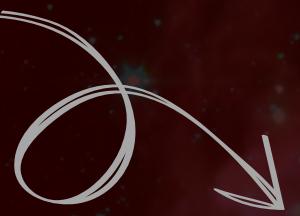
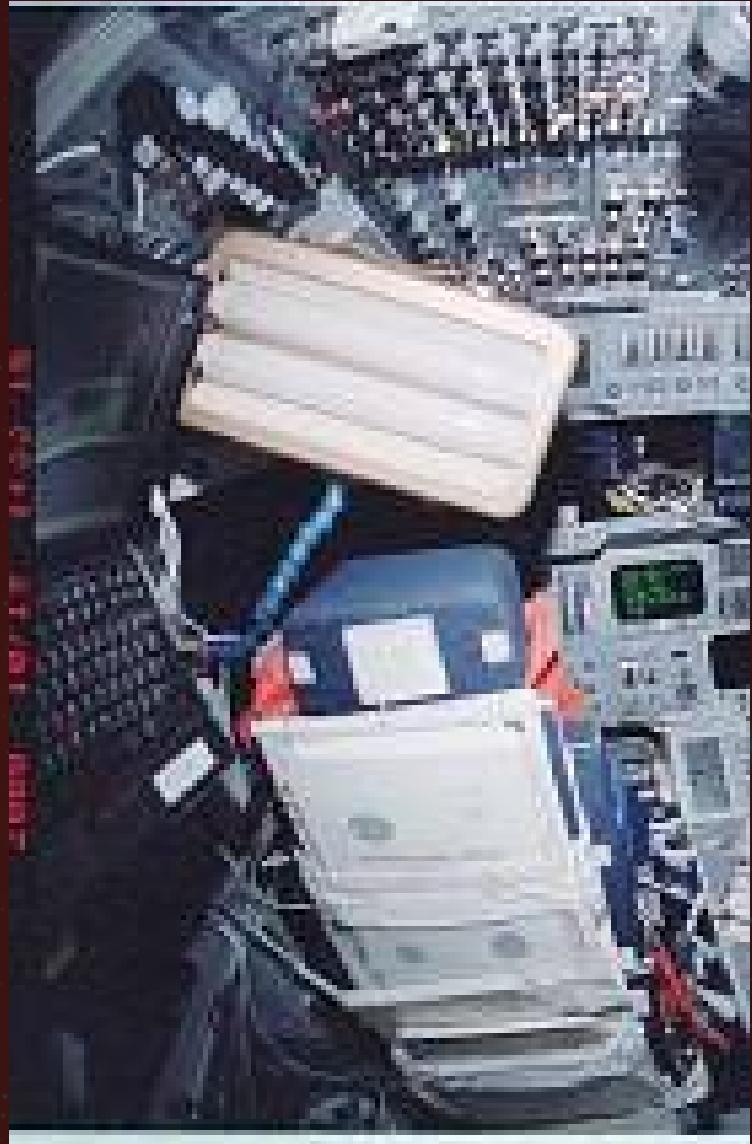


# DUALITY-AI

eSpace Station Object Detection

# Why Object Detection in Space?



Space Stations are cluttered environments.



Quick access to safety gears (Oxygen tanks, fire extinguishers) is critical.



Manual identification is error prone due to emergencies.



# What are we building?

A YOLOv8-based real-time object detection model

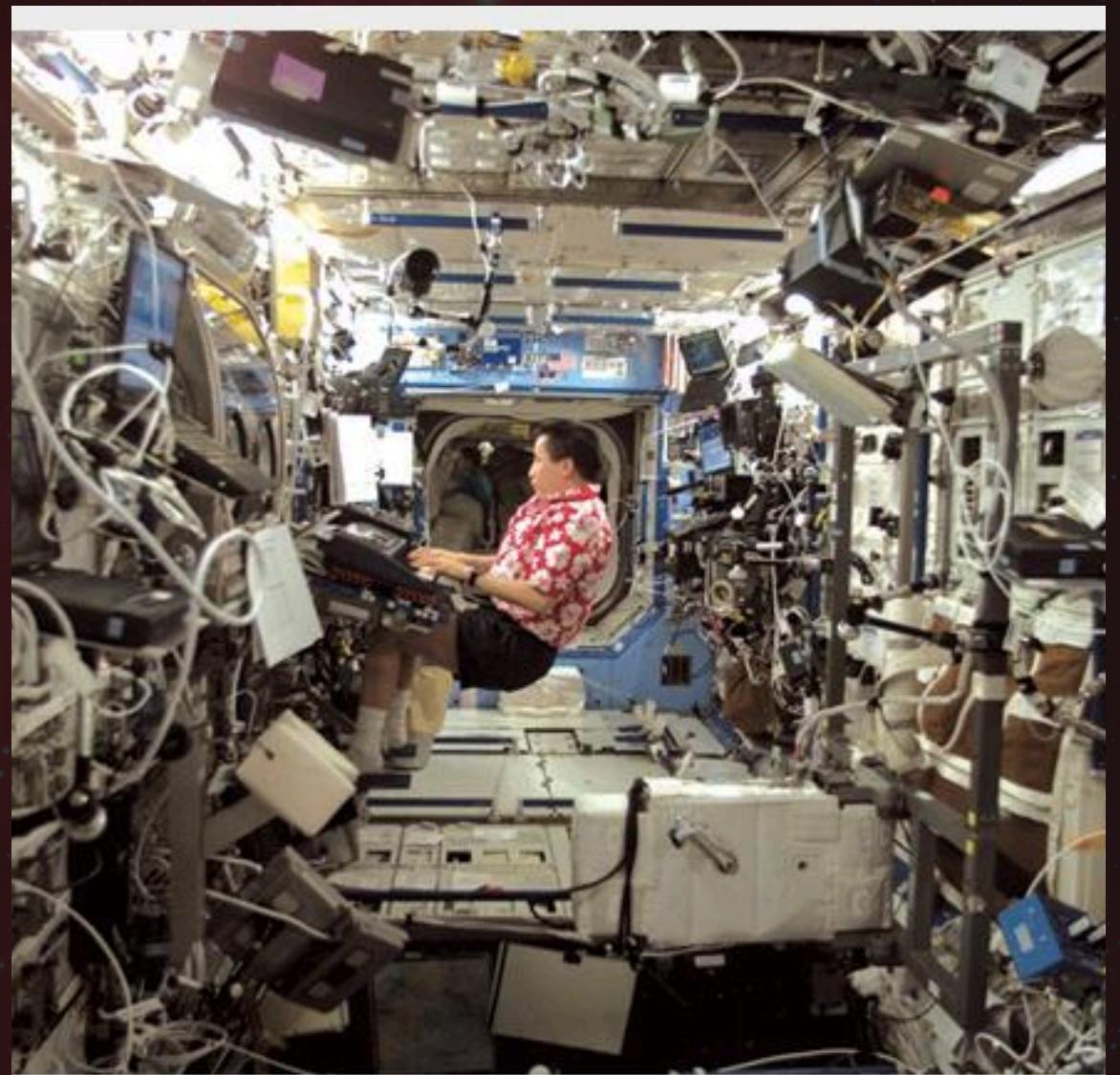
01

Identifies critical space tools: fire extinguisher, oxygen tank, toolbox

02

Trained entirely on synthetic data from Duality AI's Falcon simulator

03



# Synthetic Data

Falcon Simulator (Duality AI)

Synthatic Imges + labels



# Powerful Tools

Python | YOLOv8

OpenCV | Anaconda

# MODEL PIPELINE



**DATASET**



**PROCESSING**



**YOLOv8 TRAINING**



**EVALUATION**

# Step-by-Step Pipeline

01 Set up YOLOv8 environment

02 Downloaded & analyzed Falcon data

03 Augmented and pre-processed data

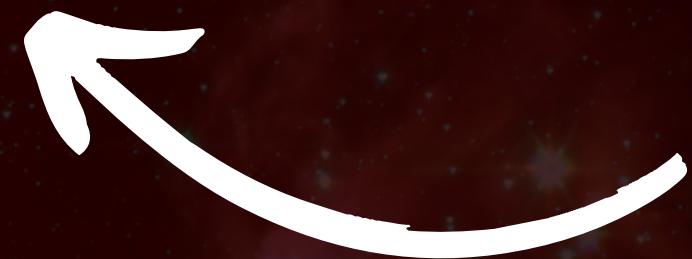
04 Trained model using YOLOv8

05 Evaluated using mAP, PR curves

06 Optimized & visualized predictions

# OUR TEAM

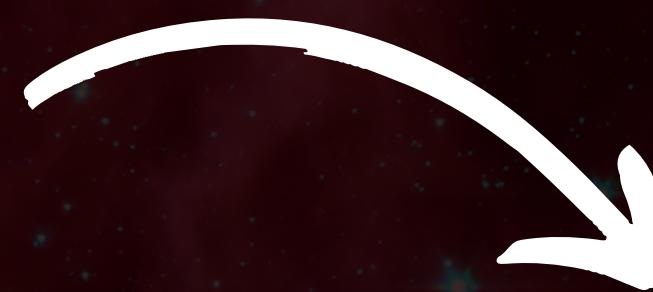
Kartik Yadav  
(Frontend Developer & API Manager).



Nakul verma  
(Admin & Backend Developer)



Piyush Kumar  
(Backednd & Blockchain Developer).



Om Kumar  
(Frontend Developer & Database Manager).

# What Sets Us Apart?

01 Robust under occlusion (trained with augmented shadows and rotations)

02 Lightweight – optimized for low-latency deployment on edge devices

Uses only synthetic data — no real-world images required

Modular and reproducible pipeline

03

04

# Real Problems

Synthetic data imbalance

Similar-looking objects

Limited field-of-view scenarios

# Smart Solutions

Over/under-sampling, rotation augmentations

Label smoothing and IoU tuning

Focused failure case analysis

# What's Next?

Expand to more object classes      01

Real-world test deployment in AR glasses      02

03   On-device inference with TensorRT

04   Falcon + RL-based robot navigation

Fully synthetic → fully  
functional model

# Ready-for Space

Built, trained, and  
evaluated from scratch

Tackles space safety  
via machine vision

# THANK YOU

Empowering Space Safety with  
Synthetic Vision