Tackling the CSA Moonwalker Challenge: Exploring the Distant Universe with JWST

Presenter: Ashley Ferreira (she/her) - a4ferreira@uwaterloo.ca

Other Team Members: Yusuf Ahmed, Dhvani Doshi, Daniel Reimer

Much of this work was conducted at the University of Waterloo on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples, situated on the Haldimand Track, the land granted to the Six Nations that includes six miles on either side of the Grand River.

Our Solution: Webb gAlaxy COunter (WACO)

A jupyter notebook that can demonstrate how to...

Step 1

Retrieve and enhance image

Step 2

Create a sky map to show object's coordinates

Step 3

Estimate the number of galaxies in given image

We noticed that much of the JWST data analysis tools were either quite advanced or based on simulation data and so our hope is to make real data more accessible to students just beginning in astronomy research like us!

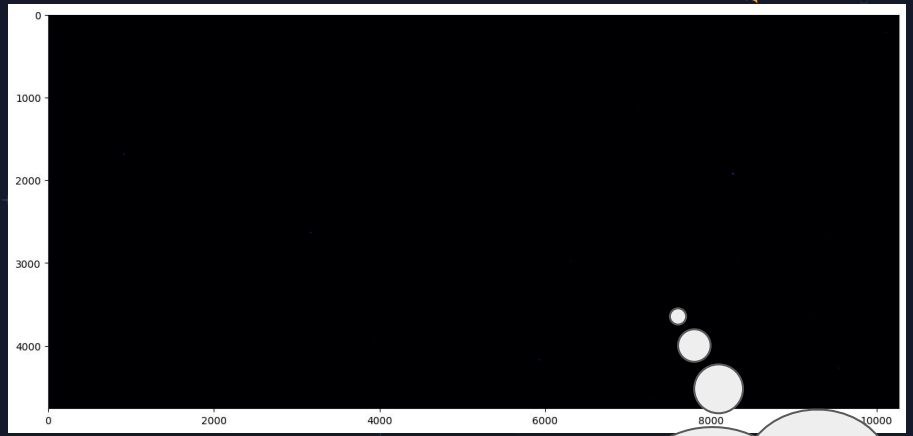
SCAN ME

Step 1: Retrieving and Enhancing Image

01

processed image retrieved from https://www.nasa.gov/.

Chosen target was JWST's first deep field image: SMACS 0723



02

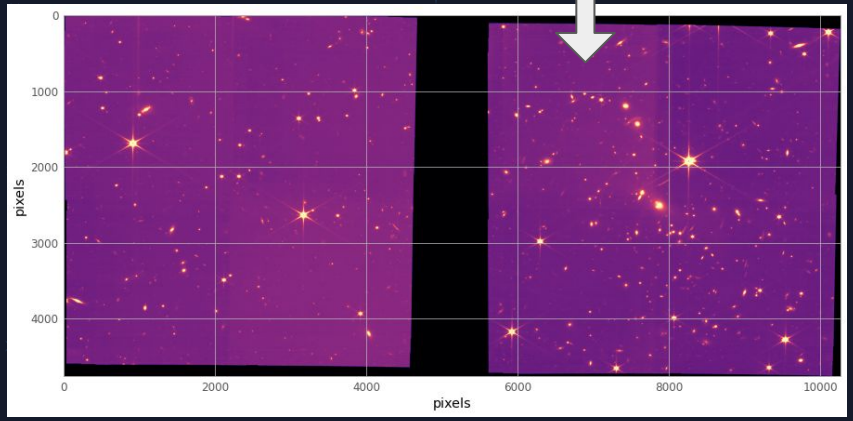
Initial raw image once it was retrieved using a MAST query

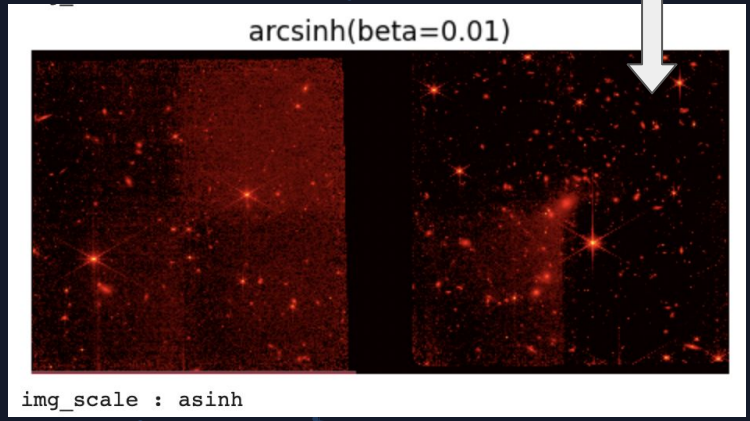
Completely dark since the image data has not been scaled correctly!

Step 1: Retrieving and Enhancing Image

We can use different scaling methods to enhance the raw image in order to actually see the information

Image is “flipped”





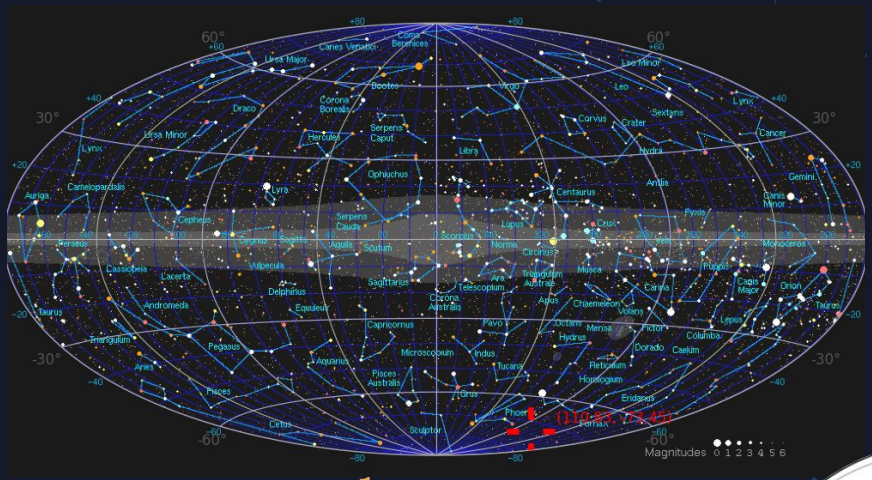
03

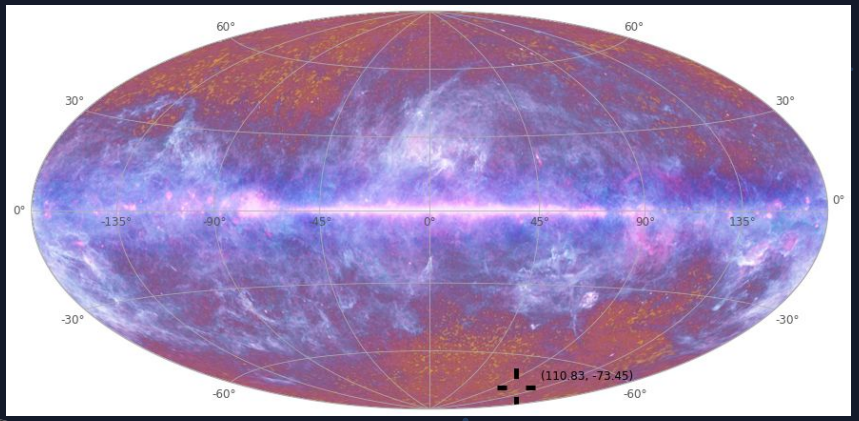
Enhanced image using astropy’s ZScaleInterval

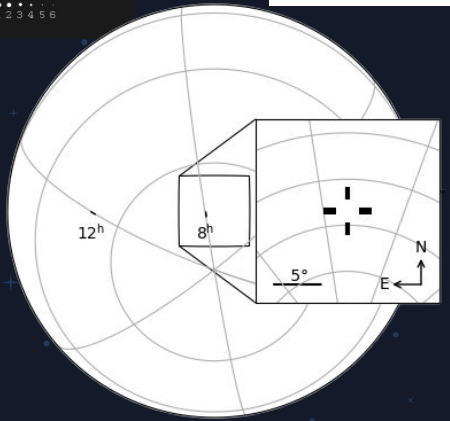
04

Other custom filters can be applied

Step 2: Place Target on a Sky Map







Users can see their target mapped onto several different projections and sky map backgrounds, they can even upload their own!

Step 3: Estimate Number of Galaxies

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estimation for number galaxies in image: 6305
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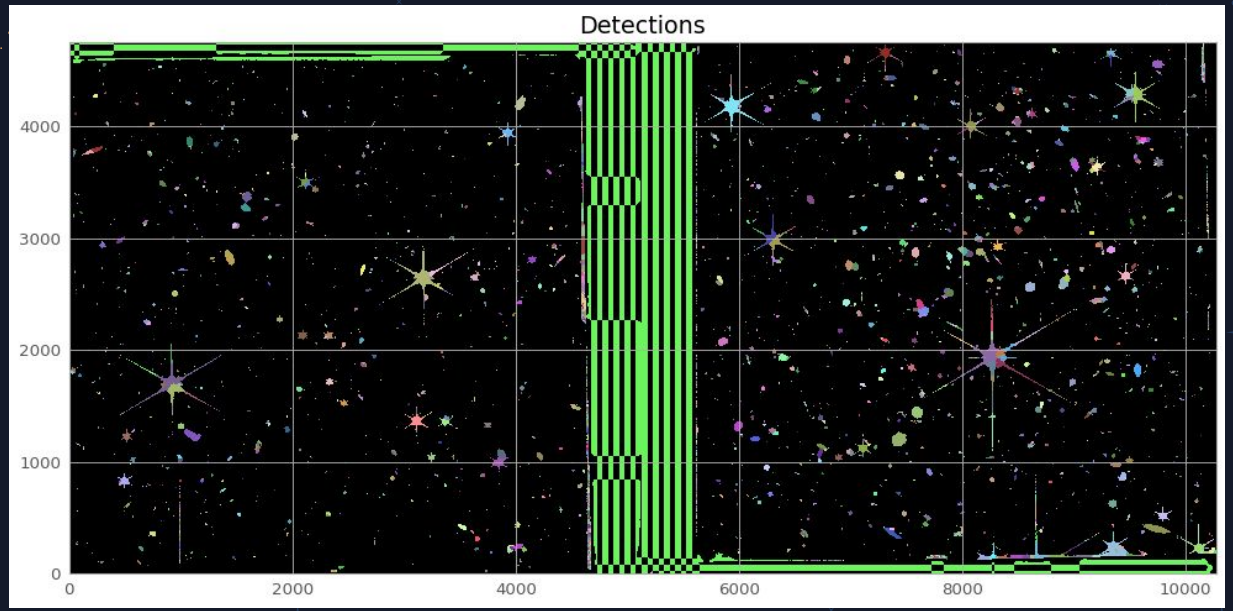
Hubble detected almost 3,000 galaxies in similar RHS image



Method taken from existing STScI JWST simulations notebook

JWST Story

Written by GPT-3 and Illustrated by DALL-E 2

When OpenAI launches an API for DALL-E 2 we can automatically and interactively generate story content like this in our notebook!

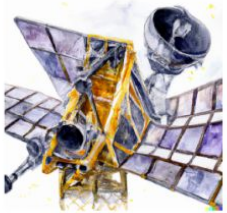
Big Telescope, Bigger Dreams

Written by: GPT3

Illustrated by: DALLE2

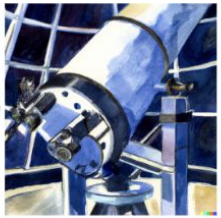
1

The James Webb Space Telescope was built to explore the universe.



2

It is the largest and most powerful (*space*) telescope ever made.



3

The telescope will allow scientists to see things that they have never seen before.

4

They will be able to see the first stars and galaxies that formed after the Big Bang.

5

They will also be able to study the atmospheres of planets around other stars.

6

The telescope will help us to understand the universe and our place in it.

7

8

Big Telescope, Bigger Dreams

Written by: GPT-3

Illustrated by: DALL-E 2

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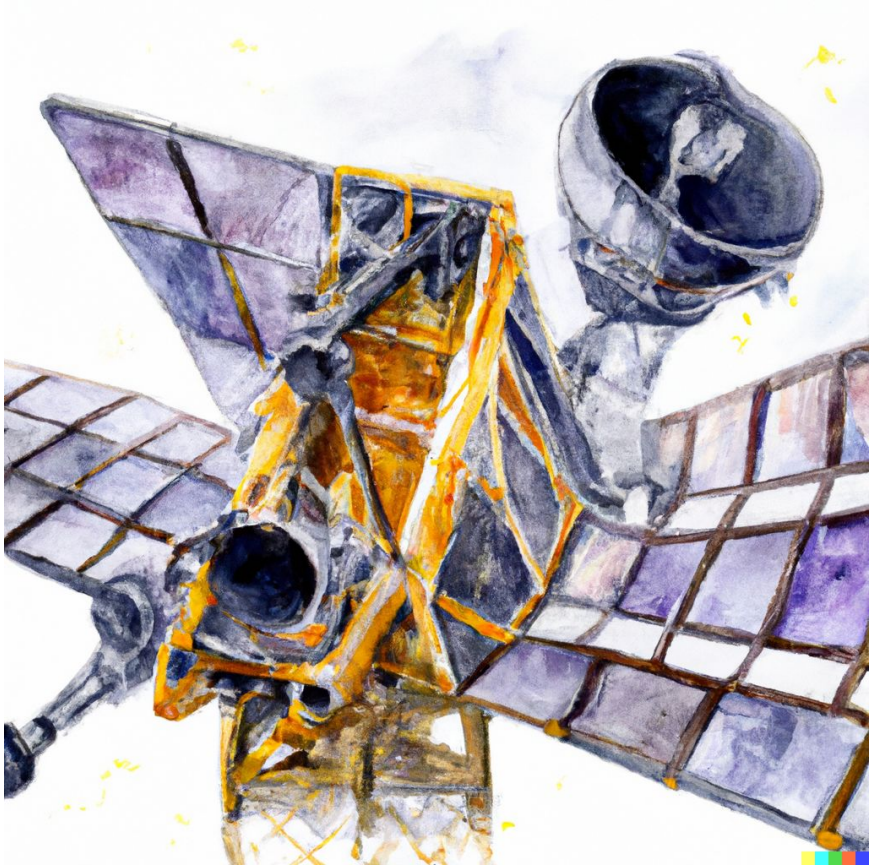

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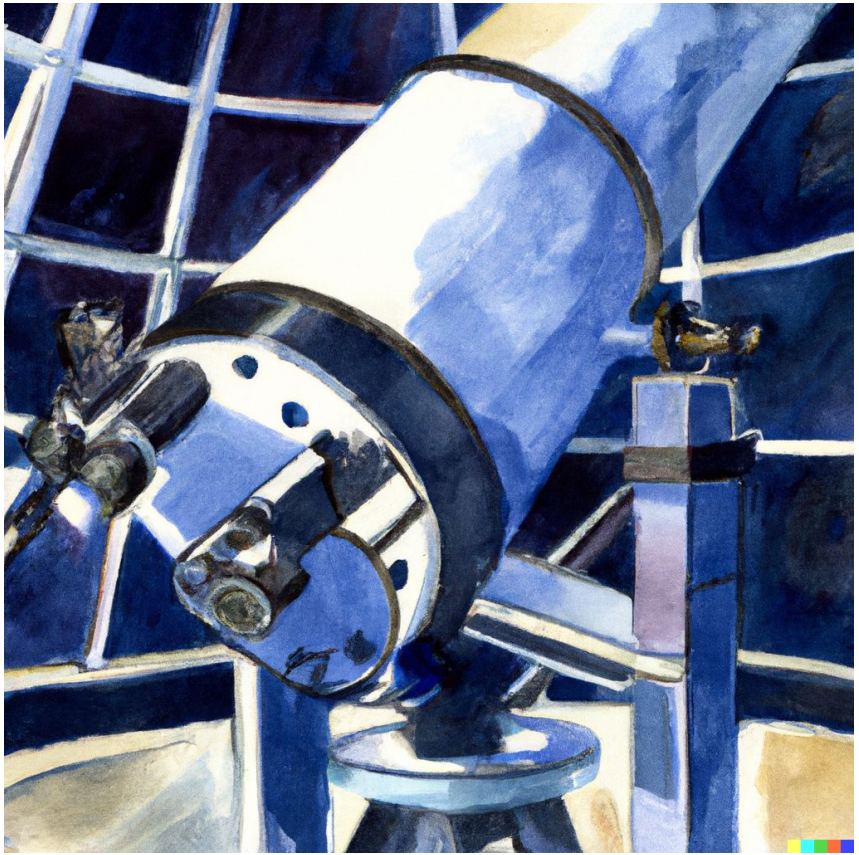

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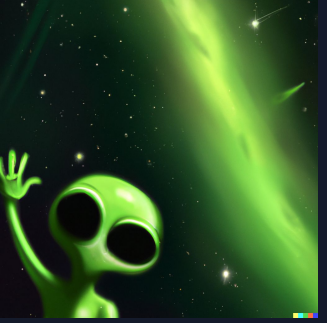
The telescope will help us to understand the universe and our place in it.


THE END



Questions?

Thank you to all the space apps organizers, mentors, and judges - we learned so much!
A full list of references and acknowledgments is included in our notebook.

CREDITS: This presentation template was created by **Slidesgo**, including icons by **Flaticon,** infographics & images by **Freepik**