

THE WONDERS OF
SPACE



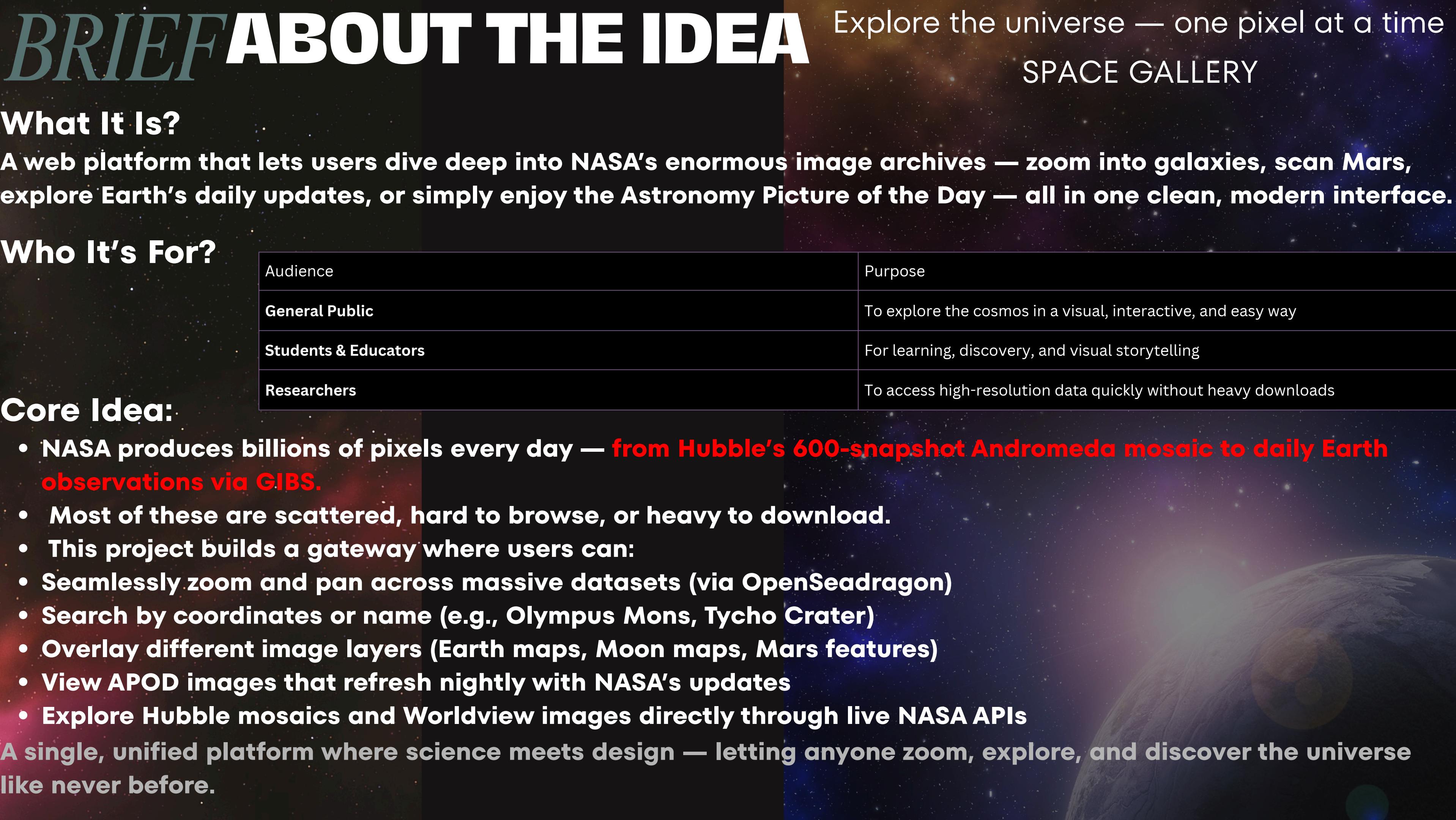
WE CAPTURE, WE SHOW!

WELCOME TO NASA_MINIONS



Team Details :

- a. **Team name:** nasa_menions
- b. **Team leader name:** Kashish Shrivastav
- c. **Problem Statement:** Embiggen Your Eyes!



BRIEF ABOUT THE IDEA

Explore the universe — one pixel at a time
SPACE GALLERY

What It Is?

A web platform that lets users dive deep into NASA's enormous image archives — zoom into galaxies, scan Mars, explore Earth's daily updates, or simply enjoy the Astronomy Picture of the Day — all in one clean, modern interface.

Who It's For?

Audience	Purpose
General Public	To explore the cosmos in a visual, interactive, and easy way
Students & Educators	For learning, discovery, and visual storytelling
Researchers	To access high-resolution data quickly without heavy downloads

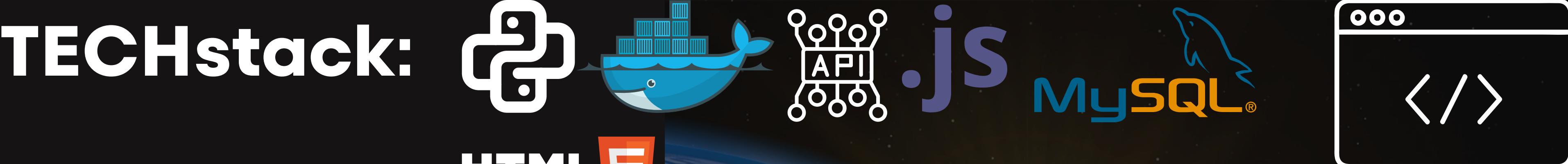
Core Idea:

- NASA produces billions of pixels every day — from Hubble's 600-snapshot Andromeda mosaic to daily Earth observations via GIBS.
- Most of these are scattered, hard to browse, or heavy to download.
- This project builds a gateway where users can:
- Seamlessly zoom and pan across massive datasets (via OpenSeadragon)
- Search by coordinates or name (e.g., Olympus Mons, Tycho Crater)
- Overlay different image layers (Earth maps, Moon maps, Mars features)
- View APOD images that refresh nightly with NASA's updates
- Explore Hubble mosaics and Worldview images directly through live NASA APIs

A single, unified platform where science meets design — letting anyone zoom, explore, and discover the universe like never before.

LIST OF FEATURES OFFERED BY THE SOLUTION

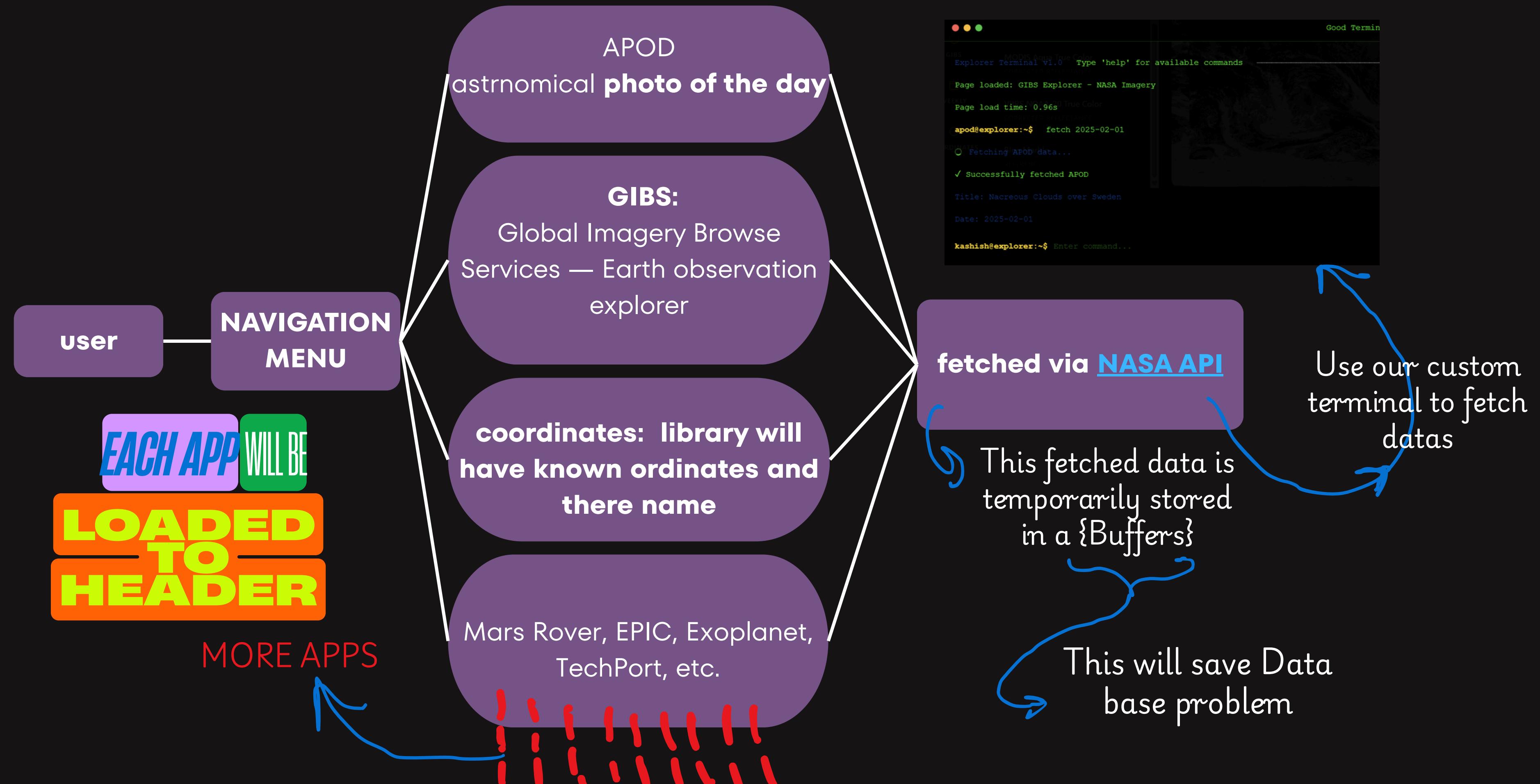
Feature	Description
Zoomable High-Resolution Images	Smooth pan and zoom of gigapixel to terapixel NASA images using tile-based streaming (OpenSeadragon).
Multi-Dataset Integration	Access and combine data from multiple NASA APIs including APOD, GIBS, Hubble mosaics, Mars imagery.
Coordinate & Feature Search	Search by geographic coordinates or named planetary features (e.g., Olympus Mons, Tycho Crater).
Multi-Temporal Image Comparison	Compare images across different dates using swipe, opacity slider, or timeline animations.
User-Friendly Gallery UI	Clean, NASA-themed interface with vertical sidebar menu on desktop and hamburger menu on mobile.
Dynamic Image Refresh	Automated data refresh (e.g., APOD updates nightly) via Celery scheduled tasks and caching.
Overlay Multiple Imagery Layers	Layer different spectral bands or datasets simultaneously with adjustable opacity.
Client-Side User Data Import	Allow users to import and overlay their own GeoTIFF or vector data locally without server storage.
Responsive Design & Accessibility	Optimized UI for desktop, tablet, and mobile with accessibility considerations.
Terminal-Style Status Footer	Fixed footer on desktop displaying real-time system and API connection status with colored indicators.
Scalable Backend Architecture	Modular Django apps with FastAPI microservices and Redis caching ensure efficient data handling.
Future AI-Enhanced Search	Planned integration of AI-powered natural language queries for intuitive data exploration.



python lib:

Category	Python Libraries / Tools	Purpose
Web Framework / Backend	Django, FastAPI, Flask	API creation, server-side logic, modular backend architecture
Asynchronous / Task Scheduling	Celery, Redis	Scheduled tasks (e.g., APOD refresh), caching, queue management
Data Access / APIs	Requests, HTTPx	Fetching data from NASA APIs like APOD, GIBS, Hubble
Geospatial / Mapping	Rasterio, Geopandas, Shapely, PyProj	Handling GeoTIFF, vector data, coordinate transformations
Visualization / Frontend Integration	OpenSeadragon (via JS), Plotly, Matplotlib, PyVista, PyThreeJS	Tile-based zoomable imagery, 3D visualization, charts, overlays
Image / Video Processing	Pillow, OpenCV, imageio	Manipulating images, overlays, video frames
Numerical / Scientific Computing	NumPy, SciPy, Pandas	Array operations, statistics, data processing
Machine Learning / AI (future integration)	PyTorch, TensorFlow, Scikit-learn	AI-powered search, feature extraction, predictive analytics
Utilities / Helper Libraries	tqdm, logging, json, pyyaml	Progress bars, logging, config and JSON handling
Web Interaction / Frontend Support	Jinja2, Bootstrap (via templates)	Responsive UI, dynamic HTML generation
3D / Interactive Rendering	PyVista, VTK, PyThreeJS	3D models, terrain overlays, interactive exploration

PROCESS FLOW DIAGRAM :



SCREENSHOT OF THE APP: APOD

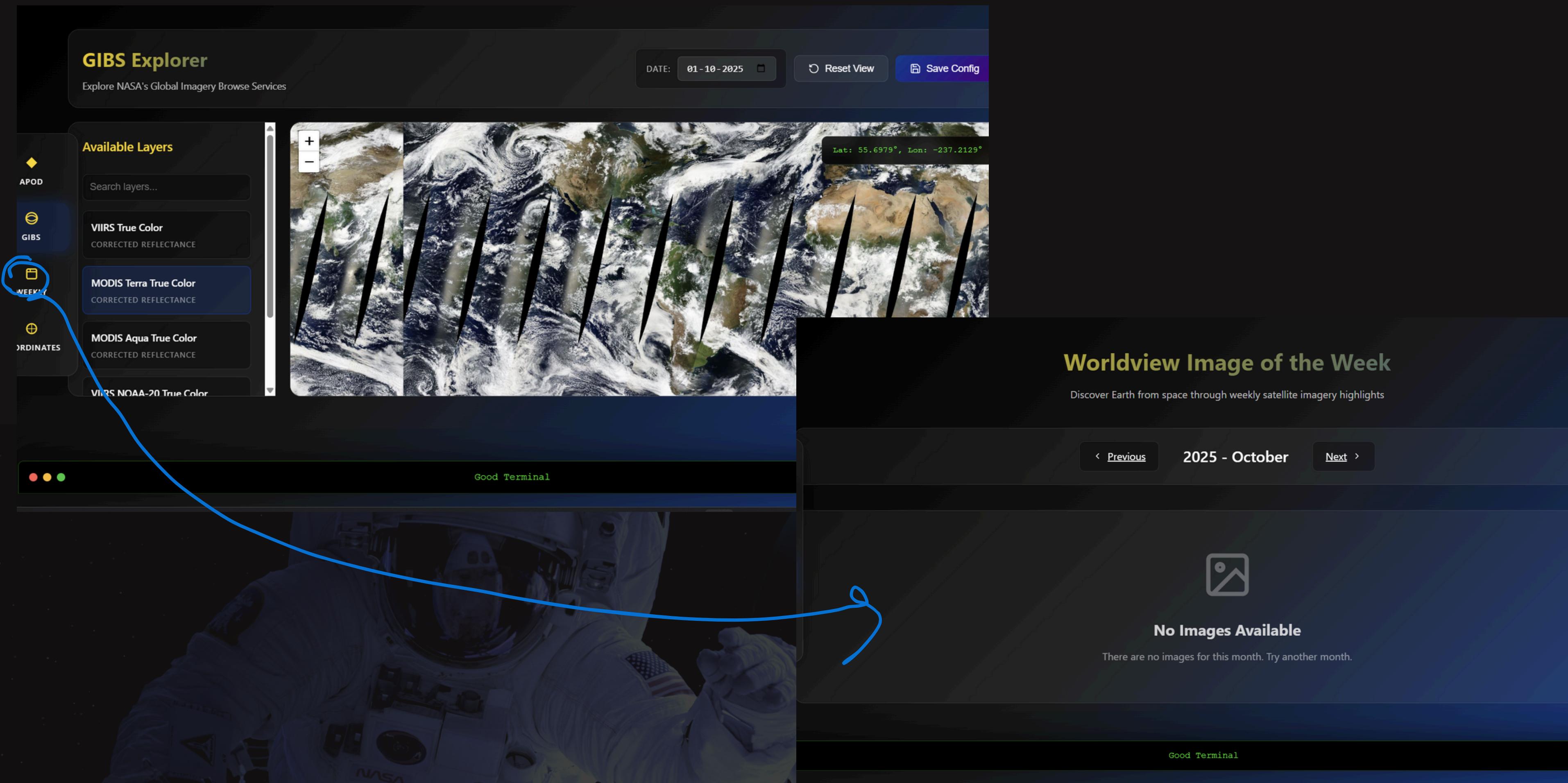
The screenshot displays the APOD application interface. The main view shows a large image of the Great Lacerta Nebula. Overlaid on the image are several interactive elements:

- A sidebar on the left contains icons for APOD, GIBS, WEEKLY, and COORDINATES.
- A "View Fullscreen" button is located above the image.
- A "Good Terminal" prompt is visible at the bottom of the image area.
- A "Celestial Coordinates" section on the left lists search terms like Copernicus, Horsehead, Triangulum, and Olympus, with a note that no results were found.
- A "Quick Stats" panel on the right provides information about the current month's images:

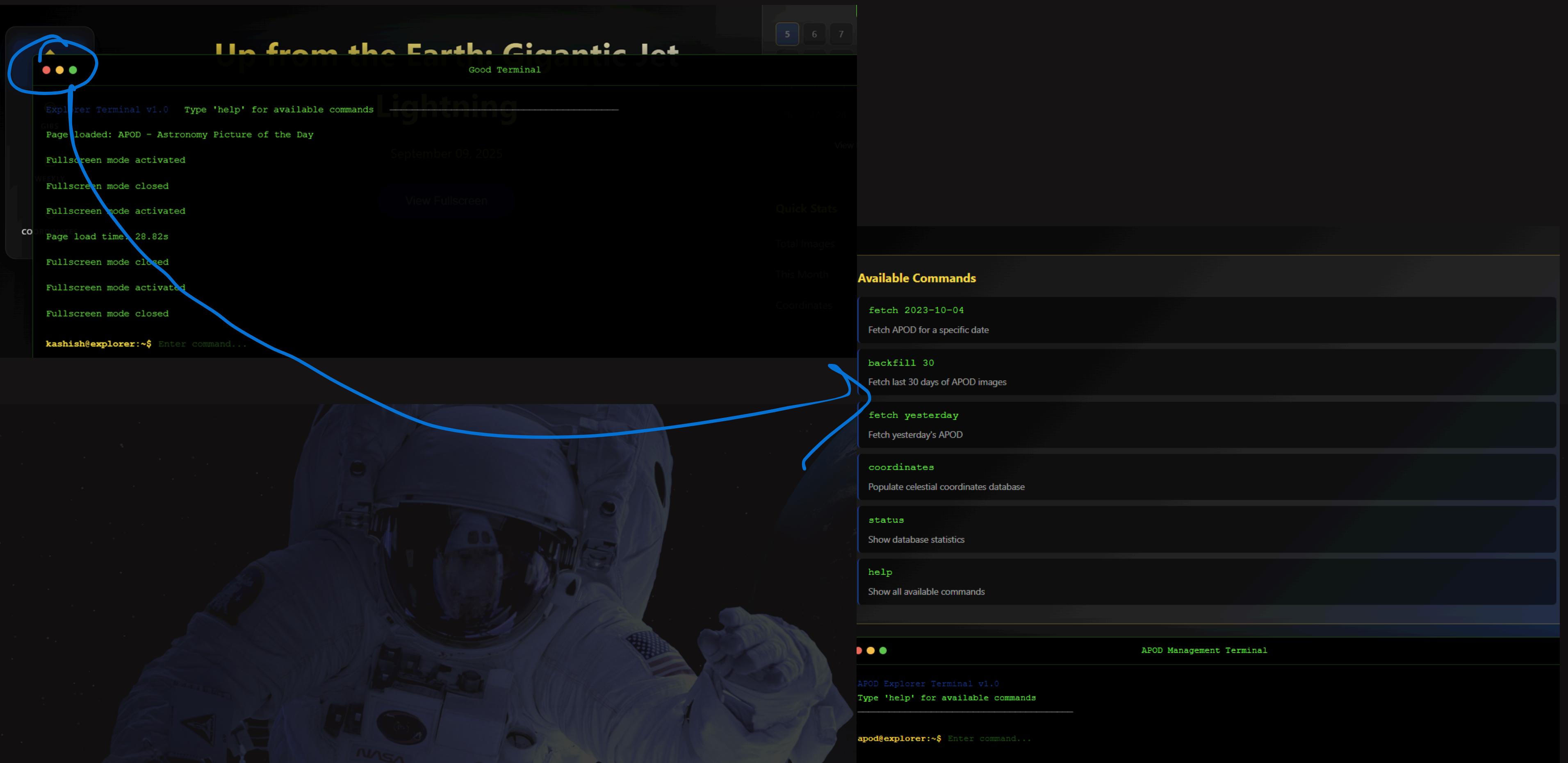
Total Images	32
This Month	1
Coordinates	0

- A calendar for September 2025 is shown, with the 10th highlighted in red.
- A "View Full Archive" button is located near the calendar.
- A blue curved arrow originates from the "View Full Archive" button and points towards the "AOPD Archive" section on the right.
- The "AOPD Archive" section displays a grid of thumbnail images for each day of September 2025, with the 10th image being "The Great Lacerta Nebula".
- A "Good Terminal" prompt is also present at the bottom of the archive section.

SCREENSHOT OF THE APP: GIBS

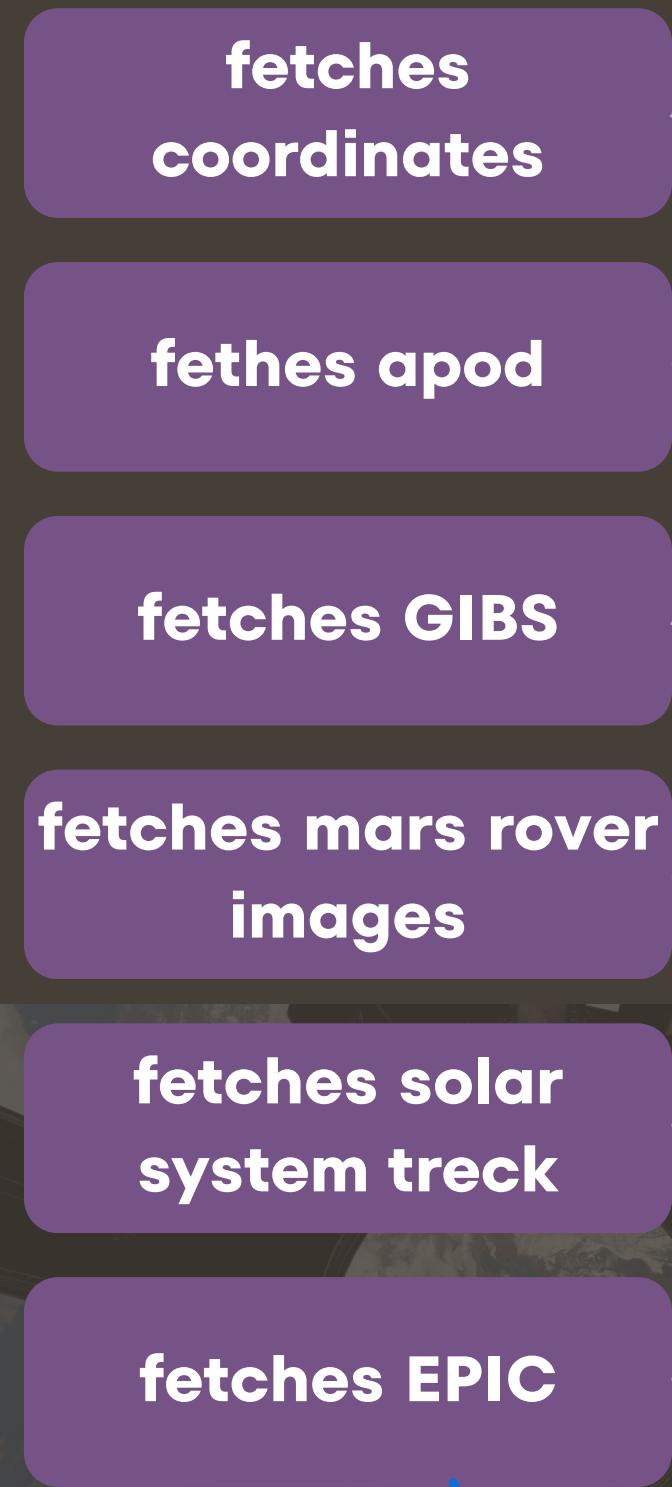


OUR GOOD TERMINAL: CUSTOM



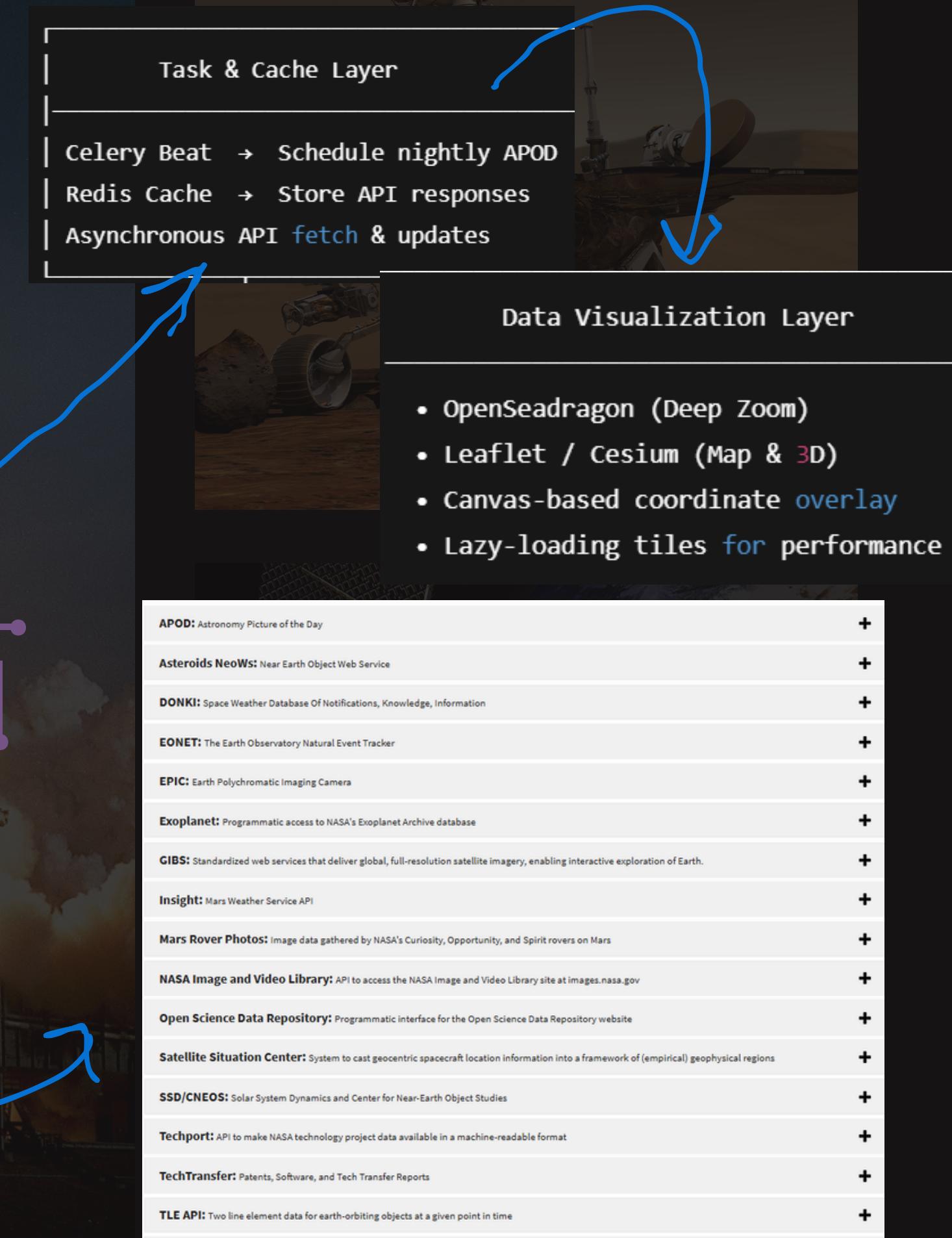
ARCHITECTURE DIAGRAM OF THE PROPOSED SOLUTION

DJANGO FRAMEWORK



Footer layer with custom terminal;

Many more



OPPORTUNITIES:

- NASA datasets are massive and complex, often overwhelming for casual users and students.
- Current tools show only parts of datasets or require specialized GIS knowledge.
- Our platform offers a unified, user-friendly gateway to explore full-resolution NASA imagery across planets and Earth.
- Integrates multiple NASA APIs (APOD, GIBS, Worldview, Hubble mosaics) into a single modular Django-based app ecosystem.
- Uses modern zoomable image technologies (OpenSeadragon) to efficiently handle terapixel-scale images without heavy downloads.

REFRENCES:

OUR DEPLOYED SITE IS PRESENT HERE: [HTTPS://EMIGEN.ONRENDER.COM](https://emigen.onrender.com)
OUR CODES ARE PRESENT HERE: [HTTPS://GITHUB.COM/KASHISH2210/EMIGEN](https://github.com/kashish2210/emigen)

Source	Description / Notes	Link
earthdata.nasa.gov	Worldview – Interactive interface for browsing full-resolution global satellite imagery	Link
earthdata.nasa.gov	Introducing Worldview's Comparison Feature – Swipe, opacity, spy tools for multi-temporal imagery comparison	Link
earthdata.nasa.gov	Worldview – Powered by GIBS	Link
earthdata.nasa.gov	Worldview Snapshots – Lightweight tool for downloading imagery with overlays	Link
science.nasa.gov	NASA Solar System Treks – Interactive portals for planetary surfaces, mission planning, 3D flyovers	Link
science.nasa.gov	Mars Trek – Visualization of Valles Marineris using THEMIS & MOLA data	Link
trek.nasa.gov	NASA Solar System Treks – Map layers available via OGC RESTful WMTS	Link
madisonastro.org	Fun with LROC QuickMap – Web-based lunar imagery exploration	Link
lroc.im-ldi.com	Lunar QuickMap Fall 2020 Update – Import/export features, new data layers, Draw & Search tools	Link
lroc.im-ldi.com	Lunar QuickMap Fall 2020 Update – GeoTIFF & Shapefile import support	Link
cesium.com	NASA GIBS – Access to 100+ satellite imagery layers, offline caching, integration with Cesium apps	Link
cesium.com	NASA GIBS – Visual presentation of geospatial data via public catalog	Link
data.nasa.gov	Gazetteer of Planetary Nomenclature – IAU-approved names for planetary features	Link
visibleearth.nasa.gov	NASA Visible Earth – Blue Marble Collection	Link
science.nasa.gov	NASA's Eyes for Museums – Real-time Earth & space visualization for exhibits	Link



THANK YOU
FOR YOUR ATTENTION