NASA Space Apps Challenge 2025 – Final Report

* **Title:**The Last Twinkle: Fight for Our Night Sky
* **Team Name:** Idea Nexus
* **Members & Roles:**

|  |  |
| --- | --- |
| **Team Members** | **Roles** |
| Jannatul Nayeem | Team Leader, App developer |
| Israt Jahan Jarin | Editor And UI/UX designer |
| Sumaiya Akter Runa | Web developer |
| Afia Tabassum | Speaker and Designer |
| MD Ishrak Uddin Shikder | App developer, Researcher |
| Arfanul Islam Rafi | Data Analyst, Researcher |

**2. Challenge Chosen**

**Challenge:** **Embiggen Your Eyes!**

**Why This Challenge?**

We chose this challenge because it captures a **real gap between NASA’s powerful datasets and the way people experience the sky**:

1. **Gigapixel NASA images are underutilized** - Telescopes and satellites (Hubble, LRO, MRO, Earth Observing missions) capture data at unimaginable resolution. But this treasure remains hidden in scientific archives, not in the hands of students or the public.
2. **The human eye is limited** - Light pollution, atmospheric interference, and faint visibility mean that most of us only see a fraction of what’s out there. Stars, galaxies, and even planetary details are invisible without technology.
3. **Barriers to accessibility** - Existing tools are often complex, requiring technical skills, large computers, or high-speed internet. This excludes students, educators, and citizen scientists who could benefit most.
4. **Lack of interactivity** - Current datasets feel static. We wanted to transform them into **living, interactive experiences** where a user can slide away pollution, watch binary stars orbit, or zoom into Mars and Moon landscapes in real time.
5. **Bridging education & inspiration** - Our project combines **scientific accuracy with gamified storytelling**. A student doesn’t just “look” at space – they play, explore, ask Einstein and Newton questions, save planets with AI guidance, and create their own scientific opinions.
6. **Citizen science empowerment** - By making invisible features visible, users can **contribute annotations, insights, and discoveries**. This democratizes space exploration, turning students and citizens into active collaborators, not passive viewers.
7. **Global awareness** – Showing the difference between a polluted sky and a clean one connects astronomy with climate awareness. People realize that human actions on Earth directly affect how much of the universe we can see.

We chose this because **our app makes the invisible visible, transforms NASA’s raw data into human experiences, and empowers the next generation to see, learn, and imagine beyond limits.**

**3. Problem Statement**

Billions of pixels of data exist:

* Earth maps from satellites.
* Gigapixel galaxies from Hubble.
* Lunar surface datasets.
* Mars global imagery from MRO.

But:

* These datasets are hard to explore.
* Ordinary users don’t understand them.
* Few tools connect science with **student learning and imagination**.

**4. Our Solution**

We built a **dual-mode interactive platform**:

**Mode 1 – Astronomy Explorer**

A scientific, data-driven side:

* Polluted sky (EarthData).
* Slider → clears pollution → faint stars from Hubble API appear.
* Click star → metadata shown (brightness, lifetime, events, partner star).
* Drag star → it **orbits its partner** (binary system simulation).
* Click star → it moves to its partner (gravitational effect).
* Zoom → explore real NASA planetary datasets (Mars, Moon).

Science + Visualization powered by NASA APIs.

**Mode 2 – Student Gamified Journey**

An AI-powered **space adventure**:

1. **Avatar Creation** – Students choose a costume.
2. **Explore Mode** –
   * Explore visible stars/planets first.
   * Mission arrives: *“One planet is in danger!”*
   * AI (using NASA Earth Science data) suggests solutions.
   * Student solves → earns **Friendship Coin** → unlocks new explorations.
3. **Planet Learning Inventory** – Earned knowledge stored like tools & badges.
4. **AI-Powered Lab** – Meet virtual Einstein, Newton, Neil deGrasse Tyson to ask questions.
5. **Student Discovery Form** – Write ideas, opinions, discoveries → stored as **citizen science contributions**.

*Gamification + AI = engagement + education.*

**5. Data & APIs Used**

| **Dataset / API** | **Use in App** |
| --- | --- |
| **NASA EarthData API** | Pollution layers → initial polluted sky view. |
| **Hubble Legacy Archive API** | High-resolution star/galaxy imagery; faint star data. |
| **LRO (Lunar Reconnaissance Orbiter) Data** | Moon datasets for zoom/exploration. |
| **MRO (Mars Reconnaissance Orbiter – HiRISE, MARCI)** | Mars surface and dust storm visualizations. |
| **NASA Solar System Treks** | Interactive planetary datasets. |
| **Worldview Snapshots API** | Near real-time Earth observation. |

AI Models:

* Trained with **NASA imagery** for star detection + enhancement.
* Used **classification & noise reduction** models to predict visibility of faint stars.
* NLP for **virtual scientist Q&A**.

**6. Technical Approach**

**Frontend:** HTML5, CSS3, JavaScript (Canvas) + Flutter (mobile prototype).  
**Backend:** Python (Flask/Django) with NASA API integration.  
**Visualization:** Canvas animations for stars & orbits, WebGL for planetary zoom.  
**AI Models:** TensorFlow + PyTorch for star recognition, text-based AI for lab interactions.

**User Flow (Explorer Mode):**

1. Open app → polluted sky (EarthData).
2. Slider → stars revealed (Hubble).
3. Click star → info box (NASA data).
4. Drag → orbit partner.
5. Zoom → planetary datasets (LRO, MRO).

**User Flow (Game Mode):**

1. Choose avatar → costume.
2. Explore visible space.
3. Get mission → AI suggests solution.
4. Solve → earn coin → unlock new world.
5. Enter lab → talk to scientists.
6. Submit discovery form.

**7. Impact**

* **Education:** Turns NASA datasets into student-friendly journeys.
* **Inspiration:** Makes science fun & accessible for all ages.
* **Science:** Encourages citizen contributions (student discoveries).
* **NASA:** Demonstrates new public engagement methods with APIs.

**8. Challenges**

* Handling gigapixel-scale datasets with performance.
* Designing a UI simple enough for students yet powerful enough for researchers.
* Training AI models with limited time.
* Making avatars & gamification without losing scientific credibility.

**9. Future Development**

* **VR/AR integration** → immersive planetarium experiences.
* **Expanded citizen science** → students’ ideas pooled into real datasets.
* **Deeper AI integration** → anomaly detection in planetary images.
* **Multiplayer exploration** → students can explore space together.

**10. Judging Criteria Alignment**

**Impact & Relevance** → Pollution awareness + student science.  
**Creativity & Innovation** → Combines NASA APIs + AI + gamification.  
**Data Usage** → Uses multiple NASA APIs effectively.  
**Design & Usability** → Simple explorer mode + fun game mode.  
**Presentation Quality** → Strong storytelling + engaging design.  
**Feasibility** → Prototype functional with clear roadmap.

**11. Deliverables**

* GitHub Repo (code + docs)
* Demo Video (storytelling + features)
* Final Documentation (this report)
* Pitch Slides (judges presentation)

**Final Note:**  
Our project bridges **two worlds**: serious space science powered by NASA APIs, and gamified learning that inspires students to see themselves as future scientists. It makes the invisible visible - not just in the sky, but in **young minds** everywhere.