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Universal

lens

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| Prepared for: | Nasa Space Apps Challenge 2025  - Embiggen your eyes challenge |
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| Executive Overview |  | NASA’s upcoming generation of advanced telescopes will produce vast quantities of high-resolution FITS images requiring detailed analysis and classification. While AI can assist in identifying patterns and categorizing celestial bodies, human input remains essential to ensure accuracy and capture anomalies AI may miss. However, the immense size of these images makes them difficult to access and analyze on normal computers, limiting this critical task to those with specialized NASA equipment |

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| Solution |  | Our solution is to create an application that can take large images and break them down into smaller readable images which are then put together in a 3D model like mold, inspired by google maps, that allows them to zoom in and out of the image as well as scroll through it. This is aimed at the public that can use our application as a relaxing “find the object” game where they will be given pieces of a large image and asked to find and categorize objects after a short tutorial.  The categorization done by users will be stored in a large dataset that allows researchers to compare AI categorization to Human categorization and document it. To allow zooming without losing image quality, we will use tiling techniques. Similar projects have been made in the past such as Borderline Science DNA. |
| Expandability |  | This solution is currently aimed for Nasa’s study of large-scale telescope images, as it helps navigate said image as well as study celestial objects at different resolution levels. However, this solution is not limited to this field. Such an application can be used for various fields such as the medical field by exploring microscope images or high-resolution medical scans, or even for fields like paleontology and archeology, by allowing comparisons at different zoom levels of artifacts from ancient civilization for example. This is to say that even though we will mostly concentrate on telescope images now, the solution proposed is ideal for a myriad of fields. |
| Main Features And advantages |  | Here are the main features and advantages of this application:   * Normal user/player login * Researchers' login * Data Collection of players’ findings (can be compared to AI findings) * Zoom in/out without losing quality or needing a super-powerful machine * Challenges for the players, made by the scientists * Players submit progress * Save coordinates, patterns, objects categorizations and notes (bookmark) * Free use * Normal people can help scientists, learn and play all in one app * Researchers can upload new data/images and challenges * Researchers can compare human finding VS AI findings * Store Right ascension and Declination of important points |

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| FUTURE IDEAs |  | * To enable users to view and zoom into extremely large images (such as those described in the challenge) on standard computers without losing resolution, we can use a layering method alongside an image tiling solution. The base layer will be a fully compressed version of the full image for quick initial rendering. As users zoom in, higher-resolution tiles (from additional layers) of the relevant sections will load dynamically, preserving image detail without overloading the system. * Use FITSreader library instead of jsFITS I/O: more quality but needs more resources. |
| Challenges |  | Here are some challenges we faced:   * Finding the best way to zoom into FITS images without losing quality for regular computers? * How can one locate themselves in the image, how to use coordinates on space, using geo-referencing points. (FITS images provide celestial coordinates) * How to navigate data to incorporate into our solution from the resources. * Really understanding the issues at hand * Reworking our solution according to new findings and learnings * Finding the best modules and formats for important features (jsFITS I/O library VS fitsreader, PNG/JPEG, Leaflet, OpenSeaDragon, etc.) |
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| **Researchers page** |  | A screenshot of a computer screen |
| **PLAYER’S page** |  | A diagram of a challenge  AI-generated content may be incorrect. |
| **Resources** |  | * NirCam * OpenSeaDragon (like Leaflet, but better) * Nasa Images () * FITS Format * AI: DeepSeek and Perplexity * Node JS * jsFITS I/O library * GitHub * Leaflet * MongoDb * James web telescope * How to handle datasets-> open data and information portal government of Canada: <https://search.open.canada.ca/data/> * Tutorials on GitHub * Micro application (easier visualization of data) * Canadian Astronomy Data Centre archive -> collections (has telescope data) * Canadian Astronomy Center * EODMS * Registry of open data of AWS * CSA open data * European Space Agency |