



# VIPER ROCKS!

CS 4961  
CSULA - Fall Semester 2023  
December 1, 2023

# Project Overview

- Volatiles Investigating Polar Exploration Rover (VIPER)
  - Landing on the Southern Pole
  - Take images of the surface
  - Citizen scientists will classify rocks
- Why is that important?
  - Provides useful information about the lunar surface for NASA's future exploration mission.

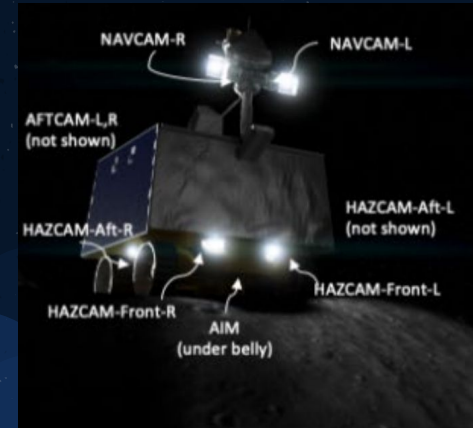


**Jet Propulsion Laboratory**  
California Institute of Technology



**CAL STATE LA**

CALIFORNIA STATE UNIVERSITY, LOS ANGELES



VIPER Rocks! Rover

# MEET THE TEAM

## UI/UX DESIGN:

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**Cristian Gomez**

**Santiago Bautista**

**Angy Xajil**

**Tammy Xaypraseuth**

## DATABASE DESIGN:

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**Michael Gibson**

**Nida Sheikh**

**Zainab Sulaiman**

**Diane Tabilas**

## PROJECT SPONSOR:

**JPL**

## PROJECT LIAISONS:

**Shan Malhotra**

**Mike Rueckert**

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**Emily Law**

## FACULTY ADVISOR:

**David Krum**

## GRADUATE ASSISTANT:

**Jerome Pineda**



# AGENDA

Introduction

Scouting, Sizing, Classification

Conceptualized User Interface

Badges/Incentives

Database

Challenges and Solution Progress

Conclusion

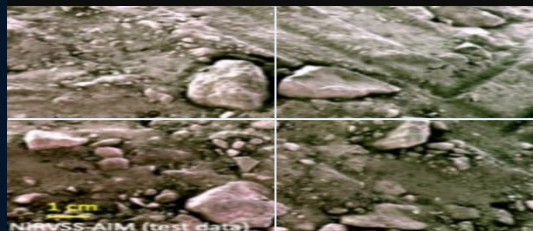




# The 3 Tasks

- SCOUTING
- SIZING
- CLASSIFICATION

Task 1: Search for Rocks



Task 2: Measuring Rock Size



Task 3: Classifying Rock Shape



# Scouting Objective

Exploration and analysis of moon rocks to gather scientific data for future missions.

- Partition workload evenly within the classification task.
- Develop a survey for the quantity of lunar rocks



# Task : SCOUTING

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## Design

Users will show/tag the exact coordinates of the rocks.

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Simulated Image



## Partitioning

Images will be divided into equal custom-sized sections.

---

## User-Friendly

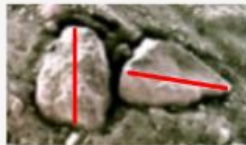
System will allow users guidance on what is classified as a rock.

---



# Sizing

Line



Ellipses/Circle



Tracing



Cutout (Multiple Lines)



Circle → Line

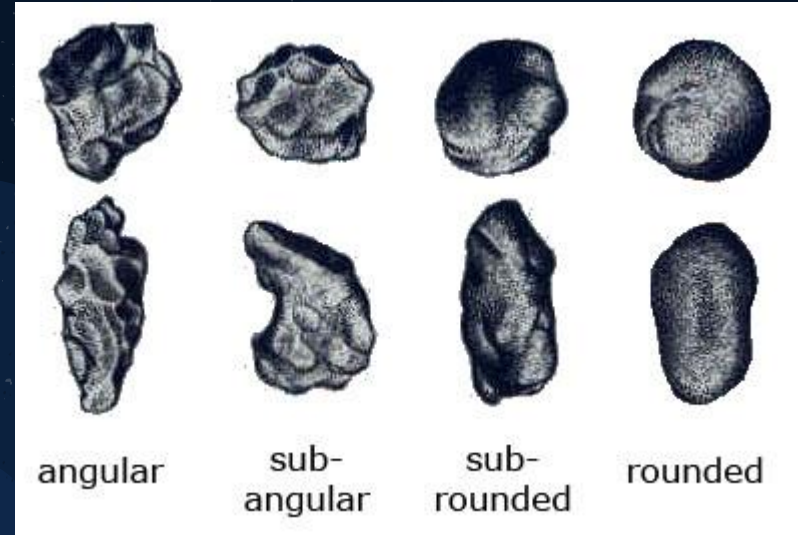


- Drag
- Drawing tool
- Undo/Redo
- Save



# Classification Objective

- The Classification system will be used to allow users to categorize rocks using an intuitive and user-friendly interface.
- This task aims to simplify the process of identifying and classifying rocks using their shapes.
- It will be used to provide insight into how surface materials on the moon degrade over time.



# Task : CLASSIFICATION

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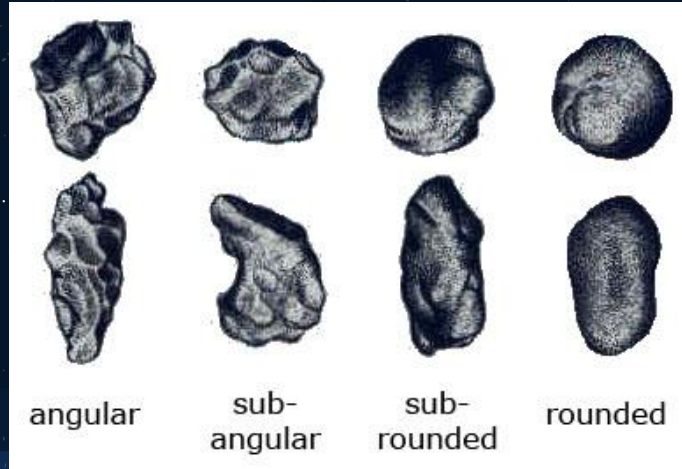
## Classify

Users will be able to classify rocks into specific shapes.

---

## Tracking Ambiguity

Users can skip shapes they are unsure of. The system keeps track of more ambiguous rock shapes when users choose to skip.



## Shape Categories

Classify rocks as Angular, Sub-Angular, Sub-Rounded, or Rounded.

---

## User-Friendly

Designed for easy and efficient rock classification. Users can refer to a photo set for each rock classification.

# Conceptualized User Interface

# UI/UX Intention



## Simplicity

Minimal, Straight-Forward, Dark theme



## Accessibility

Web Content Accessibility Guidelines  
(WCAG)



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# VIPER ROCKS

Citizen Scientists Needed. Sign up to identify moon rocks for Viper rover expeditions.

[Start](#)



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NASA Official: Michael McVetta  
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# FREQUENTLY ASKED QUESTIONS

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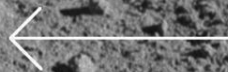
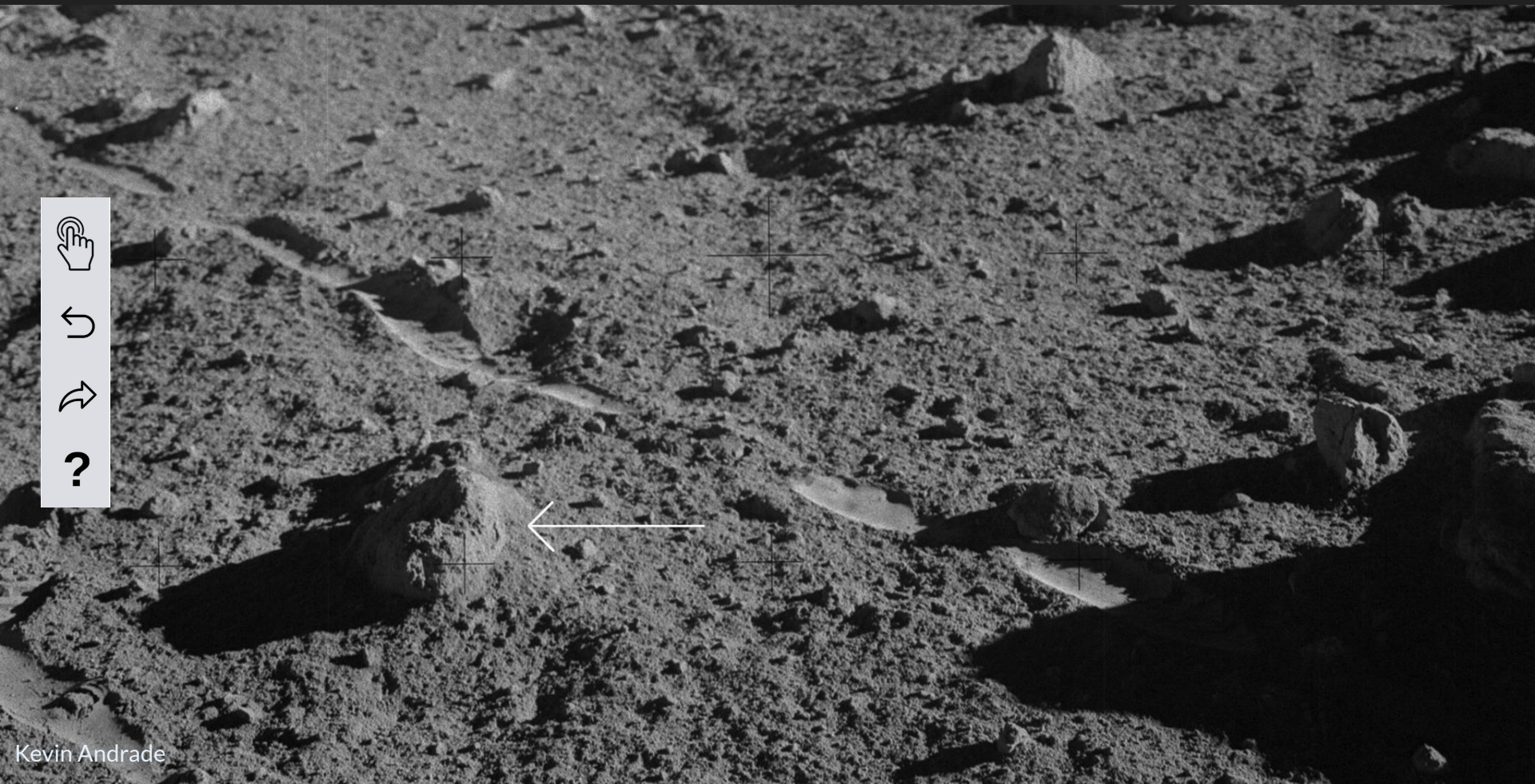
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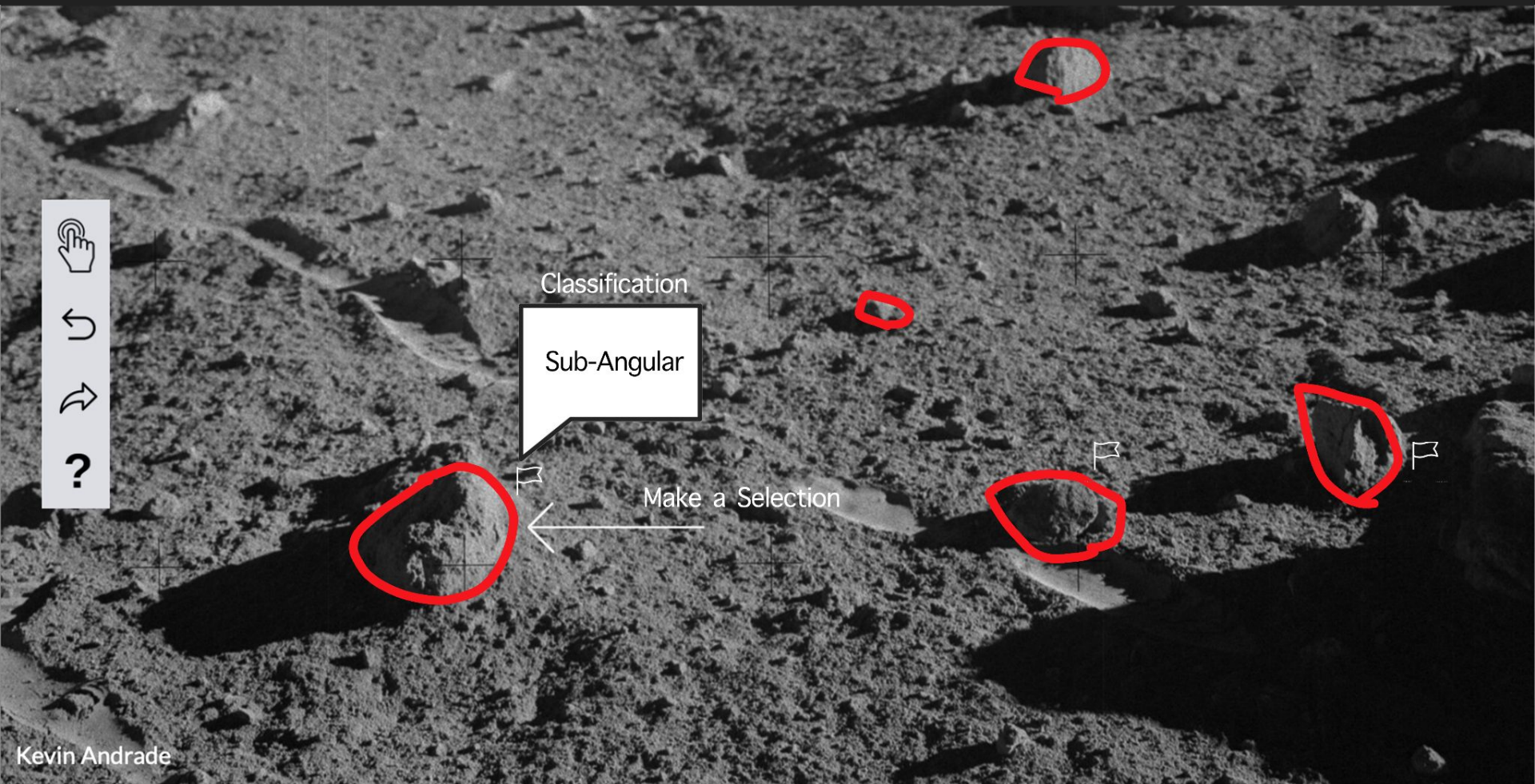
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Classification

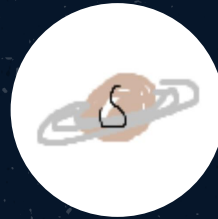
Sub-Angular

Make a Selection

# Achievements/Badges/Incentives

## Individual:

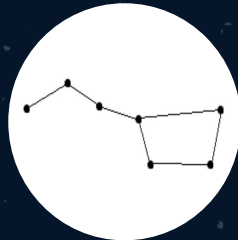
- Completing a survey
- Consistency badge - login 5 days in a row
- Volume badge - classify 10 amount of rocks in a single session



# Achievements/Badges/Incentives

Institution / group badges:

- Verified badge - displays by institution name
- Most populated badge - groups with more users than at least 75% of other groups. Every month
- Most active badge - groups that have more users logging on every day than at least 75% of other groups
- Most esteemed - groups that have more overall badges via group or individually (could do a badge for each) than at least 75% of other groups



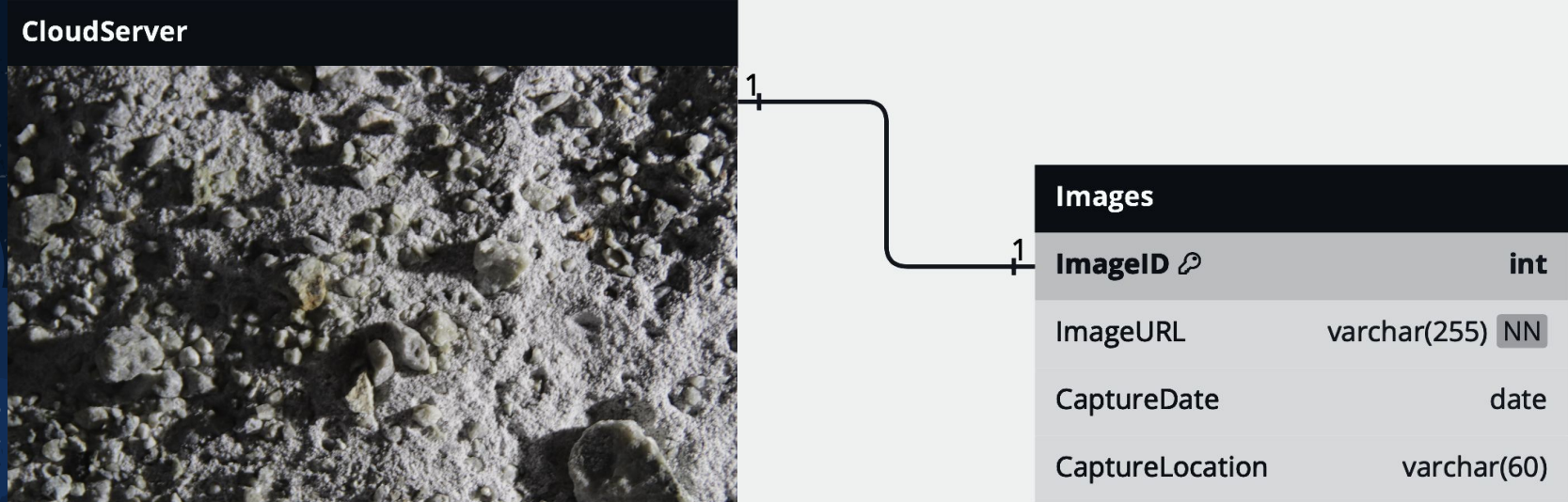
# Database Requirements

- Requirements:
  - Must store structured data for images, rocks, and users
  - Must be able to generate statistics and reports about rock data, distributions, and user contributions
- Utilizing SQL and NoSQL databases
  - SQL database to represent relationships between Users, their marks, Rocks, and Images
  - NoSQL database will store classifications, statistics, and reports and metadata



# SQL Database

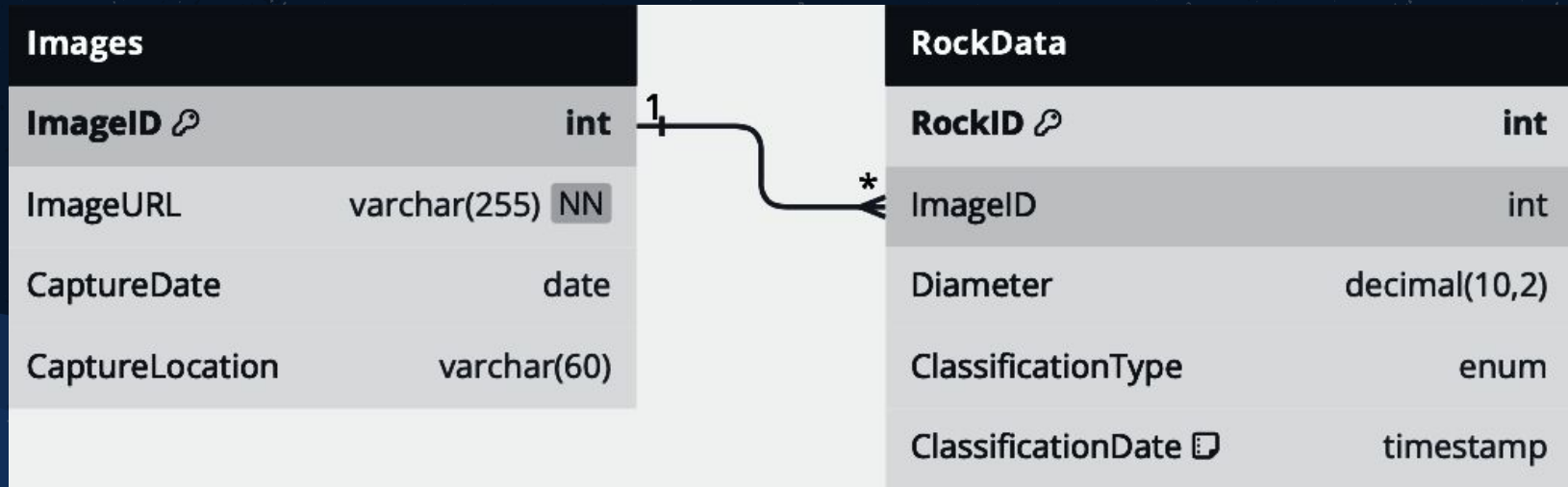
One to one relationship between Images stored in server and Rock Data  
Every image in the database has a corresponding image in the cloud server





# SQL Database

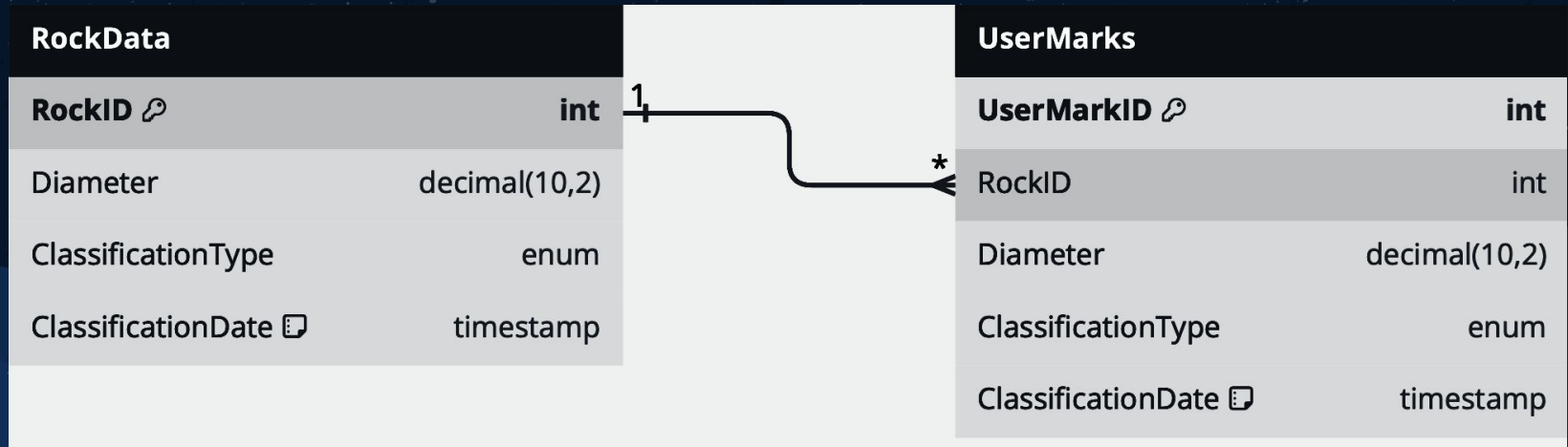
One to many relationship between Images and Rock Data



# SQL Database

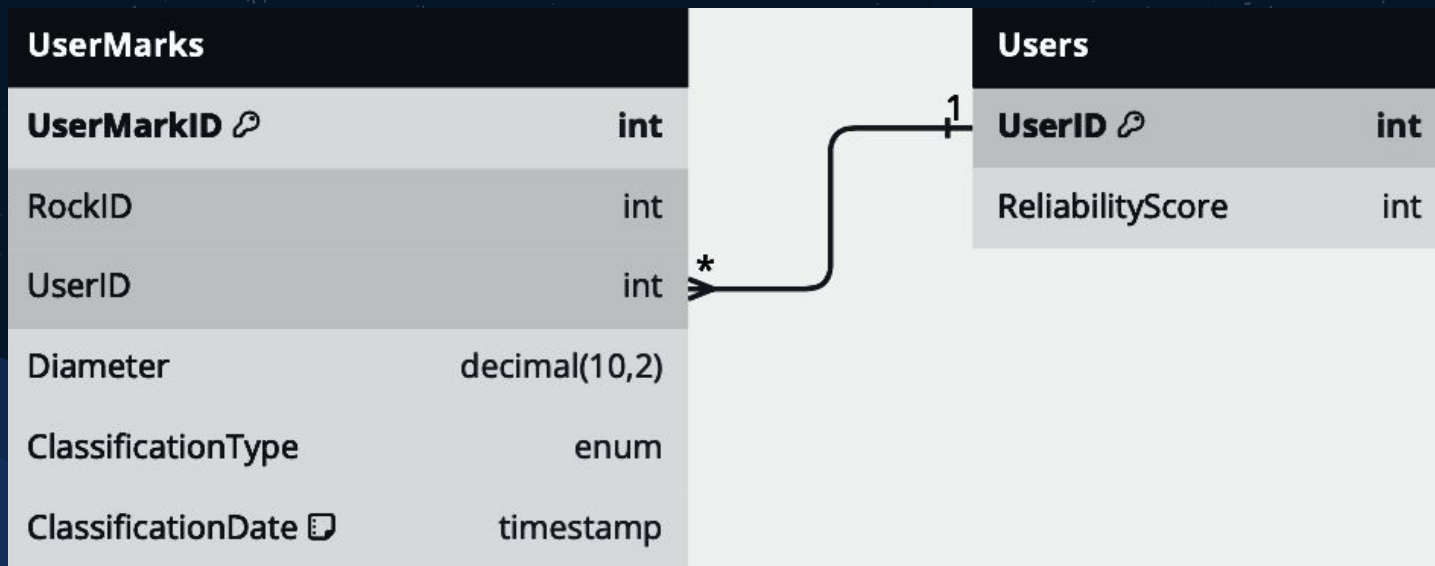
One to many relationship between the Rock Data and its various user identifications

-Backbone for our statistical analysis and inter-related reliability metrics



# SQL Database

Many to One relationship with users



# SQL Database

- Contains Users, Rock Classifications, and Statistics collections
- Statistics collection →

```
{  
  "_id": ObjectId("statistics_id_1"),  
  "rock_id": "rock_id_1",  
  "average_size": "4.5m",  
  "shape_distribution": {  
    "Angular": 70,  
    "Rounded": 30  
  },  
}
```

# Challenges

- **Navigating the Steep Learning Curve**
  - Lots of research about new skills needed
- **Starting a Project with Limitless Possibilities**
  - Starting from scratch gives us the freedom to create something new, but there is a lot of uncertainty and confusion
- **Prioritizing Human-Centered Design**
  - Consider everyone involved with project
- **Managing Scheduling Conflicts**
  - Think about our individual commitments, task dependencies, unforeseen circumstances, communication issues, and more

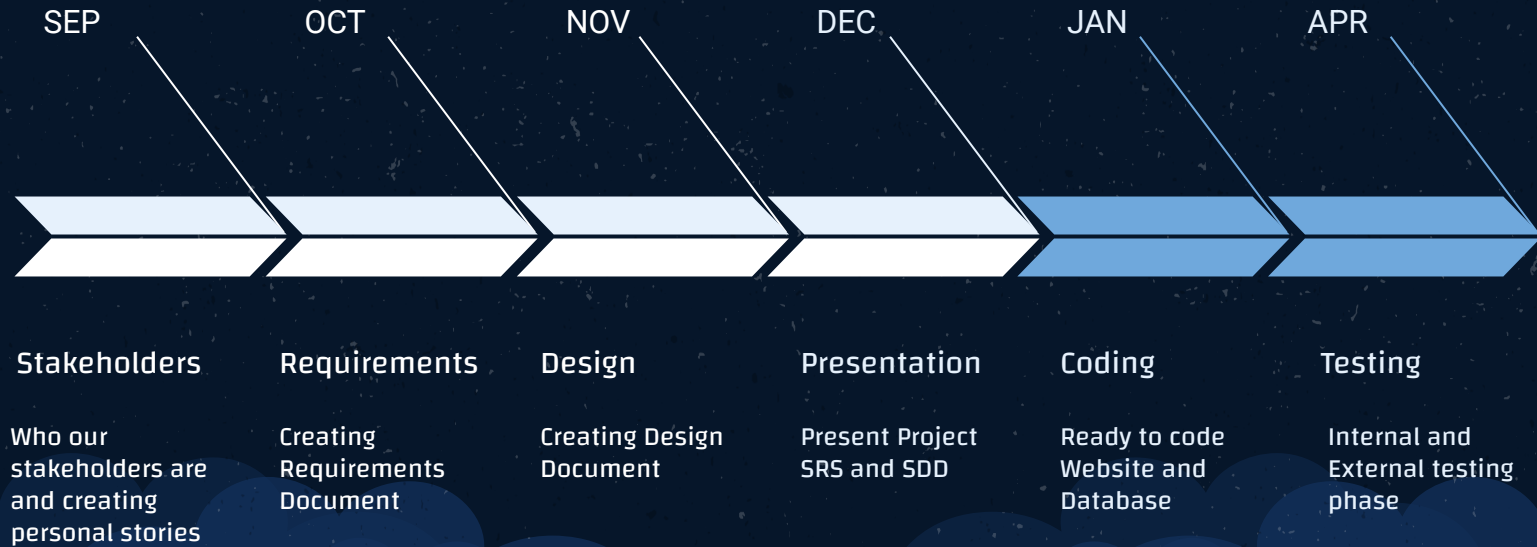


# Solution Progression

- Break down project into smaller, manageable tasks
  - Create subteams (UI/UX design, database, and more as needed)
- Establish goals and deadlines
  - Create goals to be met and keep each other accountable by meeting frequently
- Research the new topics
  - Continuously learn and adapt (eg creating a database)
- Incorporate feedback
  - Get feedback from liaisons, advisor, and each other periodically to improve and modify project (eg database, stakeholders and personas)



# VIPER Rocks! Timeline





# Conclusion

*What's our mission?*

- Encourage everyday participation of the users in our web-based application for the VIPER Rocks Mission.
  - The 3 Tasks:
    - Scouting, Sizing, and Classification.
- Encourage the use of this secure, user-friendly website and engages user participation by giving rewards.



# Conclusion

*How did this project help us?*

- **Citizen Science :**

- Demonstrate the importance for scientists to analyze, identify, categorize, and annotate surface features utilizing information from spacecraft.

- **Individual Benefits :**

- Problem-solving skills, recognition, personal satisfaction, and exposure to diverse perspectives, and team collaboration.

- **Platform Benefits :**

- Set of tools designed to support scientific research, analyze data from previous, ongoing, and planned lunar missions.



**Thank You  
For  
Listening!**

