

The background is a dark blue color. A central gold-outlined rectangle contains the text 'Team Ceres'. Several thin gold lines radiate outwards from the corners and sides of this rectangle, creating a starburst or network-like effect. The lines are of varying lengths and angles, some extending towards the edges of the frame.

# Team Ceres

A GUI Interface for Large Data Stream Analysis for All-Sky  
Astronomical Measurements

# Introduction

## Project Sponsors:



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## Project Mentor:



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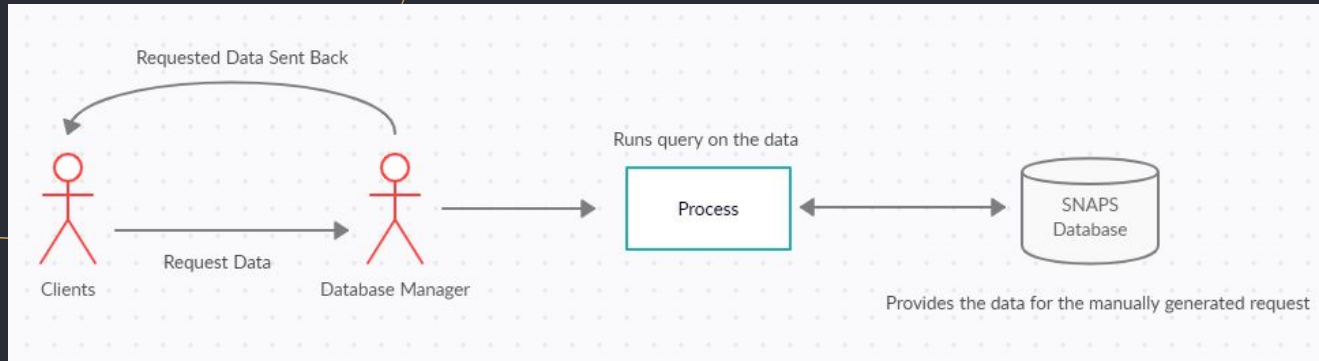
# Problem

While collecting data is not an issue, finding ways to utilize the data is

- It is estimated that when the Vera C. Rubin Observatory is finished being built in 2023, 20 terabytes of data will be collected every night for 10 years.
- By the end of the Rubin Observatory's participation in this survey, 73 petabytes of data will have been collected
- Currently, the Zwicky Transient Facility in San Diego California produces nearly 2 terabytes of data every night by participating in these surveys

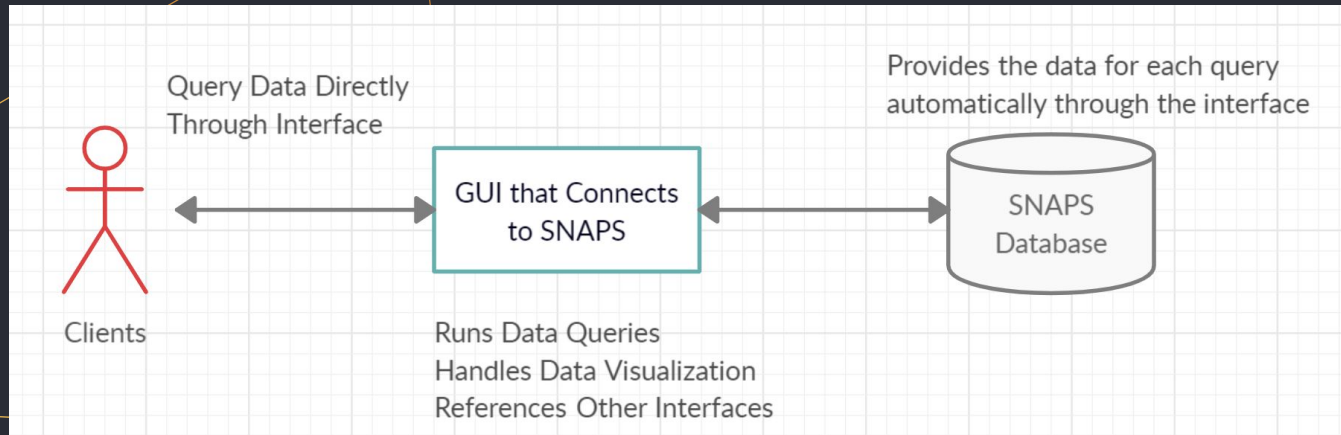
# Problem

- Clients receive a stream of data from ZTF pertaining to asteroids and other small bodies in an attempt to
  - Study the formation of our solar system
  - Prepare for asteroids impacting our planet
- No graphical interface exists to access information in the database
- Queries are run by a colleague to gather the requested information and analysis
  - Completely manual approach, not user-friendly
  - Due to the large amount of data being processed each night, database is constantly being updated manually as well



# Solution

- Create a responsive, easy to use web application that is able to
  - Query and analyze data in the database as needed
  - Update the database with new data coming in
  - Save and export subsets of data or analysis currently being viewed
  - Perform basic user authentication and hold role based permissions
- This will allow both our clients and astronomers all over the world to easily perform view data and perform research on asteroids and other small bodies



# Key Requirements

- GUI that allows:
  - Custom querying and applying analysis tools to data
  - Interactive plots for quickly viewing correlations between asteroid features
  - Mechanisms for exporting and saving subsets or current plots
- Application must be user friendly and responsive with large sets of data
- Link to other existing data sources, such as
  - ANTARES, JPL Horizons, and MARS

# Specific Requirements

- **Functional Requirements**
  - Filter/search data
  - Export data/plots
  - Set account preferences and have a section for saved work
  - Share various analytics with other users
  - View and access other users analyses
- **Performance Requirements**
  - Responsive/Reliable
  - Scalable
  - Usable
  - Secure
- **Environmental Requirements**
  - Must be able to run on locally owned NAU machines

# Closer Look

- Filter/Search Data
  - Search Bar
    - Allows for the user to enter partial and complete search values
  - Filter Options Box
    - User should be able to select specific asteroid properties to get desired data
      - Ex: name, # of observations
  - Results Panel
    - Relevant graphs and data tables given some search criteria
  - Responsiveness
    - Requests for graphs should display results quickly
- Other Key Requirements follow a similar breakdown



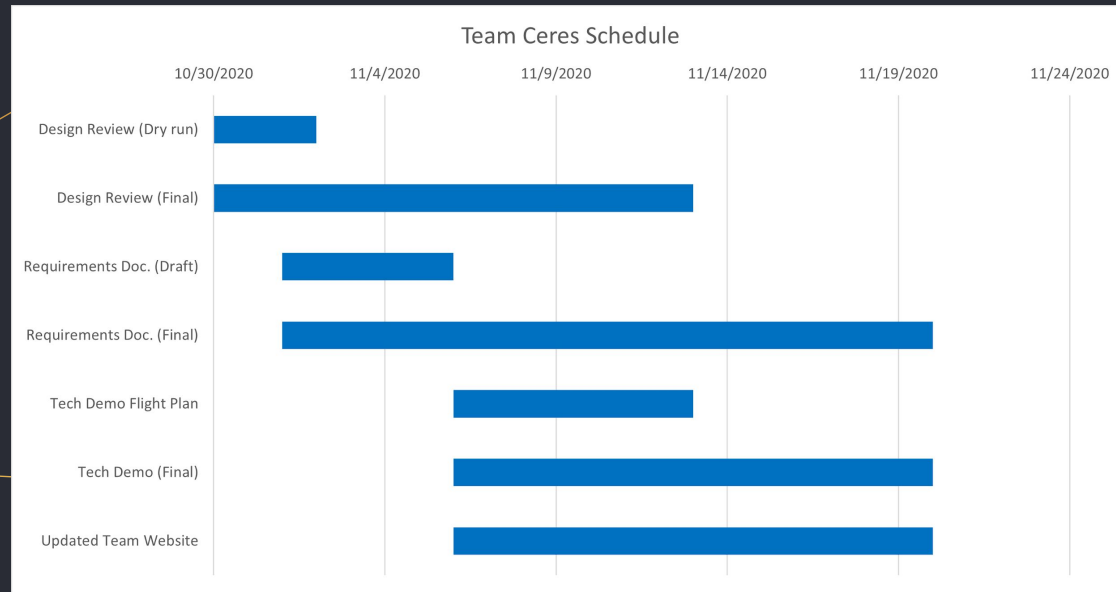
# Risks & Feasibility

## Potential risks:

- An implementation change in how the ZTF data is gathered
  - Medium-risk
    - Solution: A separate module for importing the data
      - allows for easy changes to source database schema
  - Importing large amounts of data at once, blocking access to the database
    - High-risk
      - Solution: asynchronous import process
        - allows existing tables to be used while new data is imported

# Schedule

- Finalizing our Requirements Document with clients over the next couple weeks
- Finish developing small scale demos
- Wrap up the semester with signed Req. Doc. and successful Tech. Demo
  - Overall, we are on schedule



# Conclusion

- We want to build a responsive, easy to use web application to
  - Aid our clients in their research
  - Allow astronomers across the globe the same ease of access to this data
- This research could lead us to knowledge about the formation of our solar system, and prepare us for the eventuality of an asteroid impacting our planet
- We should be able to demonstrate the feasibility and minimized risk throughout the next month through our Requirements Document and Technology Demo