Project Research

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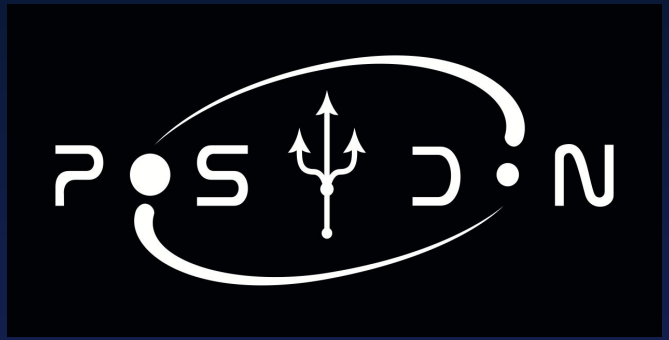
Project Overview

- Objective: Develop a system to manage and analyze binary star data
- Key Features:
  - Import multivariable time-series simulation data into relational database
  - Provide sample SQL queries
  - Enable custom queries through natural language processing
- Deliverables:
  - Relational database
  - User Interface for writing and viewing SQL queries
  - Sample SQL queries

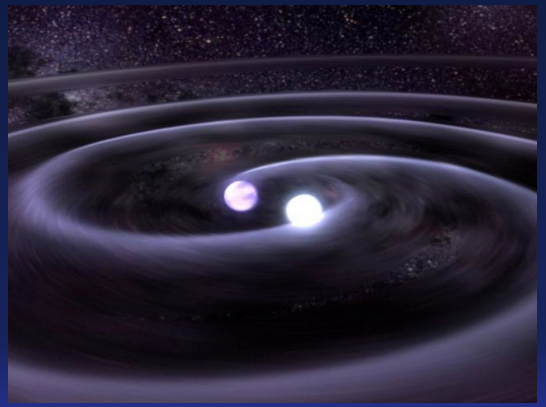
Context

- POSYDON : POpulation SYnthesis with Detailed binary-evolution simulatiONs
- Developed by a collaborative group of scientists primarily at Northwestern University
- Simulates stellar evolution of binary stars
- Generates large amount of data as simulation output



Problem Statement

The POSYDON Project needs a tool to easily query the data generated from their simulations, especially by querying a range of data based on attributes (time, mass, etc.). This tool should run on a local machine and allow a user to set-up their own database and query information from the simulations.



Related Projects - Gaia

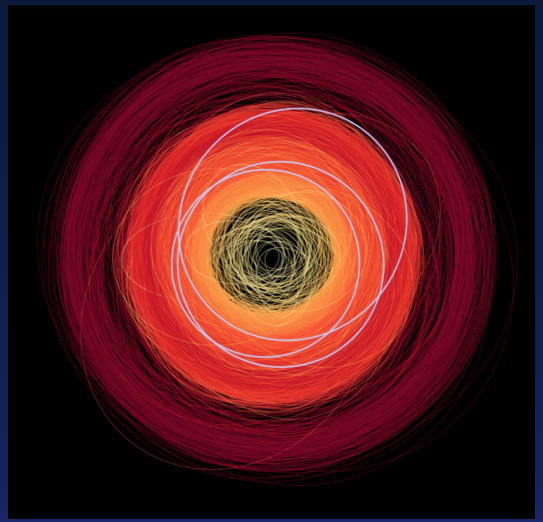
Gaia: European Space Agency satellite and database on stars in the Milky Way

Advantages

- 1 billion pixel camera
- Dedicated satellite

Disadvantages

- Expensive to maintain satellite
- Entirely managed by European Space Agency
- Not hyper specific detailed Binary Star Data



Related Projects - Binary Star Database

BDB: Binary Star Database has a large amount of real data relating to binary stars, data is entirely observed from earth and low orbit.

Advantages

- International community
- Varying types of data (visuals etc.)
- User friendly

Disadvantages

- Still under development
- Based in Moscow, Russia
- Only observed data not simulated data

Related Projects - NASA Lunar Data Project

NASA Lunar Data Project: Similar to GAIA project but ran by NASA, this project is also ran to preserve all NASA data on magnetic tape.

Advantages:

- Large budget for development
- Access to over 50+ years of collections

Disadvantages

- Works with existing data not simulated data
- No research specifically on binary stars

Lunar Data Project

Market Gap

- No existing solutions
- Related projects
  - ESA - Gaia
    - Hosted in Europe and deals with mapping stars, as opposed to being able to query *simulated* data.
  - The Binary Star Database
    - Hosted In Russia, Only contains recorded data.
  - NASA - Lunar Data Project
    - Nasa project that digitally transforms legacy data from outdated storage types such as magnetic tapes.

Our plan

- Develop a user interface using React with the Bootstrap framework
  - Create base SQL queries and allow users to insert parameters to retrieve data from the database
- Develop a backend using Node.js
- Create a PostgreSQL database to house the data from POSYDON
- Develop a tool for researchers to take our compressed data and convert it to their local database