User Needs and Requirements

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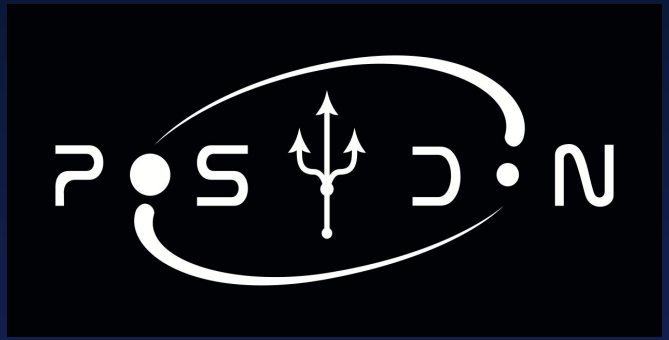
Context

- 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 massive amounts of data as simulation output

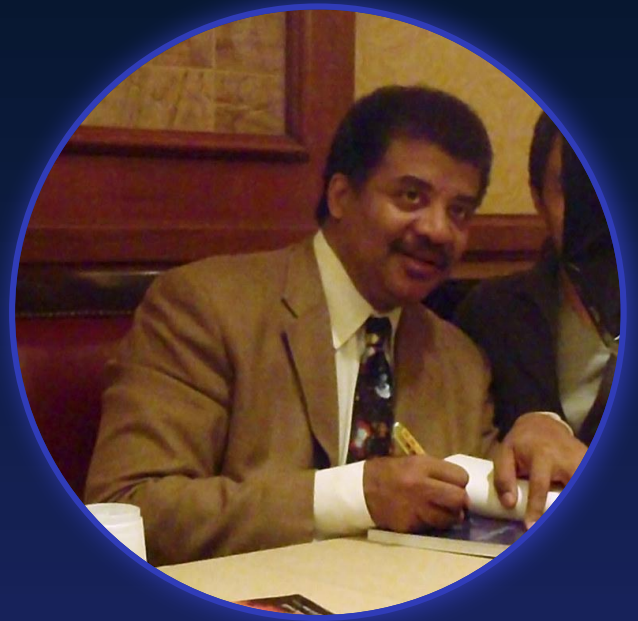


Project Overview

- **Objective:** Develop a system to manage and analyze simulated binary star data
- **Key Features:**
  - Import multivariate 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

Users - Astrophysicists

- Studying POSYDON simulation data to research binary star system evolutions
- Familiar with the purpose of the POSYDON project
- Unfamiliar with database querying



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Users - Educators

- Not an expert in binary star simulation data
- Goal to create an engaging and interactive learning environment
- Overwhelmed with administrative tasks and lesson plans

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Users - Students

- Undergrad/grad student
- Studying binary star data for school
- Busy with classes and other responsibilities
- Not an expert in Binary Star data

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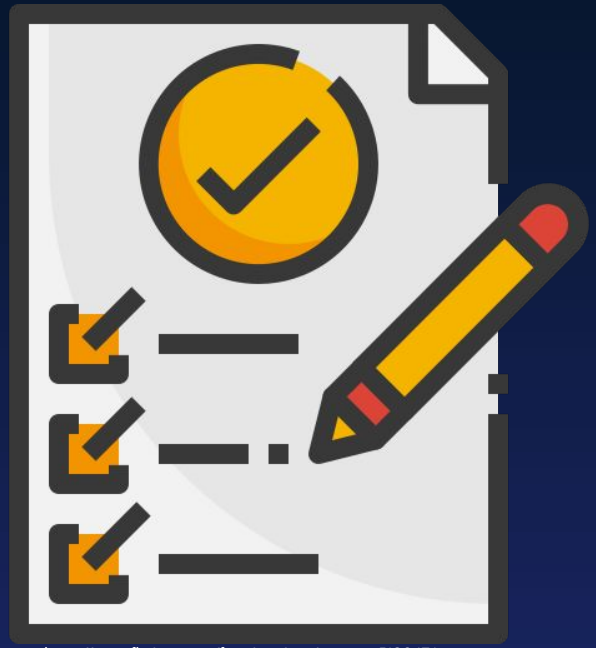
Combined User needs

- Premade SQL queries
- Ability to convert natural language into a query
- Ability to construct custom queries by selecting parameters from a list
- Ability to save previous queries to a collection
- User-friendly interface
- Customizable data views
- Advanced querying capabilities

Functional Requirements

Functional:

- Supports custom and built-in queries
- Convert natural language into SQL queries
- Ability to save custom SQL queries
- Retrieves data from a database
- Tool to convert compressed csv files into database



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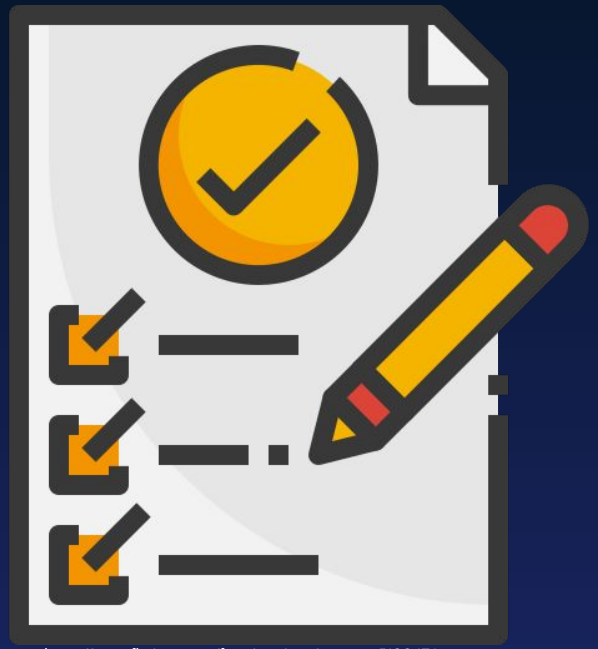
Non-Functional Requirements

Non-Functional:

- Easily understood user interface
- Time-efficient data parsing
- Clear presentation of data
- Queryable database



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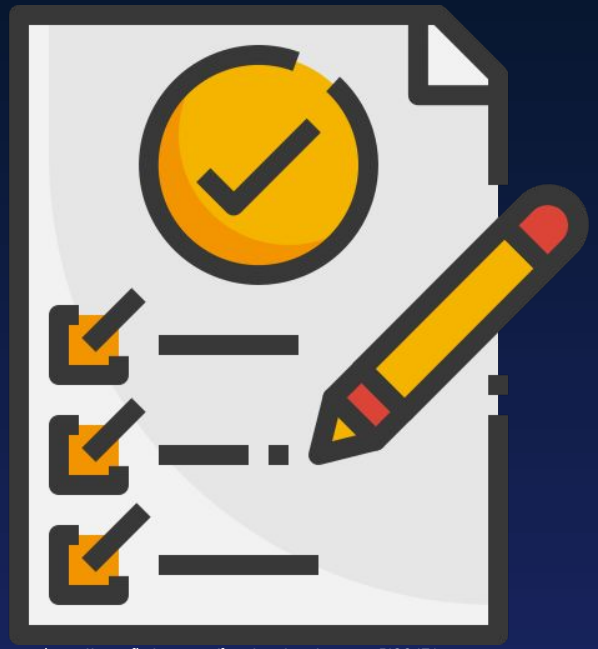
Other Requirements

Economic:

- User needs a computer with necessary system specifications to run the UI
- Computer must have adequate storage for database



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Engineering Standards

- **ISO/IEC/IEEE 12207:2017 - Systems and software engineering — Software life cycle processes**
  - This standard has information on defining, controlling, and improving the software lifecycle, which we will utilize as we iterate through different designs and as our requirements change.

- **ISO/IEC/IEEE 24748-3:2020 - Systems and software engineering — Life cycle management**
  - Provides guidance on applying standard 12207:2017, emphasizing strategy, planning, and stakeholder involvement to achieve customer satisfaction in systems and software life cycle management.

- **ISO/IEC/IEEE 29148:2018 - Systems and software engineering — Life cycle processes — Requirements engineering**
  - This standard is responsible for defining how requirements are set for a piece of software that will benefit our project to ensure we create thorough requirements and meet those requirements.

- **ISO/IEC 9075-1:2023 - Information technology — Database languages SQL**
  - This standard outlines SQL query formatting and behavior, ensuring best practices for implementing and querying our SQL database..

Conclusions

- POSYDON is a project that collects data of binary star evolution through various simulations
  - Terabytes of data have been generated
  - Missing a tool to query data
- Our project aims to design a tool for managing this data in a database
- Will feature user interface to support queries from users familiar and unfamiliar with SQL syntax
- Needs to accommodate astrophysicists, educators, and students

Thank You!

Questions?