NASA Exoplanet Data

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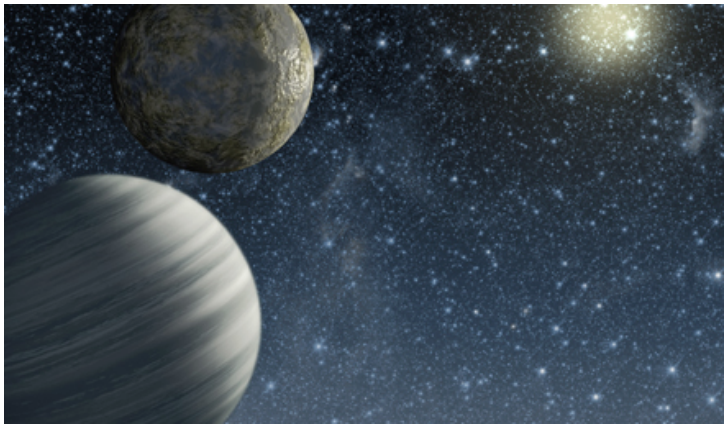
Introduction

A long standing human question that has percolated through science over the years has always been, "is there life besides us?". Obviously there has been no scientific data that has revealed an answer to this question, but a good starting point is to search for places that are similar to the only place we know life has existed... Earth. Earth can quantitatively be defined by the following traits; radius, mass, distance from the sun, type of sun, type of atmosphere, and more.



The General goal that our project will be focusing on is working to see how many of the 3725 confirmed exoplanets are actually similar to earth. Along with how many of these planets actually orbit a sun that has relatively similar traits to our planet. In order to make this comparison we will be using the traits seen in figure 1 to query against our data for the earth. Along with the traits seen in figure 2 to query against the data about the sun that the exoplanet orbits.

Traits of Earth		
Radius(Jupiter Radii)	**Eccentricity**	**Mass (Jupiter)**
0.089	0.0167	0.000314

Figure 1: In astronomy a lot of units are compared to either Jupiter mass or Jupiter Radii as a standard unit of comparison

Traits of our Sun		
Temp (Kelvin)	Radius (Jupiter Radii)	Mass (Kg)
5800	$\tilde{1}0$	$1.989 * 10^{30}$

Figure 2

About Our Dataset

0.1 Why Our Data is Interesting

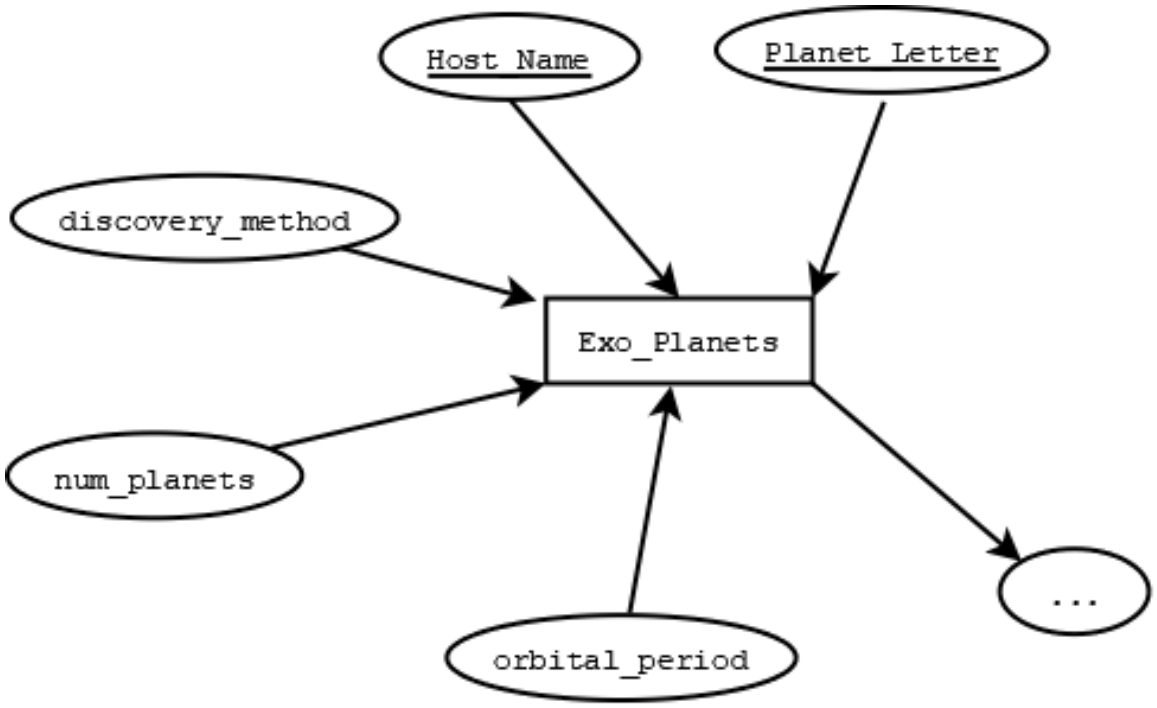
Our data set is an assembly of various statistics that categorized confirmed exoplanets that were discovered mainly by the Kepler telescope, but also a few others from the K2 telescope. These exoplanets in the data set were discovered by a variety of different methods. The method of investigation that returned the most exoplanets was the transit methods. This uses the periodic dimming of the star to see if there is any planets orbiting the star of interest. A few other methods used to acquire the data set are as follows; microlensing, imaging, and radial velocity. Overall the data contains a total of 3725 confirmed exoplanets.

0.2 Source

URL of data: https://exoplanetarchive.ipac.caltech.edu/index.html
***Note:** The data from this URL is a group effort provided by the sponsors below

ERD Diagrams

For the normalization of the table we just had to choose a unique primary key, which we chose as a combination of the host star name and the planet letter. This allowed for all unique keys. There were no relations for our table that were necessary for normalization of the data we needed.



Interesting Queries

As stated in the introduction the focus of our queries was to look into how many of the exoplanets had similar traits to the earth or had a host star with similar properties to our sun.

Planets similar to Earths mass

SELECT Host_Name, planet_letter, mass FROM exo_planets WHERE mass BETWEEN 0.0001 AND .001;

Returned 1 planets *Note: Our deviation from earths radius was pretty small.

Planets similar to Earth's radius

SELECT Host_Name, planet_letter FROM exo_planets WHERE radius BETWEEN 0.0001409948 AND 0.00017232697;

Returned 0 planets

Planets similar to Earth's orbital period

SELECT Host_Name, planet_letter, orbital_period FROM exo_planets WHERE orbital_period BETWEEN 360 AND 370;

Returned 1 planets
Planets that orbit A similar size sun

SELECT COUNT* FROM exo_planets WHERE stellar_radii BETWEEN 0.9 and 1.1;

Returned 897 planets

How many planets have similar eccentricity

SELECT Host_Name, planet_letter, eccentricity, mass, radius, orbital_period FROM exo_planets WHERE eccentricity BETWEEN .01503 AND .01837

Returned 3 planets

Challenges With Our Data

Obtaining and loading the data into the table did not provide that many challanges. We initially had some issues using the COPY command, but this was pretty easy to deal with after including an explicit delimiter to account for the comma that was used to separate data in the file. Also we had some issu

PSQL Code

```
psql initial load of data
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CREATE TABLE planets (pl_hostname varchar(255), pl_letter  varchar(255), pl_discmethod
varchar(255),pl_pnum int,pl_orbper float,pl_orbpererr1  varchar(255),pl_orbpererr2
varchar(255),pl_orbperlim varchar(255),pl_orbpern float,pl_orbsmax float,pl_orbsmaxerr1
varchar(255),pl_orbsmaxerr2 varchar(255),pl_orbsmaxlim varchar(255),pl_orbsmaxn float,pl_orb
float,pl_orbeccenerr1 varchar(255),pl_orbeccenerr2 varchar(255),pl_orbeccenlim varchar(255),
float,pl_orbincl float,pl_orbinclerr1 varchar(255),pl_orbinclerr2 varchar(255),pl_orbincllim
varchar(255),pl_orbincln varchar(255),pl_bmassj float,pl_bmassjerr1 varchar(255),pl_bmassjer
varchar(255),pl_bmassjlim varchar(255),pl_bmassn float,pl_bmassprov varchar(255),pl_radj
float,pl_radjerr1  varchar(255),pl_radjerr2 varchar(255),pl_radjlim varchar(255),pl_radn flo
float,pl_denserr1 varchar(255),pl_denserr2 varchar(255),pl_denslim varchar(255),pl_densn flo
int,pl_kepflag int,pl_k2flag int,ra_str varchar(255),dec_str varchar(255),ra varchar(255),st
varchar(255),dec varchar(255),st_decerr varchar(255),st_posn varchar(255),st_dist float,st_d
varchar(255),st_disterr2 varchar(255),st_distlim varchar(255),st_distn float,st_optmag float
varchar(255),st_optmaglim varchar(255),st_optband varchar(255),gaia_gmag float,gaia_gmagerr
varchar(255),gaia_gmaglim varchar(255),st_teff float,st_tefferr1 varchar(255),st_tefferr2
varchar(255),st_tefflim varchar(255),st_teffn float,st_mass float,st_masserr1 varchar(255),s
varchar(255),st_masslim varchar(255),st_massn float,st_rad float,st_raderr1 varchar(255),st_
varchar(255),st_radlim varchar(255),st_radn float,pl_nnotes int,rowupdate  varchar(255));
\copy planets FROM 'planets.csv' WITH ( FORMAT CSV);
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SQuirreL work on data
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DROP TABLE exo_planets;
CREATE TABLE exo_planets (Host_Name varchar(255), planet_letter varchar(255), discovery_meth
varchar(255), num_planets int, orbital_period float, eccentricity float, inclination float,
mass float, mass_type varchar(255), temperature float, density float, distance float, optica
float, optical_mag_type varchar(255), stellar_radii float, primary key (host_name, planet_le

INSERT INTO exo_planets (Host_Name, planet_letter, discovery_method, num_planets, orbital_pe
eccentricity, inclination, radius, mass, mass_type, temperature, density, distance, optical_
optical_mag_type, stellar_radii) SELECT DISTINCT pl_hostname, pl_letter, pl_discmethod, pl_p
pl_orbper, pl_orbeccen, pl_orbincl, pl_radj, pl_bmassj, pl_bmassprov, st_teff, pl_dens, st_d
st_optmag, st_optband, st_rad FROM planets;


SELECT Host_Name, planet_letter FROM exo_planets WHERE radius BETWEEN 0.0001409948 AND 0.000


SELECT Host_Name, planet_letter, mass FROM exo_planets WHERE mass BETWEEN 0.0001 AND .001;


SELECT Host_Name, planet_letter, stellar_radii FROM exo_planets WHERE stellar_radii BETWEEN

SELECT COUNT(*) FROM exo_planets WHERE stellar_radii BETWEEN 0.9 and 1.1;
```

```
SELECT COUNT(Host_Name) FROM exo_planets WHERE stellar_radii BETWEEN 0.9 and 1.1;

SELECT Host_Name, planet_letter, stellar_radii, temperature FROM exo_planets WHERE stellar_ra
0.9 and 1.1 AND temperature BETWEEN 5202 AND 6358;

SELECT COUNT (*) FROM exo_planets WHERE eccentricity BETWEEN .01503 AND .01837;

SELECT Host_Name, planet_letter, eccentricity, mass, radius, orbital_period FROM exo_planets
eccentricity BETWEEN .01503 AND .01837;

SELECT Host_Name, planet_letter, orbital_period FROM exo_planets WHERE orbital_period BETWEE
370;
```