

CISSUS

About

Project

Members



ABOUT THE TEAM

In Greek mythology, Cissus was a satyr who was turned into an ivy plant. Now exploring exosky! challenge.

You are the team owner.

 Edit Details

ABOUT THE CHALLENGE

What would the night sky look like if you were standing on one of the many exoplanets discovered by astronomers and space missions? The list of 5500+ exoplanets at the NASA Exoplanet Archive can be combined with the latest star catalogs to translate the location and brightness of millions or even billions of stars to another perspective. From that perspective, anyone could use their imagination to draw constellations, much like our ancestors did on Earth thousands of years ago. Your challenge is to develop an app or interface for students that allows them to choose an exoplanet and then either display an interactive star chart or export a high-quality image for printing or viewing on a computer or virtual reality display, where they can draw and name constellations.

Team Information

Local Event

Brooklyn, NY, United States

Challenge

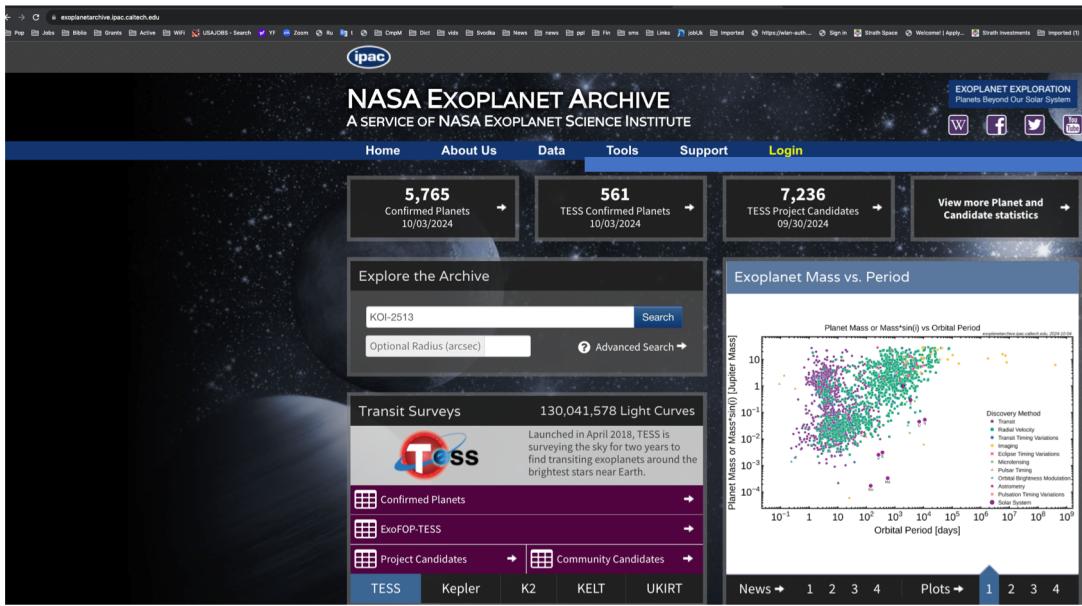
Exosky!

Desired Skills

- [Arts](#)
- [Arts & Multimedia](#)
- [Astrophysics](#)
- [Coding](#)
- [Data Analysis](#)
- [Data Visualization](#)
- [Graphic Design](#)
- [Open Science](#)
- [Planets & Moons](#)
- [Public Speaking](#)
- [Software](#)
- [Space Exploration](#)
- [Videography/Photography](#)
- [Web Design](#)
- [Web Development](#)
- [Writing & Communications](#)

Languages Spoken

- [English](#)



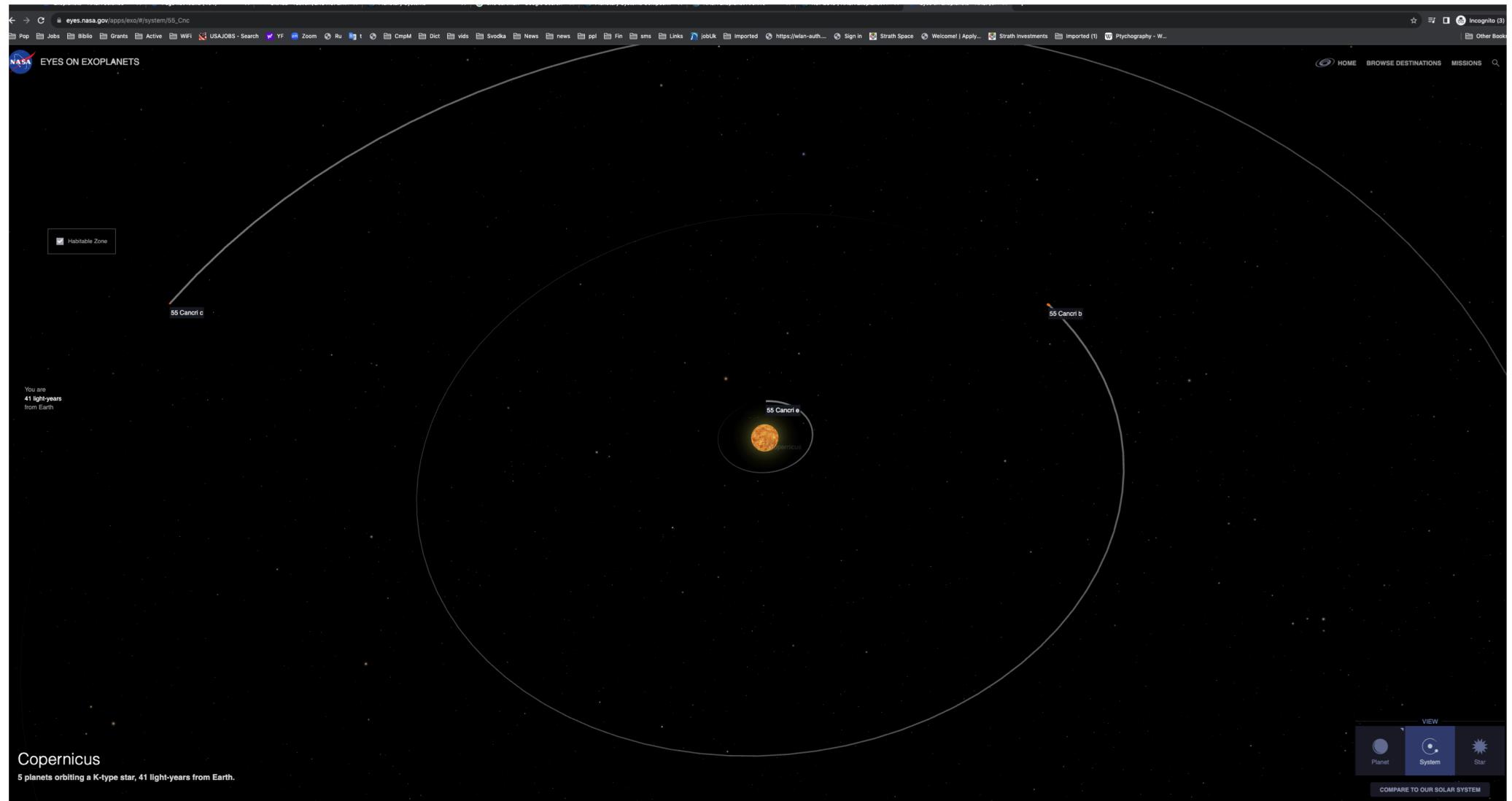
NASA data used



NASA EXOPLANET ARCHIVE NASA EXOPLANET SCIENCE INSTITUTE																
Planetary Systems																
Planet Name	Host Name	Default Parameter Set	Number of Stars	Number of Planets	Discovery Method	Discovery Year	Discovery Facility	Solution Type	Commercial Flag	Planetary Parameter Reference	Orbital Period [days]	Orbit Semi-Major Axis [au]	Periastron Radius [Earth Radii]	Aphelia Radius [Jupiter Radii]	Period & Mass [Earth]	
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Fischer et al. 2008	14.65162±0.0007	0.115±0.000011	261.881±			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Wright et al. 2009	14.65126±0.0070	0.115±0.006	260.615±3			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Marcy et al. 2002	14.650±0.0008	0.115±0.003	267±22			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	McArthur et al. 2004	14.67±0.0	0.115±0.003	249±29			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Nair et al. 2004	14.647±0.001	0.115	289.21±6			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Rosenblatt et al. 2021	14.6517±0.00003	0.115±0.000018	267±8			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Neves et al. 2014	14.6513±0.00005	0.115±0.00011	260.666			
55 Cnc b	55 Cnc	1	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Bonneau et al. 2018	14.651±0.0001	0.115±0.0006	255.442±5			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Balleux et al. 2015	14.6512±0.0015	0.115227±0.0000079	263.9785			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Butler et al. 1997	14.649±0.0009	0.11	267			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	1996	Lick Observatory	Published Confirmed	0	Sant et al. 2015	14.6	0.113	254.25			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	End et al. 2012	14.651±0.0001	0.115±0.0006	254.25±3			
55 Cnc b	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Bourrier et al. 2018	44.39±0.204	0.237±0.0013	51.21±3			
55 Cnc c	55 Cnc	1	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Nelson et al. 2014	44.37±0.000	0.2375±0.00024	56.6985			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Wright et al. 2009	44.378±0.0070	0.238±0.014	52.440±8			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	McArthur et al. 2004	43.93±0.25	0.249±0.008	69.0±12.7			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Rosenblatt et al. 2021	44.387±0.0038	0.243±0.0017	54.35±2.1			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	End et al. 2012	44.38±0.007	0.237±0.0013	52.44±1			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Fischer et al. 2008	44.344±0.007	0.249±0.00045	53.711±2			
55 Cnc c	55 Cnc	0	2	5	Radial Velocity	2004	McDonald Observatory	Published Confirmed	0	Balleux 2015	44.417±0.0073	0.24137±0.00026	54.47±8			

<https://exoplanetarchive.ipac.caltech.edu/>

NASA data used



3d navigation interactive app <https://eyes.nasa.gov/apps/exo/#/>

Use of data, use of IT

Interaction with AI created plausible path for a school student to understand the meaning of data and to start analysing data

Explain to high school student what exoplanet is

An exoplanet is a planet that orbits a star outside of our solar system. The term "exo" means "outside," so an exoplanet is simply a planet located outside our own planetary neighborhood.

Key Points for High School Students:

1. **Not in Our Solar System:** While we have planets like Earth, Jupiter, and Mars orbiting our Sun, exoplanets orbit other stars in the vast universe.
2. **Diverse Worlds:** Exoplanets come in many shapes and sizes. Some might be similar to Earth, while others can be gas giants like Jupiter, icy worlds, or even planets with molten surfaces.
3. **How We Find Them:**
 - **Transit Method:** When an exoplanet passes in front of its star (from our viewpoint), it slightly dims the star's light, allowing us to detect its presence.
 - **Radial Velocity:** The gravitational pull of the exoplanet makes its star wobble slightly, which we can measure.
4. **Why They Matter:** Studying exoplanets helps scientists learn about other planetary systems, and it could help us answer big questions, like whether life exists elsewhere in the universe!

In summary, an exoplanet is a planet that exists beyond our solar system, orbiting a different star, and scientists use different methods to discover and study them.



explain what Kepler object is

A Kepler object refers to a celestial body or candidate exoplanet that was discovered using data from NASA's **Kepler Space Telescope**. The Kepler mission was specifically designed to search for Earth-like exoplanets by observing distant stars for signs of planets orbiting them.

Explain transit method from your answer to PhD in physics

The **transit method** is one of the most successful techniques for detecting exoplanets, especially in the context of the Kepler mission. Here's a more detailed, physics-focused explanation of how it works:

Overview of the Transit Method:

The transit method detects exoplanets by measuring the periodic dimming of a star's light caused by a planet passing, or transiting, in front of it from our line of sight. When this happens, the planet blocks a small fraction of the star's light, creating a temporary and periodic dip in the star's observed brightness.

Key Concepts:

1. Light Curve and Photometry:

- The core data used in the transit method are the **light curves**—graphs of a star's brightness as a function of time.
- Photometric precision is critical; the light blocked by an Earth-sized planet transiting a Sun-like star is around 0.01% (100 parts per million) of the total light output.
- The duration and depth of the dip provide insights into the planet's size, orbit, and other properties.

2. Geometric Configuration:

- For a transit to be observed, the orbital plane of the planet must be aligned with our line of sight to the star. The probability P_{transit} that a randomly oriented orbit will be observed is given by:

$$P_{\text{transit}} \approx \frac{R_*}{a}$$

where R_* is the radius of the star and a is the semi-major axis of the planet's orbit. This shows that the likelihood of observing a transit increases for planets close to their host stars.

3. Stellar Flux Reduction:

The fractional reduction in stellar flux ΔF during a transit can be approximated by the ratio of the

Use of data, use of AI

can you imitate Eric Cartman asking why he should care ?

If I am a high school student who wants to use your previous link, where do I start, and what do I do with that information?

Memory updated

If you're a high school student and want to explore exoplanets using NASA's Exoplanet Archive, here's how to get started and what you can do with the information:

Step 1: Access the Exoplanet Archive

Go to the NASA Exoplanet Archive here:
<https://exoplanetarchive.ipac.caltech.edu/>

Step 2: Explore the Data

Once you're on the website, you can start by:

- **Clicking on "Confirmed Planets":** This will show you a table of all the confirmed exoplanets discovered so far.
- **Search Filters:** You can use the search options to narrow down planets based on different characteristics like size, distance from Earth, or even the method used to discover them (e.g., transit method, radial velocity).

Step 3: Understanding the Data

- Each exoplanet entry shows you important details such as:
 - **Planet Name:** The official name of the exoplanet.
 - **Discovery Method:** How it was found (e.g., transit method or radial velocity).
 - **Orbital Period:** How long it takes for the planet to orbit its star.
 - **Radius & Mass:** These tell you how big and heavy the planet is.
 - **Host Star:** Information about the star it orbits.

Step 4: Learn More with Visual Tools

The archive also has some fun tools:

- **Exoplanet Transit and Light Curve Tools:** You can visualize how a planet blocks light from its star, just like scientists do when they discover exoplanets.
- **Planet Systems Visualization:** You can view 3D models of planetary systems, which help you

Sure! Here's how Eric Cartman might ask why he should care about exoplanets:

Cartman: "Oh come on, dude! Why should I even care about some dumb planets way out there in space? It's not like they're gonna come over for lunch or something! I mean, we've got enough problems here on Earth. I've got video games to play and cheesy poofs to eat! Why should I waste my time looking at these faraway rocks? Is there even anything interesting about them, or are they just boring?"

This type of playful and dismissive attitude captures Cartman's character perfectly. The humorous take can highlight a common teenage sentiment: focusing on immediate interests instead of broader scientific exploration. If you're curious about exoplanets and why they matter, feel free to ask!

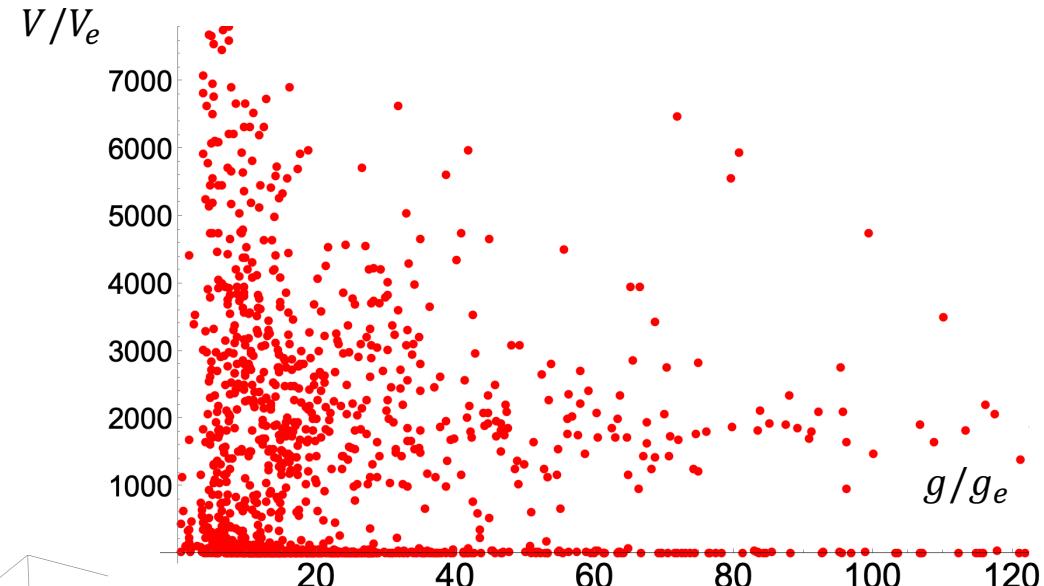
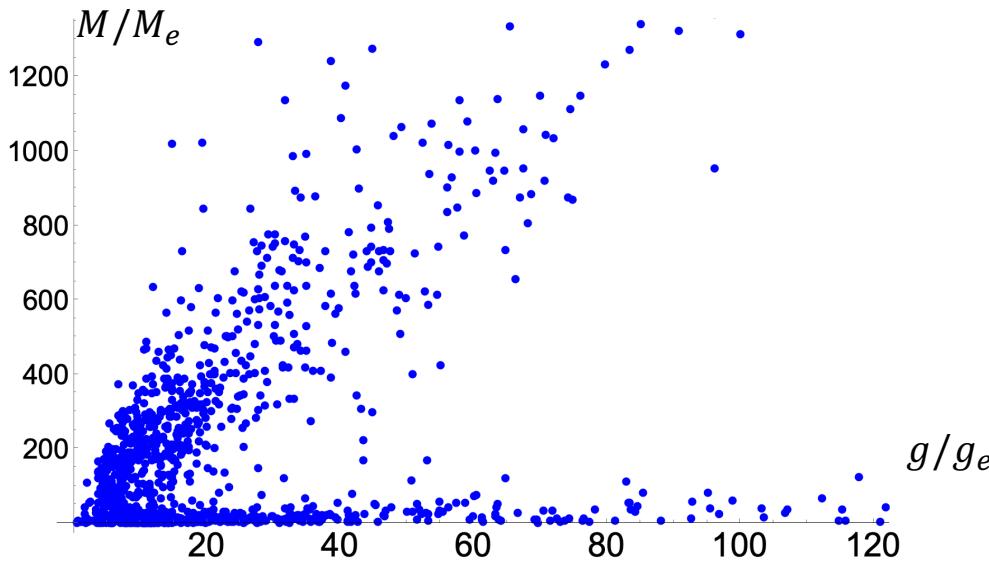
What would a wise man respond to "Is there even anything interesting about them, or are they just boring?"

A wise man might respond thoughtfully to the question about exoplanets by highlighting their significance and the intriguing possibilities they present. Here's how he might frame his response:

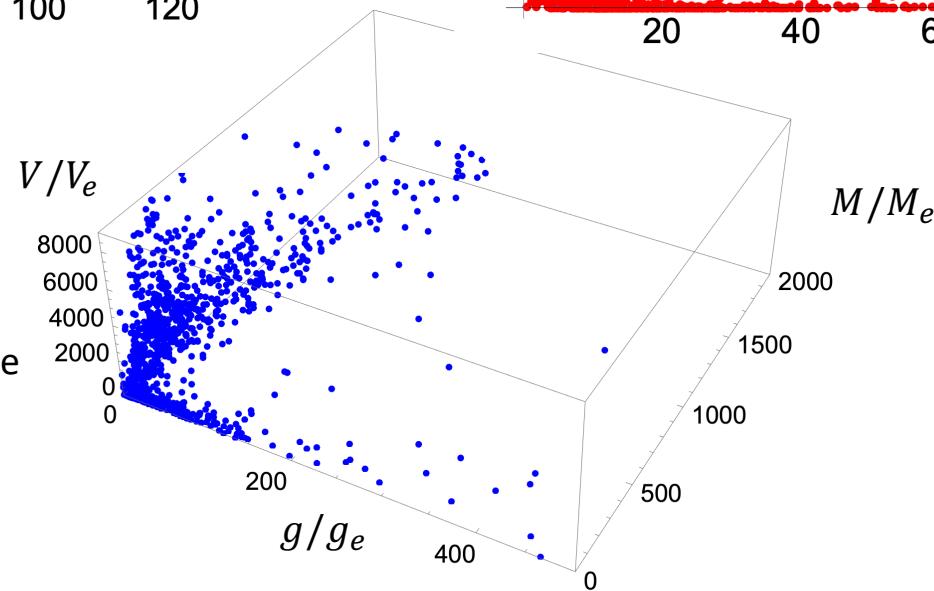
"Interesting? Absolutely! Exoplanets are not just distant rocks; they hold the keys to understanding our universe and our place in it. Each discovery tells us more about how planetary systems form and evolve, which can shed light on the history of our own solar system."

1. **Potential for Life:** Many exoplanets exist in the 'habitable zone' where conditions could allow for liquid water, a crucial ingredient for life. We know it. Discovering planets like Proxima

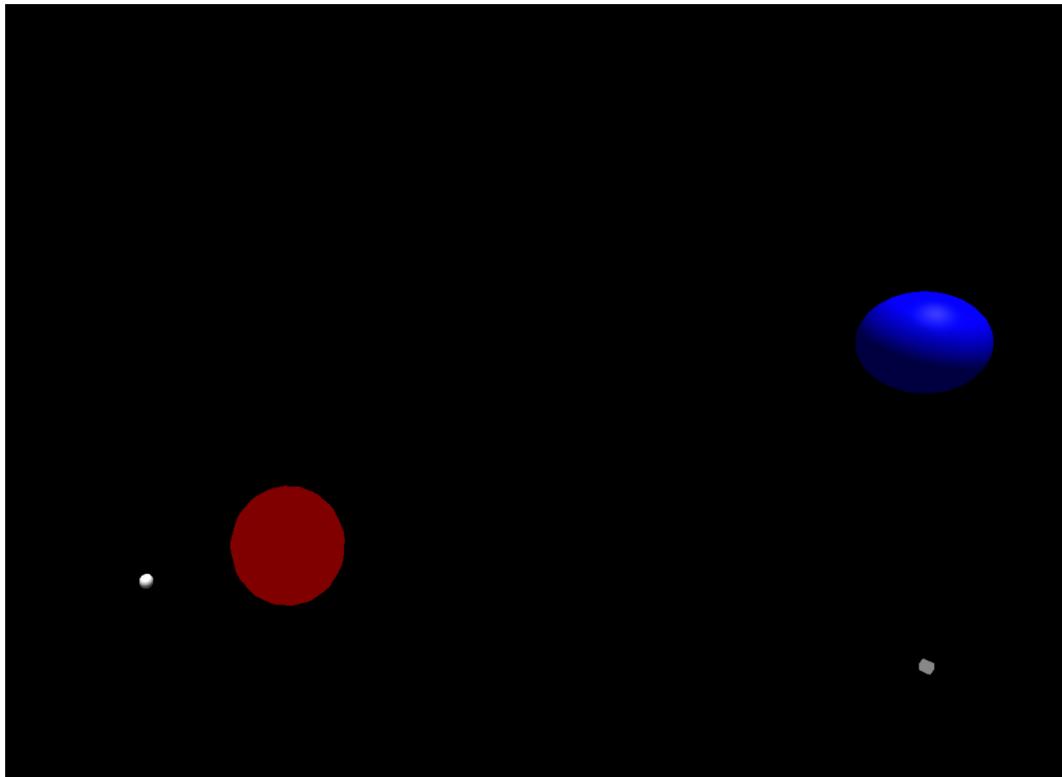
Science from data: human intelligence. Exploring exoplanets masses, volumes, gravitational accelerations at surface



Scatter plots of planets mass M , volume V , gravitational acceleration at the surface g , relative to Earth values. Planets with both M and radius values were selected only. Multiple measurements for the same planet were averaged. Big outliers are removed.



Java script app , allowing interactive 3d plots, with user-provided planet coordinates and radii



Java script app allowing interactive 3d plotting of student supplied or pre-entered coordinates and radii. It is aimed to allow learning how planetary systems of interest looks like, and how to find the data, and how to make such Java scripts, all assessible at the school level and above. Full path to performing all those tasks can be provided, aided with search and AI tools. Everything was created during 2 hackaton days, without preparation, and without using knowledge of Java or Java scripting. All results offered through search or AI were scrutinized using a human brain, at about 40% rejection rates. Full details about the process are available on request.