

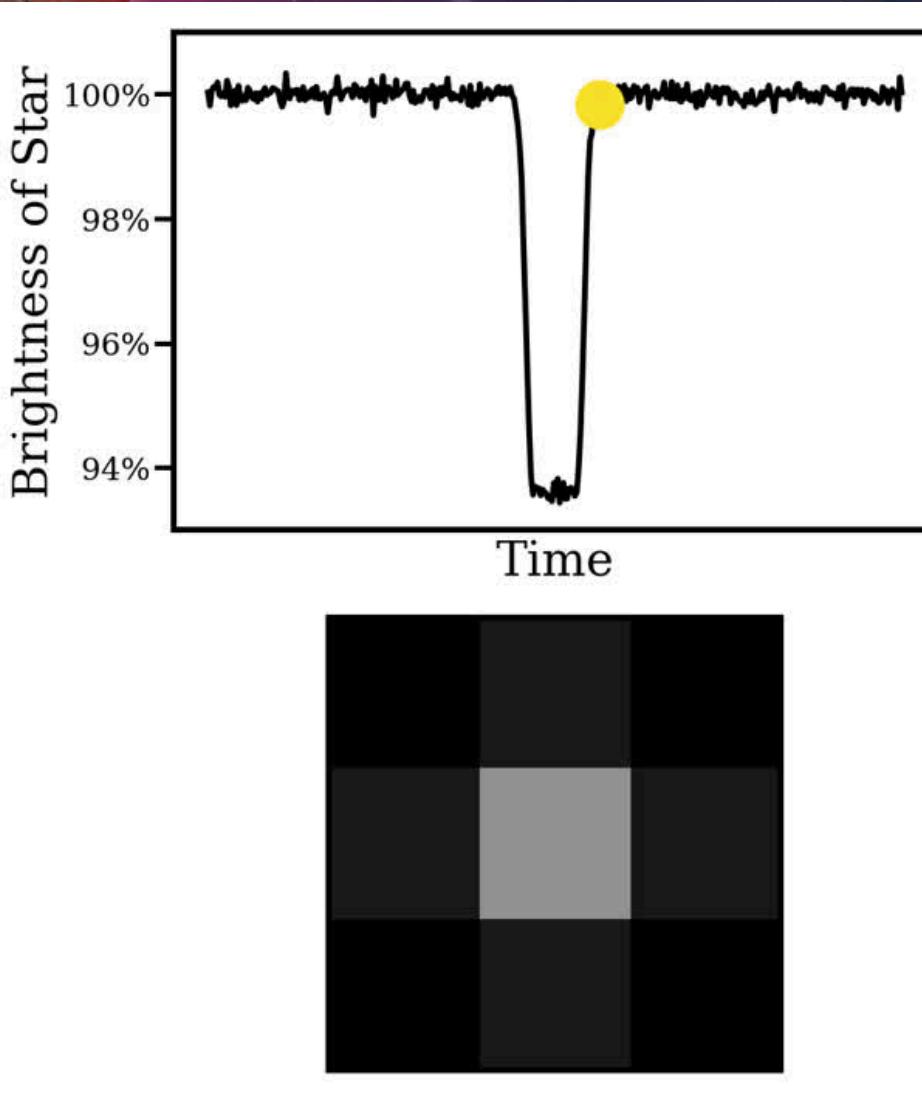
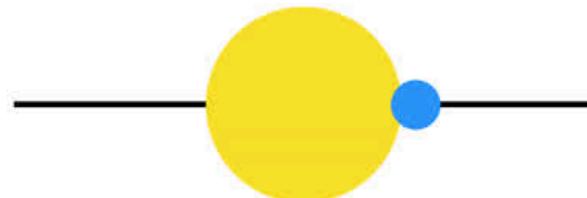
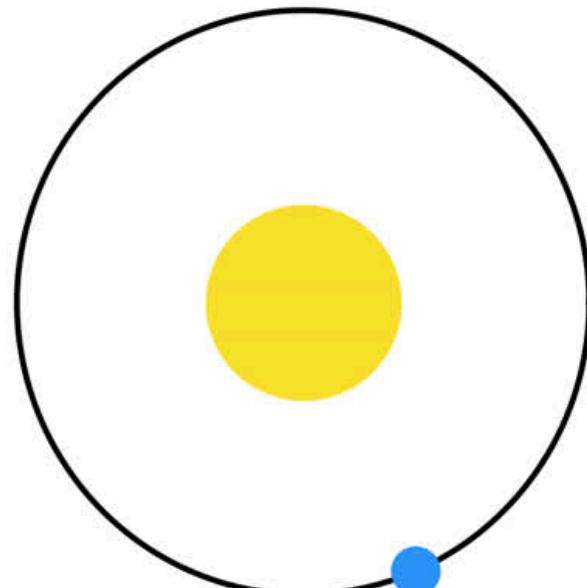
# *Hunting For Exoplanets Using AI*

*Criterion Labs*

*By: Samarth Singhal, Sandeep Singhal,  
Logan May, Yasser Hamdy, Will Swinson*

# Planet or Pretender?

Alysa Obertas (@AstroAlysa)



Data from space observatories, like the Kepler and TESS satellites, provides light curves that track a star's brightness.



A periodic dip in the data, such as the one shown, is a potential sign of an exoplanet.

? The challenge: Most of these signals are not planets, but 'false positives' caused by things like starspots or background stars.

# Strength in Numbers: Our AI Ensemble

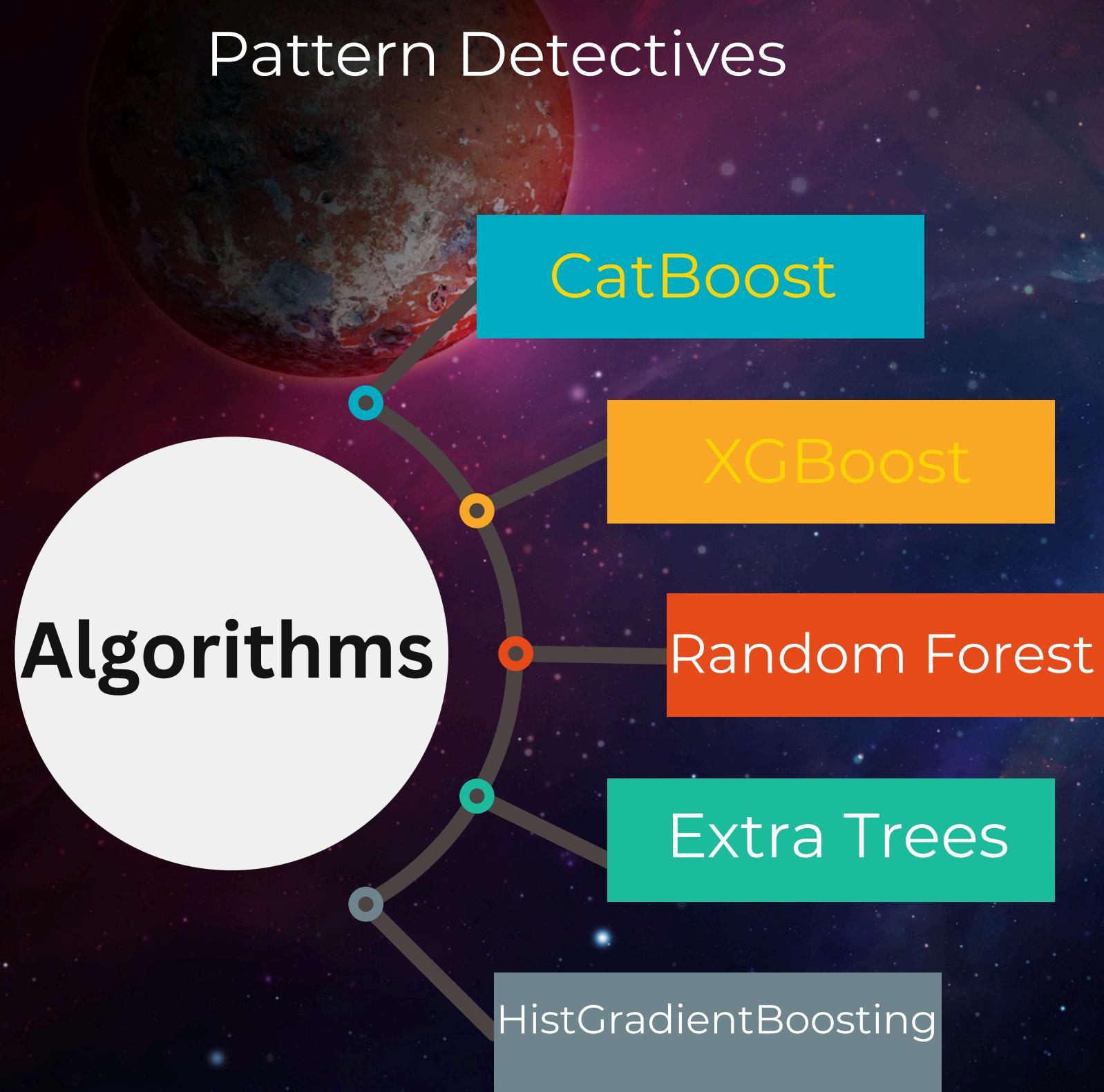
Our solution to our problem is an **ensemble method**: which is an AI committee where diverse models vote to find the planets with higher accuracy. We used various algorithms such as RandomForest and CatBoost.

## ***Key Benefits:***

- Boasts confidence in each discovery
- Dramatically Reduces False Positives
- Grounded in proven scientific research.

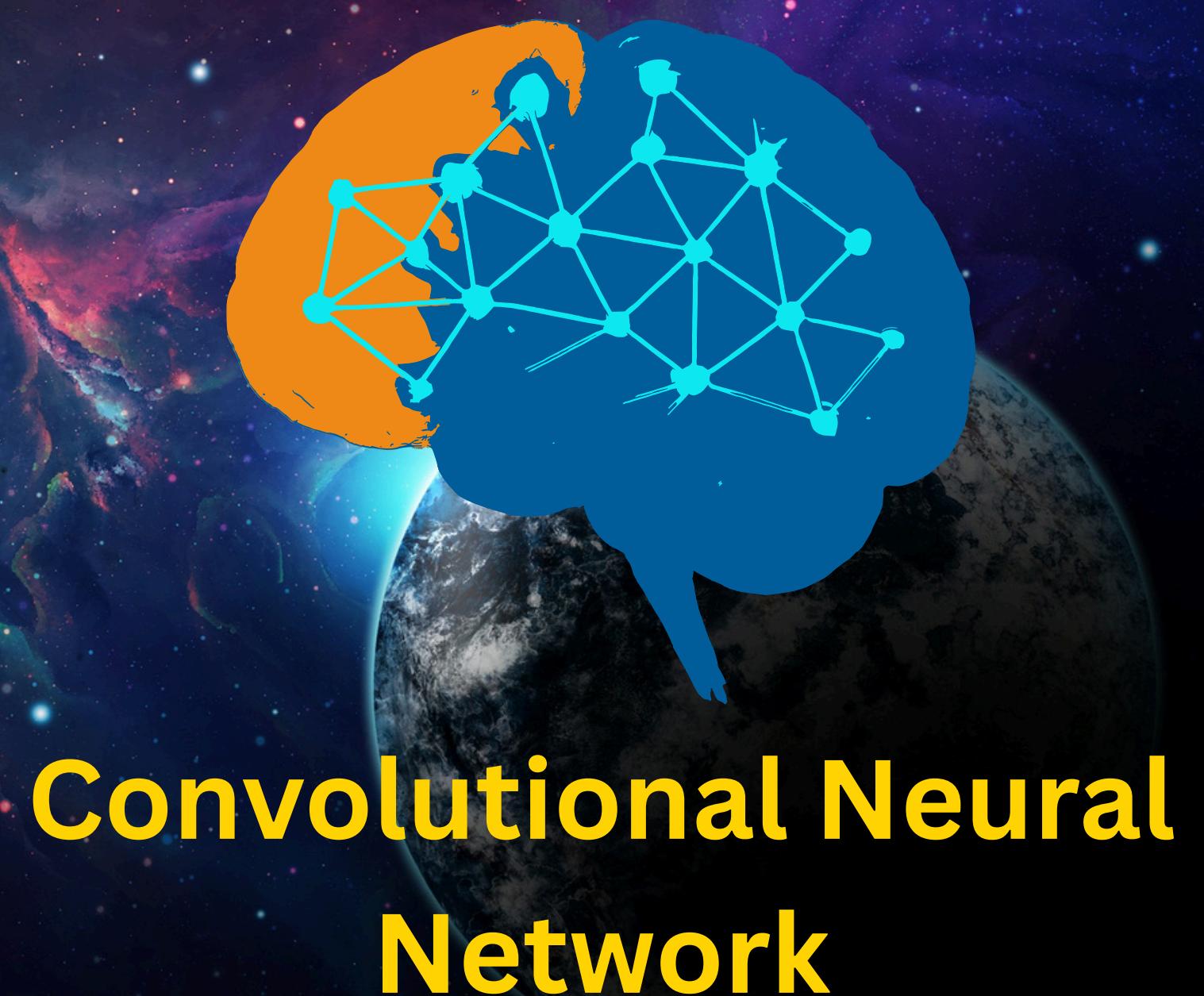


# Our Planet Hunting Toolkit



Experts at finding hidden patterns in the numbers.

Vision Specialist



Trained to visually recognize the "shape" of a real planet.



# Step 1: Data Prep

We cleaned and prepared the raw data for the AI



# Step 2: Model Training



Each of our AI models  
analyzed the prepared data



# Step 3: Ensemble Voting

The models voted what signals looked most promising



# Step 4: Final Candidates

## High Scoring candidates are flagged as potential new exoplanets

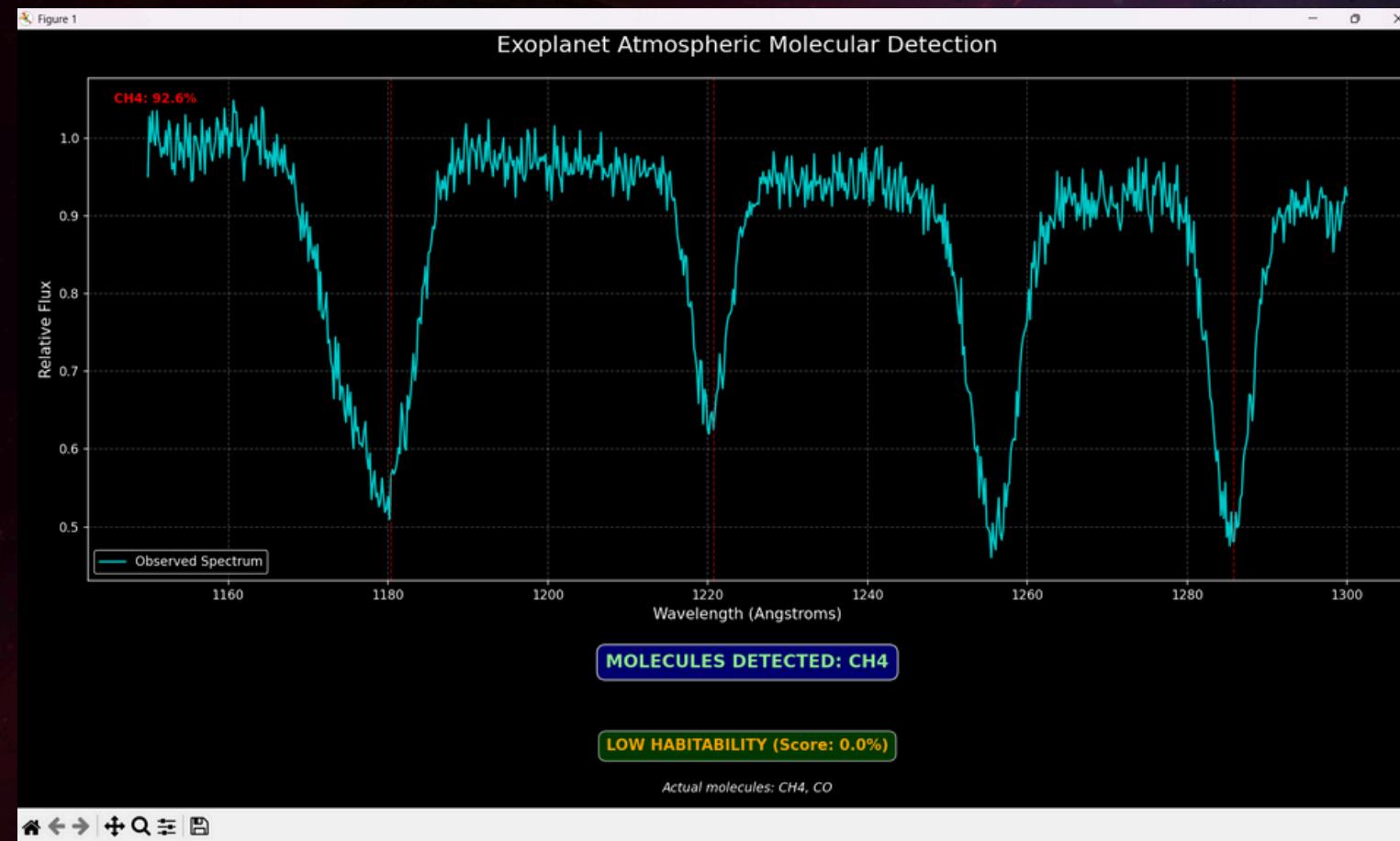


# Old Way



# New Way

# The Search For Water | Accelerating Discovery



We built a proof of concept that scans a planet's atmosphere for water. It scans the UV spectrum for the unique “fingerprint” of water. This can potentially find the next planet humanity settles on.

The screenshot shows the "Exoplanet Data Hunter" application. On the left, a sidebar has "Navigation" with "Home", "Dataset Explorer", "Educational", and "Search" options. It also lists "Quick Links" for "NASA Exoplanet Archive", "NASA Space Apps Challenge", "TESS Mission", and "Kepler Mission". A "Data Files" section shows "32 datasets available" with a dropdown menu currently set to "NASA\_Space\_Apps\_Resources\_toi\_catalog\_20251004\_201856.csv". The main area is titled "Exoplanet Data Hunter" with the sub-instruction "Discover and download the latest exoplanet datasets using advanced search". It features a search bar with "Search SERP API" and a "Download NASA Data" button. A message says "No search history yet."

This tool can search Google Scholar for any questions you have, update the ml dataset daily, and search google images for diagrams to help you understand tough topics. This makes our project accessible to everyone.

With more GPUs, more Algorithms, and more Data 90%+ Accuracy is Feasible!!!!

# Citations

Exoplanet transit method." GIF, created by Alysa Obertas, uploaded August 31, 2021, licensed under CC BY-SA 4.0. Wikimedia Commons.

Vanderburg, Andrew. "Tutorial 2: Finding planets in K2 data." How to find planets, accessed October 2, 2025.  
<https://avanderburg.github.io/tutorial/tutorial2.html>

NASA Exoplanet Archive. "K2 Planets and Candidates Table." NASA Exoplanet Science Institute, Caltech, accessed October 3, 2025, DOI: 10.26133/NEA19. <https://exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-tblView?app=ExoTbls&config=k2pandc>

NASA Exoplanet Archive. "TESS Project Candidates (TOI) Table." NASA Exoplanet Science Institute, Caltech, accessed October 3, 2025. <https://exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-tblView?app=ExoTbls&config=TOI>

NASA Exoplanet Archive. "Kepler Objects of Interest (KOI) Cumulative Table." NASA Exoplanet Science Institute, Caltech, accessed October 3, 2025, DOI: 10.26133/NEA4. [[Malik, A., Moster, B. P., & Obermeier, C. "Exoplanet detection using machine learning." Monthly Notices of the Royal Astronomical Society, Volume 513, Issue 4, published July 2022, pp. 5505–5516, DOI: 10.1093/mnras/stab3692.  
\[\[Google. "Gemini." Large language model, conversational consultation and code pair programmer, October 5, 2025.  
Borson, Bob. "hard math on a chalkboard black and white." Life of an Architect, January 25, 2018.\]\(https://academic.oup.com/mnras/article/513/4/5505/6472249\]\(https.jpeg\)https://academic.oup.com/mnras/article/513/4/5505/6472249\]\(https.jpeg\)</a></p></div><div data-bbox=\)](https://exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-tblView?app=ExoTbls&config=cumulative](https.jpeg)https://exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-tblView?app=ExoTbls&config=cumulative](https.jpeg)</a></p></div><div data-bbox=)

[https://www.lifeofanarchitect.com/035-architecture-and-math/hard-math-on-a-chalkboard-black-and-white/.](https://www.lifeofanarchitect.com/035-architecture-and-math/hard-math-on-a-chalkboard-black-and-white/)