



Discovering Potentially Habitable Exoplanets With Artificial Intelligence

INTRODUCTION

Are we alone in the universe? Are there other Earth-like planets? Humanity has long sought answers to these questions. With technological breakthroughs in both space exploration and machine learning, we have begun to take the first steps toward answering those questions – with data to back it up. Come explore the data sources and machine learning methods that are now being used to identify potentially habitable planets located within our galactic neighborhood.

Identification & Habitability Factors^{5, 11, 12, 14}

- Star Transit Photometry
- Habitable Zone Proximity
- Planetary Mass
- Planetary Composition
- Orbital Trajectory & Velocity

KEY DELIVERABLE

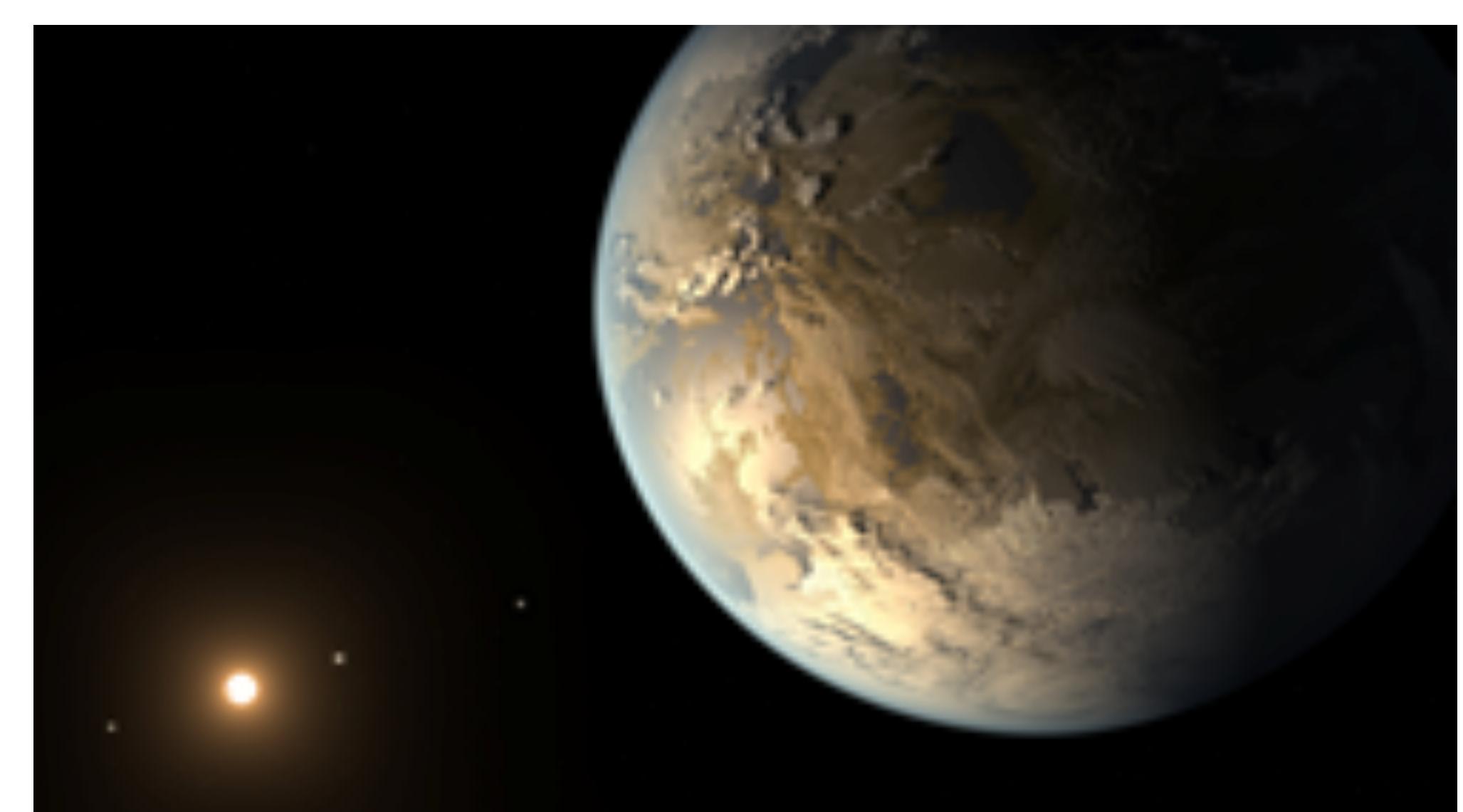


Source: Getty Images

An Extended Abstract Summarizing

- Data Sources
- Exoplanet Habitability Factors
- Machine Learning Methods
- Findings of the Scientific Community
- Based on Scholarly Research

CONCLUSIONS



An artistic rendering of Kepler 186-f, the first Earth-size planet confirmed to orbit within the habitable zone of another star. Image CC by nasa.gov

- **3,791 Confirmed Exoplanets¹⁸**
- **14 Potentially Habitable Exoplanets (Conservative)²⁵**
- **41 Potentially Habitable Exoplanets (Optimistic)²⁵**

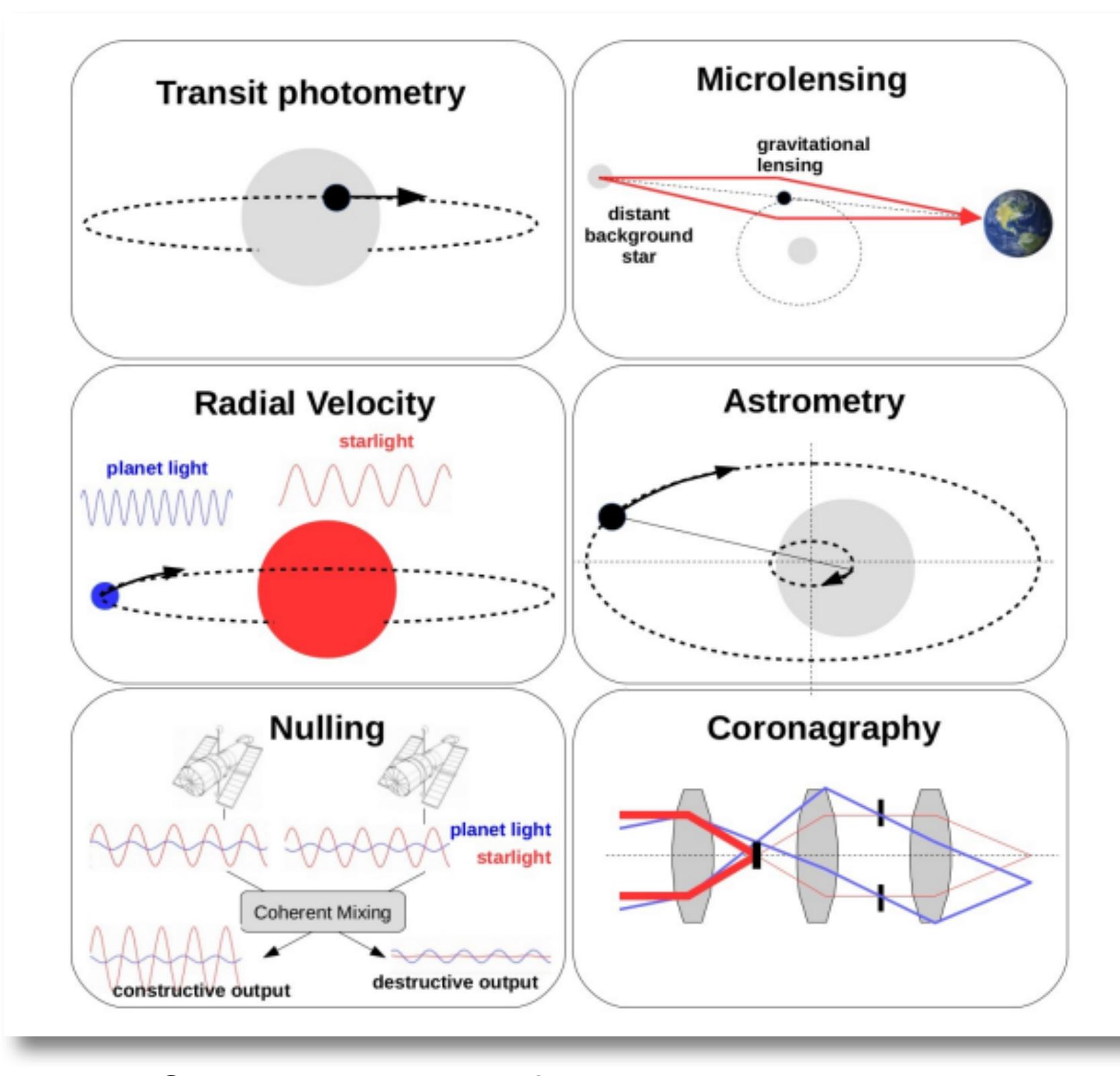
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MACHINE LEARNING METHODS & MATERIALS

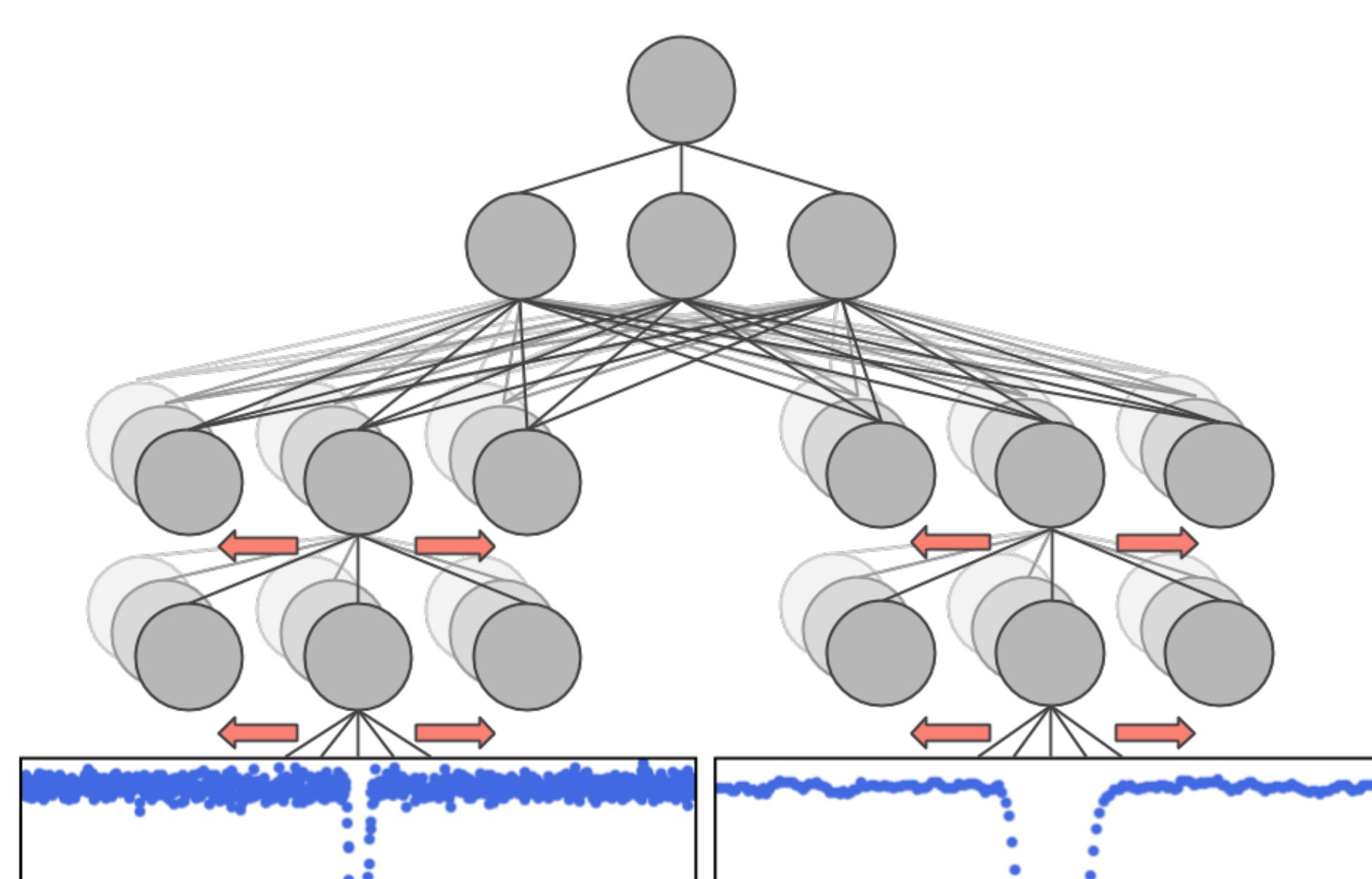
Data Sets

- NASA Kepler Mission Data¹⁷
- NASA Exoplanet Archive¹⁸
- University Of Puerto Rico at Arecibo Habitable Exoplanets Catalog²⁵



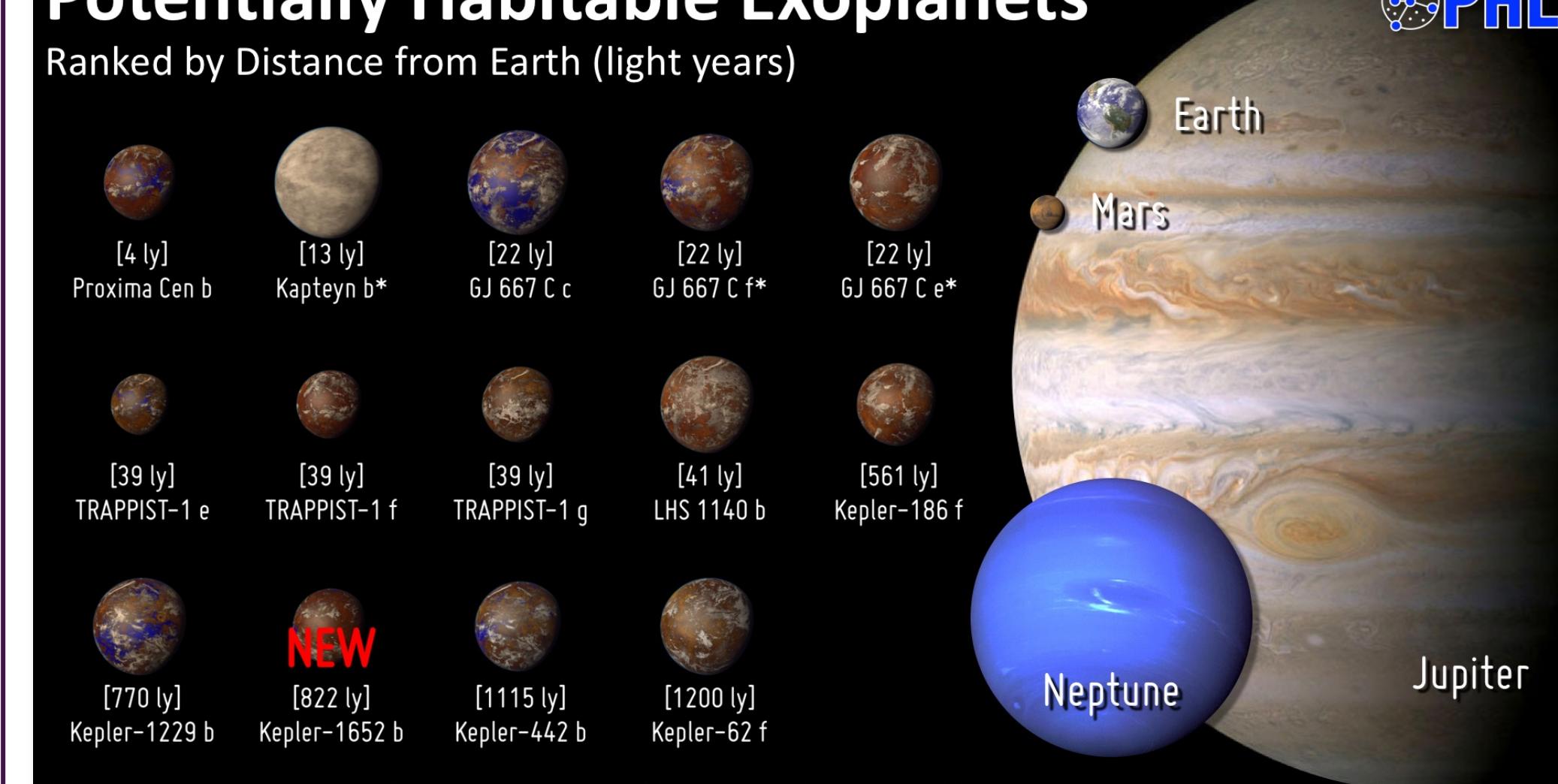
Machine Learning Techniques

- Deep Convolutional Neural Networks²⁴
- Recursive Feature Elimination²⁴
- Support Vector Machines^{19, 24}
- Gaussian Naïve Bayes^{3, 19}
- K-Nearest Neighbors^{3, 5, 19}
- Random Forest/Decision Trees^{3, 16, 19}



Google is in on the exoplanet action: "We trained a convolutional neural network (CNN) to predict the probability that a given Kepler signal is caused by a planet. We chose a CNN because they have been very successful in other problems with spatial and/or temporal structure, like audio generation and image classification²⁴

Potentially Habitable Exoplanets



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