

## Exoplanet Neural Network Project Abstract

The purpose of neural networks in this project is to classify exoplanets as terrestrial or gas giants. This program can be used by astronomers who have measurements of exoplanets, like their radius and orbital period, but need to determine the type—terrestrial like Earth, or gas giant like Jupiter. As we progress in space exploration, one of the main focuses of space research narrows down to finding a new, habitable planet. Not only will this program help cut down the workload of astronomers, but it will also help humankind by addressing the lack of options as our only home deteriorates. While traditional methods of determining terrestrial planets work, they are complex and time-consuming. With this program, astronomers will only need the planet's radius and orbital period to easily find a terrestrial planet. The data used to train and predict the exoplanet types for the AI was obtained directly from NASA's Exoplanet Catalog. To train the neural network for an accuracy rate of 98% or more, it was necessary to include both terrestrial and gas giant exoplanet data in the training dataset and adjust variable rates that would decrease the neural network's cost value. When determining the type of the planet, if the neural network outputs a value between 0 and 0.5 (not inclusive), the program accurately predicts "The exoplanet is a terrestrial planet," otherwise, if it returns a value between 0.5 and 1, the program predicts "The exoplanet is a gas giant." While this program serves as a useful tool for space science, having it predict all planet types, in addition to terrestrial and gas giants, would significantly expand its usability. This implementation of this would require adding values for all four exoplanet categories as the third data point in the data sets representing each exoplanet.