Project Milestone

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Overview and Motivation: The main motivation of the project is to set the framework for better understanding the methods used to discover exoplanets. If we are able to draw correlations between discovery methods and exoplanet attributes, we can get a better idea of the strengths and weaknesses of the different discovery methods. This will help to inform future decisions on which methods should be used when creating new discovery facilities.

New data is coming in every day on the discovery of these exoplanets, so it is becoming more and more important to be able to narrow down on which methods are best able to capture which kinds of exoplanets.

Related Work: We were both inspired by the examples of parallel coordinate plots that were shown in Lecture 15. They were a new (to us) and intuitive way to display tabular data. They require a number of interaction features to be useful, but the nature of a final project allows us to take the time to implement them fully.

Questions:

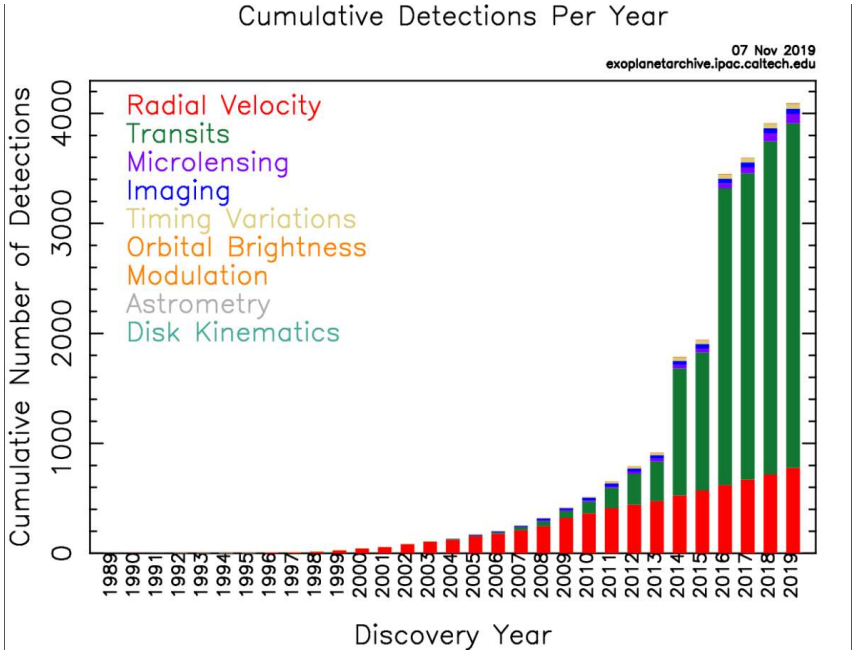
- Which scientific methods are most commonly used to discover exoplanets?
- How do the discovery methods vary in terms of capabilities? Are some better better able to discover far away planets? or small planets?
- Are different facilities more successful than others? Do they specialize in specific discovery methods? Do they have different limitations in terms of planet size, distance, etc?

- How has all of the above changed over time?

Data:

- The data will come from the NASA Exoplanets archive, Confirmed Planets table. https://exoplanetarchive.ipac.caltech.edu/
- We did some supplementary research on the different discovery methods in order to give a brief explanation of them all
- Many rows are missing specific data, such as mass, radius, and distance. We will create the option to filter these out depending on how useful they are for the visualization. Many values also have errors associated with them. We are still deciding on whether we would like to include any possible errors in data in our visualization, but our current model does not implement it.
- If we choose to develop the star-map plots described below, we'll need to do calculations to convert Right Ascension and Declination data into pixel positions

Exploratory Data Analysis: The NASA exoplanet archive includes a number of plots with the data, which is useful to better understand the data before writing our own code. For example:



The Exoplanet archive also allows us to pick axes to generate custom scatterplots. Control over the visualization beyond that is very limited, but it is still useful for exploratory purposes. Together, these tools allowed us to identify which questions would be interesting to ask. They also showed some of the challenges that we would have to overcome with our designs. Namely, much of the data can can be densely packed, and we may need interactive features (filtering, brushing etc) to make the visualizations useful.

- Design Evolution: What are the different visualizations you considered? Justify the design decisions you made using the perceptual and design principles you learned in the course. Did you deviate from your proposal?
    - Scatterplot to visualize two attributes of particular interest
    - Parallel axes to get a broader view of correlation between different attributes
    - Storytelling to give an introduction to different methods and planet attributes (including units used)
    - So far, very little deviation from the proposal. We have initially chosen to make fewer columns available in the parallel axes plot and may restrict the different choices to not include everything available in the data set