Name(s)

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Project Number

J1629

Project Title

A Study of Galaxy Clustering

Abstract

Objectives/Goals
The objective of this experiment was to determine whether or not galaxies cluster, and if so, to measure that clustering. Studying this clustering could provide information on the current balance between dark energy and gravity.

Methods/Materials
A list of all the objects found in the COSMOS Survey (done by Hubble) was downloaded. Then, using various parameters, it was cut down to objects that were most likely galaxies. Then a program was written using the programming system MATLAB to quantitatively compare the clustering of the galaxies to the clustering of points in a randomly generated scatter plot.

Results
The results consisted of a plot of two histograms, one showing various ranges of angular separation vs. the amount of galaxy pairs within those separations, and the other showing various ranges of angular separation vs. the amount of random pairs of points within those separations. A second plot was the ratio between the amount of galaxies and amount of random points in each bin of angular separation. This had a negative slope, meaning galaxies are generally found more tightly clustered than random points.

Conclusions/Discussion
Galaxies are not found at random, nor are they tightly clustered, meaning there is somewhat of a balance currently between dark energy and gravity. The measure of the amount of clustering may eventually be able to be used in a model of the universe to solve for the density of dark energy, and thus give a more accurate understanding of the beginning (and possible ending) of the universe.

Summary Statement

This project measured the amount that galaxies cluster compared to random points.

Help Received

Father helped derive the error bar formula, correct the paper, find flaws in the program, and find relevant research done by other scientists. Ms. Laura Berger corrected the paper.