SMACC

SDSS MOC4 Asteroid Color Classification

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Introduction

- The Sloan Digital Sky Survey is a multi-spectral survey of celestial objects, most notably of asteroids.
- About a half-million observations of asteroids have been made over the course of 18 years.
- Classifying the compositions of these asteroids has been something of a hot topic.

Notable Previous Efforts

- *Solar System Objects in the SDSS Commissioning Data* (2000): Used Autoclass, a NASA-developed unsupervised Bayesian classification algorithm. Concluded that there were **two classes**: *C*— and *S*— classes [1].
- *Searching for V-Type and Q-Type Main-Belt Asteroids Based On SDSS Colors* (2007): Used extensive computational and numerical analysis to conclude there were **four classes**: *C*—, *S*— *V*—, and *Q*— classes [2].
- *SDSS-based taxonomic classification and orbital distribution of main belt asteroids* (2009): Used templates of what different classes "should look like", applied supervised learning, and concluded there were **sixteen classes** [3].

What We're Doing

We plan to use at least a K-Means++ algorithm and Carvano's data correction methods to see if we can reasonably replicate his results using only unsupervised learning.

- If we keep the growth trend from before, we might find out that there are actually 256 classes.
- More realistically, we expect to find that there are less than sixteen classes.
- It is the belief of some professors here that it is only possible to identify five or six, given the kind of color information in the database.

References

- Z□. Ivezić et al., “Solar system objects in the SDSS commissioning data,” *The Astronomical Journal*, 2001.
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- J. M. Carvano, P. H. Hasselmann, D. Lazzaro, and T. Mothé-Diniz, “SDSS-based taxonomic classification and orbital distribution of main belt asteroids,” *Astronomy and Physics*, 2009.