I explore the use of time series satellite imagery and supervised machine learning techniques for crop classification. Crop classification is important for understanding the agricultural cover of our evermore populated planet. Studies via satellite imagery are often publicly limited to data with low revisit rates or coarse spatial resolution. A recent surge in “new aerospace” companies such as Planet Labs provide higher cadence data at finer spatial resolution. I explore this temporal pixel information throughout a growing season for crop classification.

Rapid Eye satellite imagery was gathered from Planet Explorer [1]. Labels were constructed from the USDA Crop Data Layer (CDL) [2] and were sampled to match the satellite’s ground resolution (5 m).

Per Image:
- 5 bands (B, G, R, Red Edge, NIR)

Per Pixel:
- 15 time stamps from February – December 2016

The top crops in each scene (six in Scene #1 and nine in Scene #2) are masked and 100,000 random samples of each crop are added to each associated dataset.

Each pixel location is a temporal example in the dataset.

A comparison of mono- vs. multi-temporal results shows that temporal information can be helpful for successful crop classification. I would like to continue this work using Planet data from 2017 for a similar analysis once the USDA Crop Data Layer is released for the 2017 year. The current cadence of Planet satellites is near daily, providing even richer temporal information compared to what was used in this project with 2016 data (~1 image/month).

This analysis shows pixel-by-pixel classification. Incorporation of spatial information into the approach will likely boost performance. Textural features can be incorporated using local binary patterns (LBP) or gray-level co-occurrence matrix. To expand into a more complex approach, I would be interested in using entire scenes with temporal information as input.