

# FarmView: Regression Analysis of 2016 Sorghum Composition

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# Sorghum bicolor

- Bioenergy sorghum breeders expect to double yield in the next five years alone.
- Drought-tolerant and highly productive grass.
- Diverse gene pool containing over 40,000 genetic varieties.



# Ground Robot and Aerial Drone

- Ground robot traverses rows of sorghum.
- Aerial drone flies above field of sorghum.



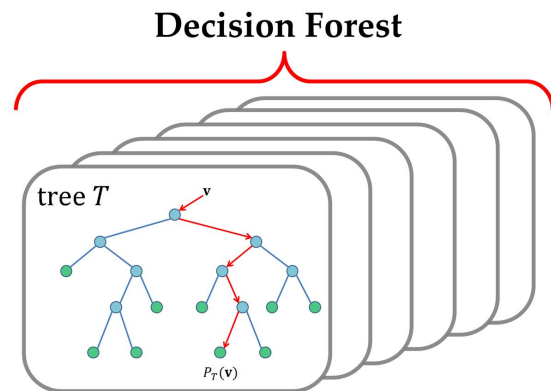
# 2016 Sorghum Dataset

- Field cultivated in Pendleton, South Carolina in 2016.
- 698 subplots (samples).
- 29 input features: accession (e.g. country of origin), GPS field location, ground robot, aerial drone, harvest phenotypes (e.g. harvested plant weight).
- 21 composition features as the output features.



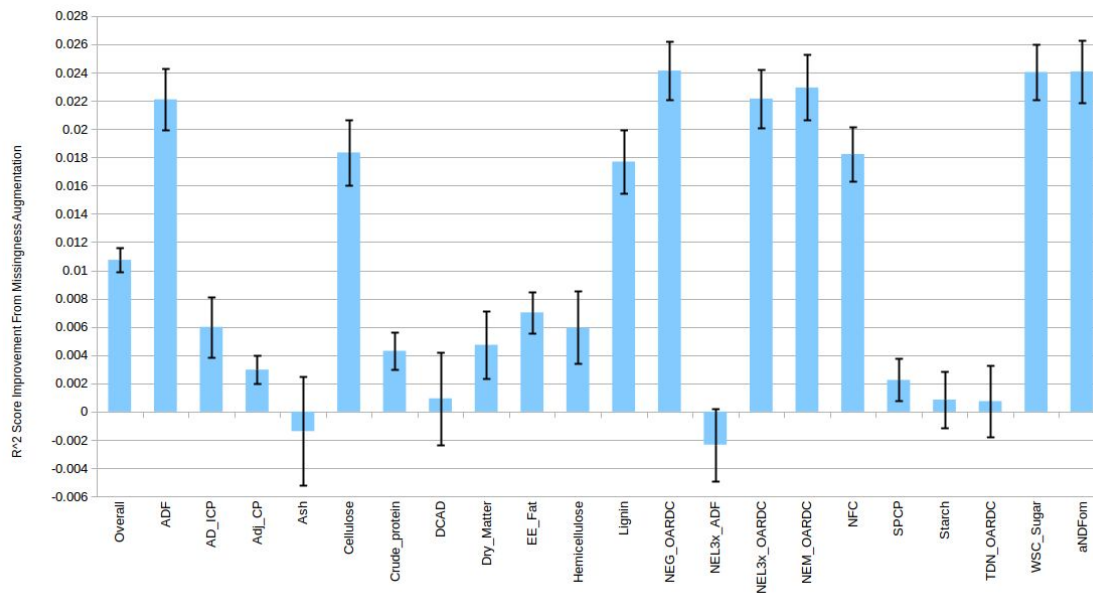
# Random Forest Regressor

- First formally defined by Breiman in 2001.
- Final prediction is average of the outputs of its constructed regression decision trees.
- Fast and perform well in practice.



# Missingness Augmentation

- Over half of the samples are missing >24% of the input features.
- 2.5% increase in  $r^2$  score by augmenting the training set with training samples that had selected values removed and replaced with missing values.



# Best Regressor: Random Forest

- Overall  $r^2$  score of 0.436
  - Multi-dimensional  $r^2$  score across all 21 output features.
- Random forest with 100 regression trees, max depth of 10.
- 10-fold cross validation.
- Full results, source code and input files available at <https://github.com/bparr/dap/>.

# Acknowledgements

- Advisor: Dr. Artur Dubrawski.
- Saswati Ray and Simon Heath from AutonLab.
- U.S. Department of Energy: Breeding High Yielding Bioenergy Sorghum for the New Bioenergy Belt.