Sorghum Composition Prediction

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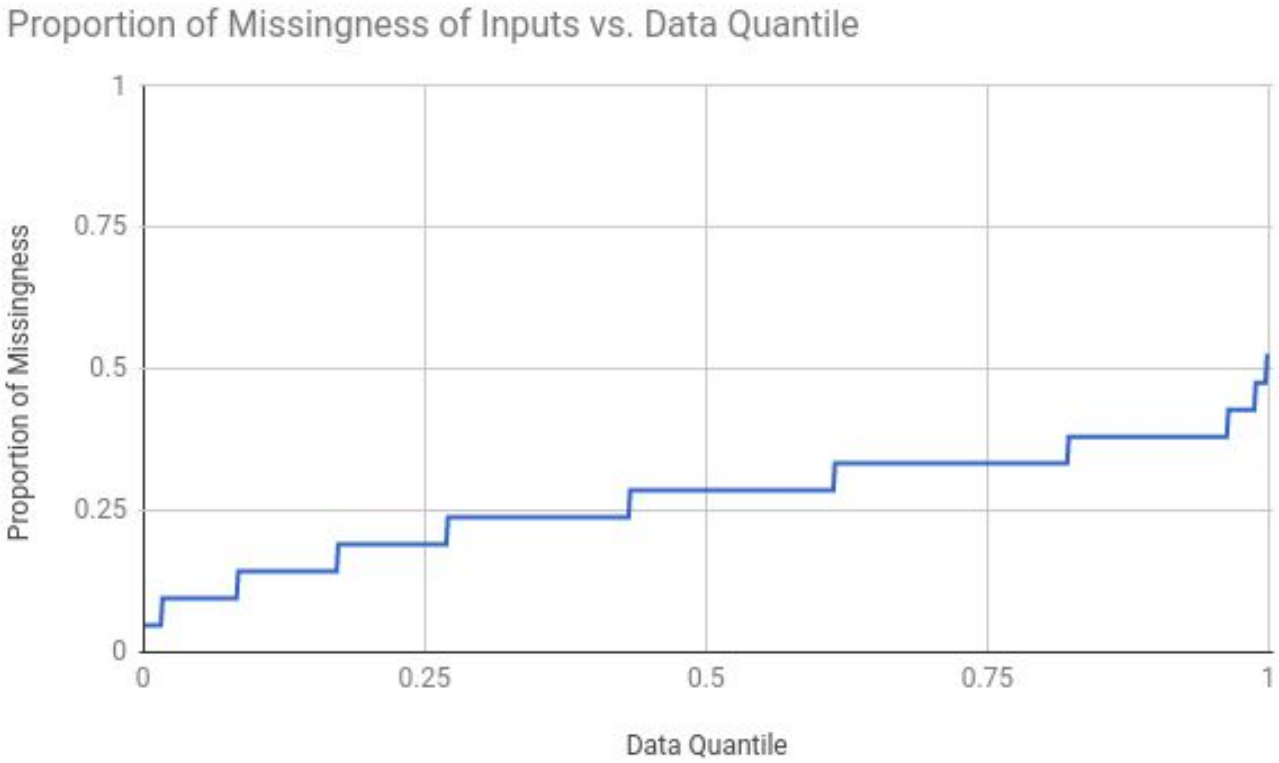
Methods

- Random Forests
- Inputs
  - Harvest features: Plant heights, wet weights and panicle lengths.
  - Robot features: Light interception, leaf area, vegetation index, etc.
  - Accession features: Sorghum type, photoperiod sensitive/insensitive, etc.
- See Appendix A for full list of input features.
- Output: A single composition feature
  - A random forest was generated for each composition feature.

CDF of Missingness of the Inputs

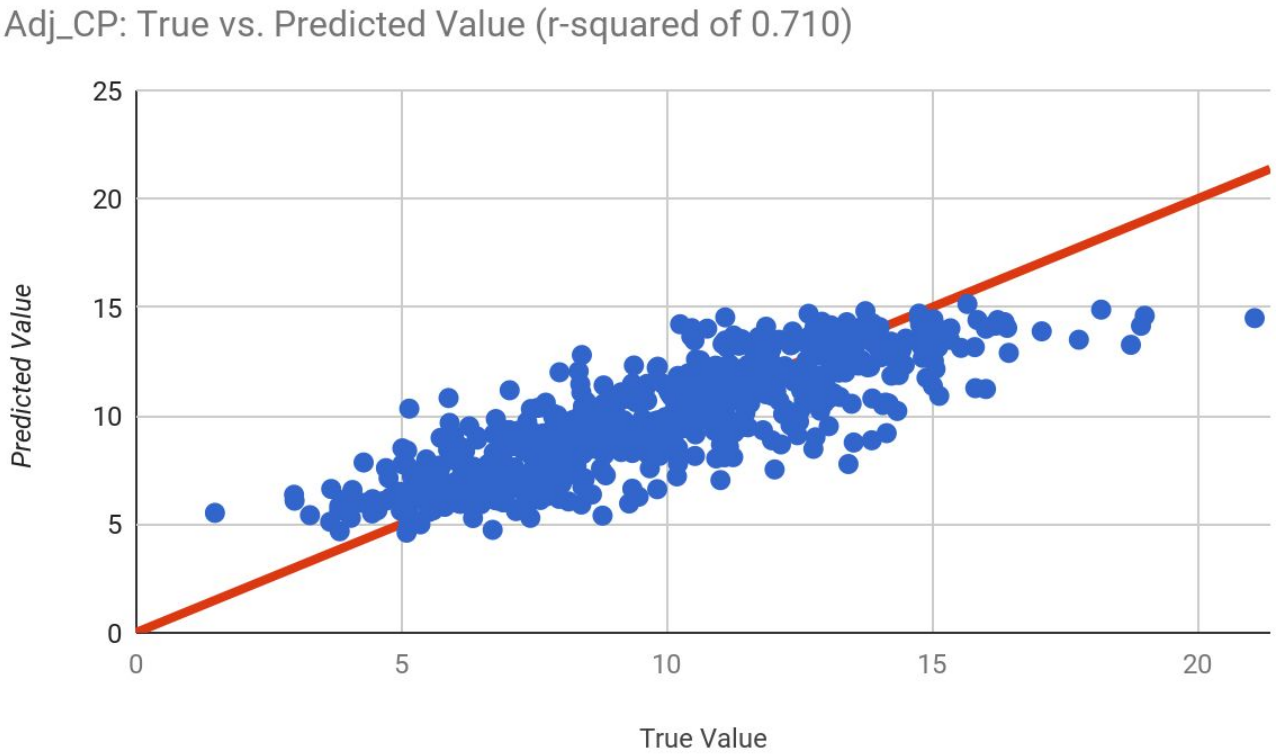


Random Forest R^2 Score from 10-fold CV Predictions

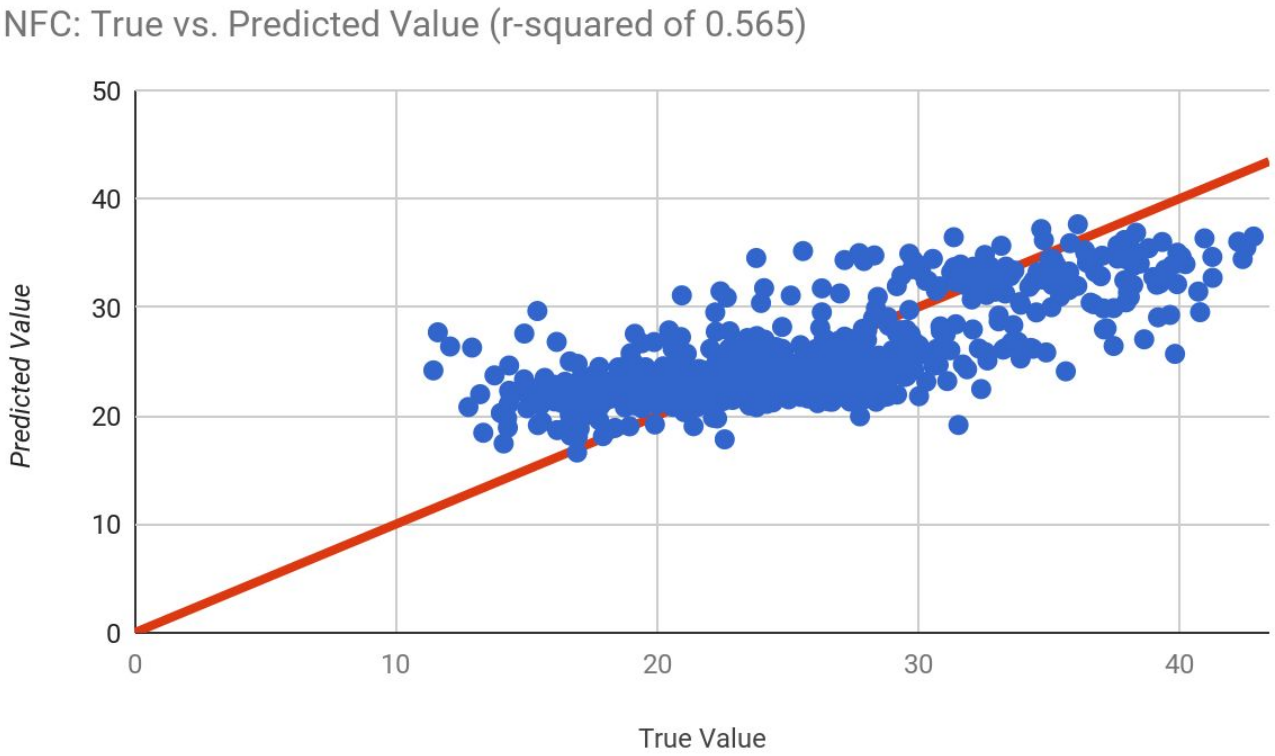
Feature	R^2 Score
Adj_CP	0.710
Crude_protein	0.668
WSC_Sugar	0.601
EE_Fat	0.574
NFC	0.565
SPCP	0.547
aNDFom	0.501
Cellulose	0.496
ADF	0.492
NEG_OARDC	0.490
NEM_OARDC	0.468
NEL3x_OARDC	0.458
Lignin	0.438
AD_ICP	0.393
TDN_OARDC	0.281
Hemicellulose	0.264
Dry_Matter	0.211
Starch	0.208
NEL3x_ADF	0.203
DCAD	0.116
Ash	0.061

Sorted by R^2 score.

Predicting Adj_CP



Predicting NFC Percentage



Discussion

- Unsatisfactory predictions for prioritized composition features
  - Cellulose, hemicellulose and lignin
- Will the aerial data improve prediction of the prioritized composition features?
  - For example, hyperspectral imaging gives view into chemical composition of plants.
- Dry Matter also performing poorly.
  - Is not correlated strongly with harvest height input, as originally expected.
  - Also, has a small range of values (89.26 - 93.98 kg).

Appendix A: Full List of Input Features

- Harvest
  - SF16h_HGT1_120, SF16h_HGT2_120, SF16h_HGT3_120, SF16h_TWT_120, SF16h_WTP_120, SF16h_WTL_120 SF16h_PAN1_120, SF16h_PAN2_120, SF16h_PAN3_120
  - Mean and standard deviation of SF16h_HGT*_120, and SF16h_PAN*_120
- Robot
  - 2016_07_13-14_Leaf_Necrosis, 2016_07_13-14_vegetation_index, 2016_08_05-08_vegetation_index, 2016_07_13_BAP_Leaf_Area, 2016_07_13_laser_plant_height, 2016_07_light_interception, 2016_08_light_interception, 2016_09_light_interception
- Accession
  - accession_photoperiod, accession_type, accession_origin, accession_race