zillow_MWS

October 13, 2017

1 Zillow prize data analysis report

`This report was last updated on 2017-10-12 at 11:52:31`

1.1 Introduction

The Zillow Prize is a Kaggle competition that aims to inspire data scientists around the world to improve the accuracy of the Zillow "Zestimate" statistical and machine learning models.

My goal is to compete for the Zillow prize and write up my results.

1.2 Methods

1.2.1 Data

The data were obtained from Kaggle website and consist of the following files: - `properties_2016.csv.zip` - `properties_2017.csv.zip` - `sample_submission.csv` - `train_2016_v2.csv.zip` - `train_2017.csv.zip` - `zillow_data_dictionary.xlsx` The `zillow_data_dictionary.xlsx` is a code book that explains the data. This data will be made available on figshare to provide an additional source if the Kaggle site data become unavailable.

1.2.2 Analysis

Data analysis was done in Jupyter Notebook (Pérez and Granger 2007)[**?**] Integrated Development Environment using the Python language (Pérez, Granger, and Hunter 2011)[**?**] and a number of software packages:

- NumPy (van der Walt, Colbert, and Varoquaux 2011)[**?**]
- pandas (McKinney 2010)[**?**]
- scikit-learn (Pedregosa et al. 2011)[**?**]

1.2.3 Visualization

The following packages were used to visualize the data:

- Matplotlib (Hunter 2007)[**?**]

- Seaborn (Waskom et al. 2014)[**?**]
- r-ggplot2
- r-cowplot

The use of `R` code and packages in a `Python` environment is possible through the use of the `Rpy2` package.

1.2.4 Prediction

Machine learning prediction was done using the following packages:

- scikit-learn (Pedregosa et al. 2011)[**?**]
- xgboost
- r-caret

1.2.5 Reproducibility

Reproducibility is extremely important in scientific research yet many examples of problematic studies exist in the literature (Couzin-Frankel 2010)[**?**].

The names and versions of each package used herein are listed in the accompanying `env.yml` file in the `config` folder. The computational environment used to analyze the data can be recreated using this `env.yml` file and the `conda` package and environment manager available as part of the Anaconda distribution of Python.

Additionally, details on how to setup a Docker image capable of running the analysis is included in the `README.md` file in the `config` folder.

The code in the form of a jupyter notebook (`01_zillow_MWS.ipynb`) or Python script (`01_zillow_MWS.py`), can also be run on the Kaggle website (this requires logging in with a username and password).

More information on the details of how this project was created and the computational environment was configured can be found in the accompanying `README.md` file.

This Python 3 environment comes with many helpful analytics libraries installed It is defined by the kaggle/python docker image: https://github.com/kaggle/docker-python (a modified version of this docker image will be made available as part of my project to ensure reproducibility). For example, here's several helpful packages to load in

1.3 Results

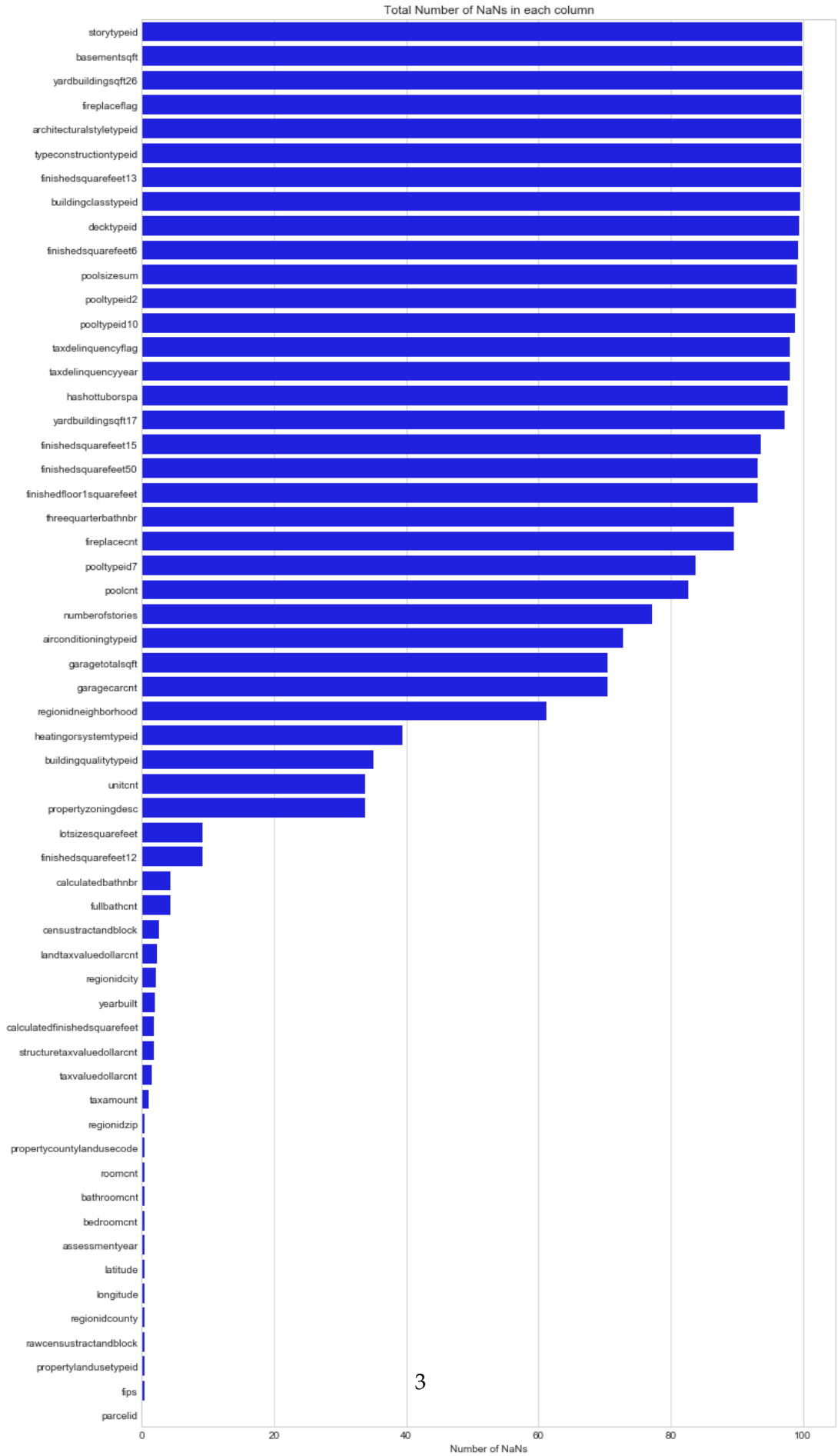
1.3.1 Import Libraries and Data

Input data files are available in the "../input/" directory.

Any results I write to the current directory are saved as output.

```
/Users/marskar/anaconda3/lib/python3.6/site-packages/sklearn/cross_validation.py:41: Deprecatio
  "This module will be removed in 0.20.", DeprecationWarning)


/Users/marskar/anaconda3/lib/python3.6/site-packages/IPython/core/interactiveshell.py:2728: Dty
  interactivity=interactivity, compiler=compiler, result=result)
```

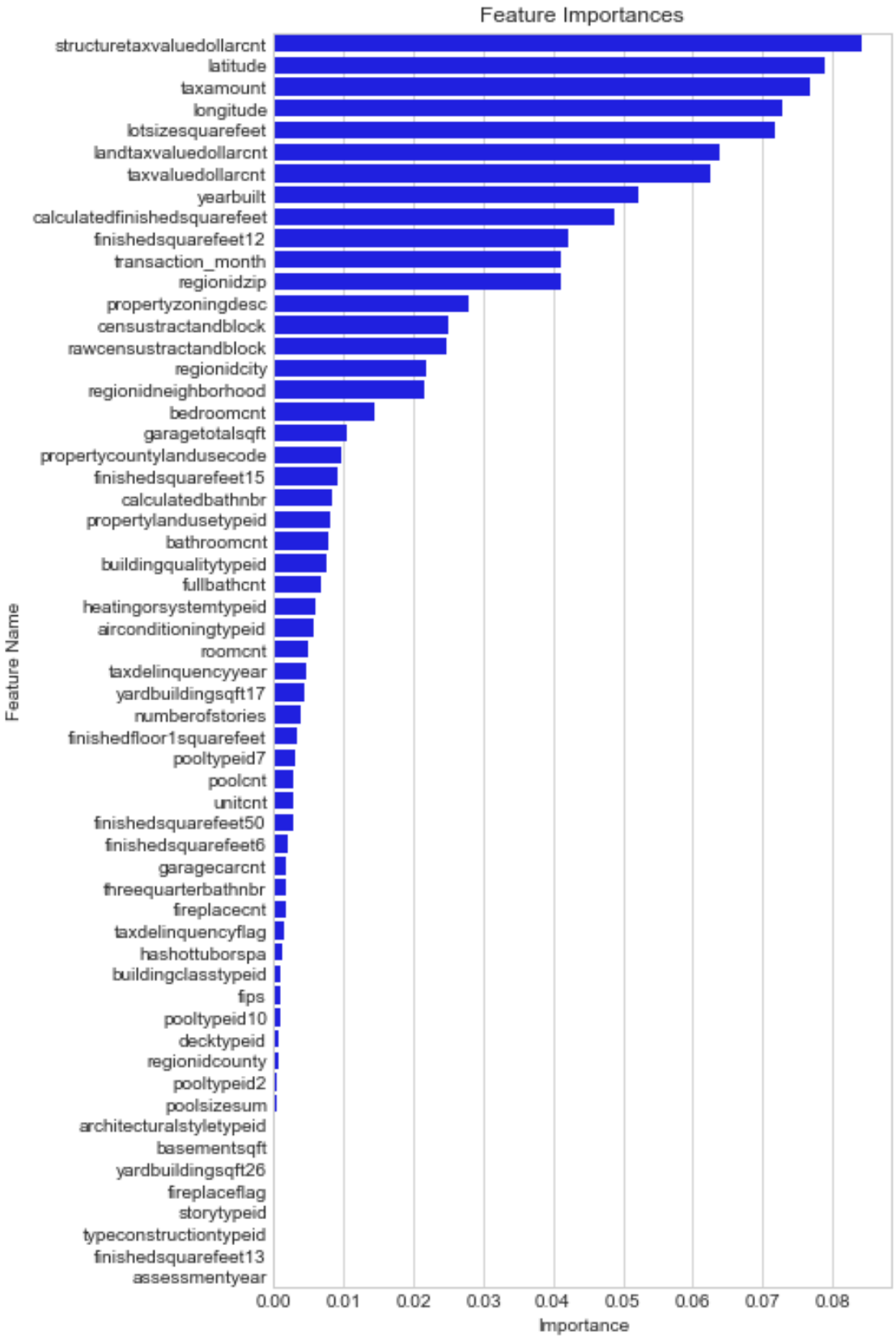

Total Number of NaNs in each column
storytypeid
basementsqft
yardbuildingsqft26
fireplaceflag
architecturalstyletypeid
typeconstructiontypeid
finishedsquarefeet13
buildingclasstypeid
decktypeid
finishedsquarefeet6
poolsizesum
pooltypeid2
pooltypeid10
taxdelinquencyflag
taxdelinquencyyear
hashottuborspa
yardbuildingsqft17
finishedsquarefeet15
finishedsquarefeet50
finishedfloor1squarefeet
threequarterbathnbr
fireplacecnt
pooltypeid7
poolcnt
numberofstories
airconditioningtypeid
garagetotalsqft
garagecarcnt
regionidneighborhood
heatingorsystemtypeid
buildingqualitytypeid
unitcnt
propertyzoningdesc
lotsizesquarefeet
finishedsquarefeet12
calculatedbathnbr
fullbathcnt
censustractandblock
landtaxvaluedollarcnt
regionidcity
yearbuilt
calculatedfinishedsquarefeet
structuretaxvaluedollarcnt
taxvaluedollarcnt
taxamount
regionidzip
propertycountylandusecode
roomcnt
bathroomcnt
bedroomcnt
assessmentyear
latitude
longitude
regionidcounty
rawcensustractandblock
propertylandusetypeid
fips
parcelid
0
20
40
60
80
100
Number of NaNs

There are several columns which have a very high proportion of missing values. It may be worth analysing these more closely.

Feature Importance by Random Forest Feature Importance

	features	importance
0	transaction_month	0.041078
1	airconditioningtypeid	0.005809
2	architecturalstyletypeid	0.000262
3	basementsqft	0.000238
4	bathroomcnt	0.007725

	features	importance
50	structuretaxvaluedollarcnt	0.084278
24	latitude	0.078829
54	taxamount	0.076839
25	longitude	0.072749
26	lotsizesquarefeet	0.071840


Feature Importances
structuretaxvaluedollarcnt
latitude
taxamount
longitude
lotsizesquarefeet
landtaxvaluedollarcnt
taxvaluedollarcnt
yearbuilt
calculatedfinishedsquarefeet
finishedsquarefeet12
transaction_month
regionidzip
propertyzoningdesc
censustractandblock
rawcensustractandblock
regionidcity
regionidneighborhood
bedroomcnt
garagetotalsqft
propertycountylandusecode
finishedsquarefeet15
calculatedbathnbr
propertylandusetypeid
bathroomcnt
buildingqualitytypeid
fullbathcnt
heatingorsystemtypeid
airconditioningtypeid
roomcnt
taxdelinquencyyear
yardbuildingsqft17
numberofstories
finishedfloor1squarefeet
pooltypeid7
poolcnt
unitcnt
finishedsquarefeet50
finishedsquarefeet6
garagecarcnt
threequarterbathnbr
fireplacecnt
taxdelinquencyflag
hashottuborspa
buildingclasstypeid
fips
pooltypeid10
decktypeid
regionidcounty
pooltypeid2
poolsizesum
architecturalstyletypeid
basementsqft
yardbuildingsqft26
fireplaceflag
storytypeid
typeconstructiontypeid
finishedsquarefeet13
assessmentyear
Feature Name
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0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
Importance

	features	importance
0	transaction_month	0.052949
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2	architecturalstyletypeid	0.000204
3	basementsqft	0.000212
4	bathroomcnt	0.014486

	features	importance
50	structuretaxvaluedollarcnt	0.060509
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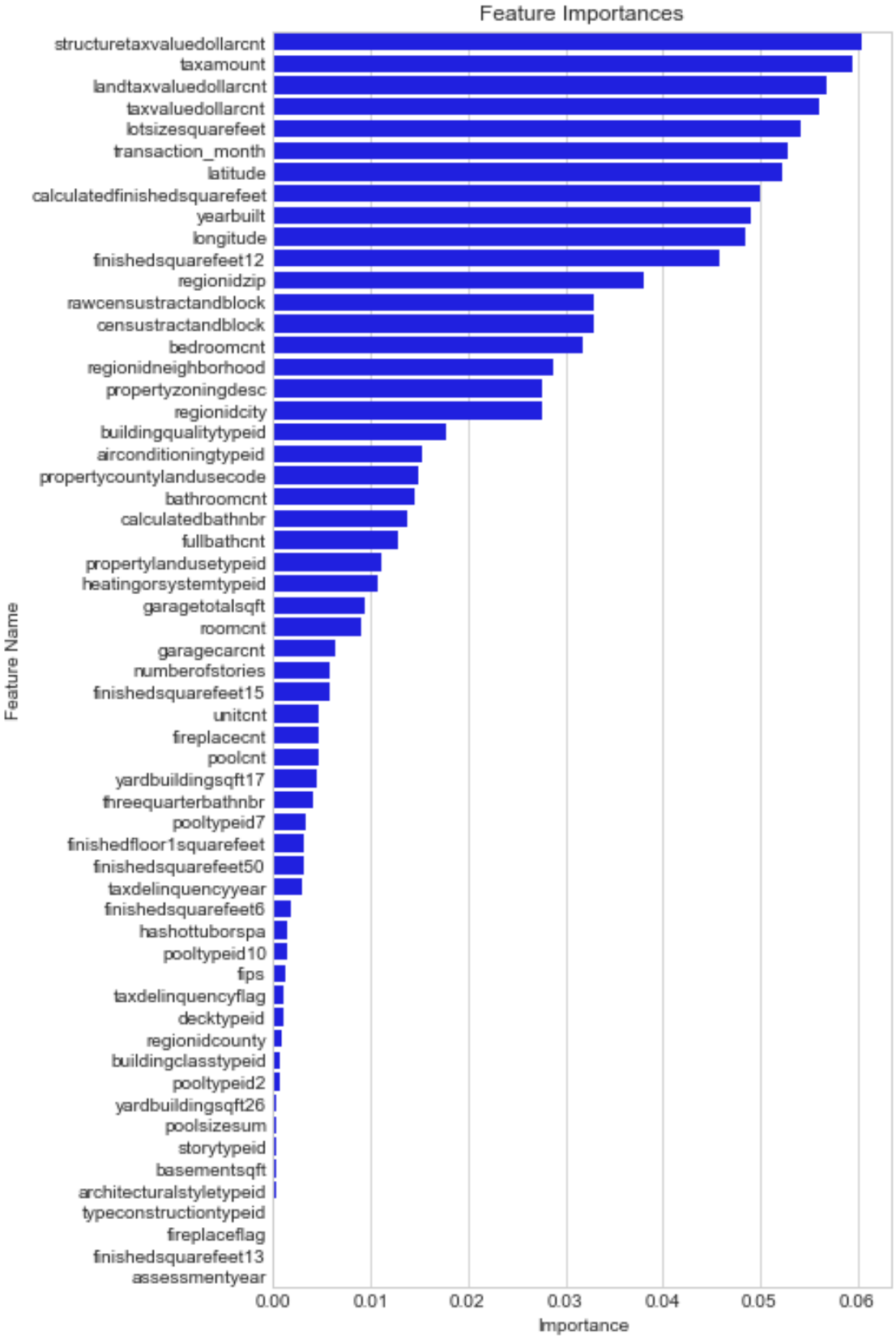
53	landtaxvaluedollarcnt	0.056897
51	taxvaluedollarcnt	0.056176
26	lotsizesquarefeet	0.054112


Feature Importances
structuretaxvaluedollarcnt
taxamount
landtaxvaluedollarcnt
taxvaluedollarcnt
lotsizesquarefeet
transaction_month
latitude
calculatedfinishedsquarefeet
yearbuilt
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regionidzip
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censustractandblock
bedroomcnt
regionidneighborhood
propertyzoningdesc
regionidcity
buildingqualitytypeid
airconditioningtypeid
propertycountylandusecode
bathroomcnt
calculatedbathnbr
fullbathcnt
propertylandusetypeid
heatingorsystemtypeid
garagetotalsqft
roomcnt
garagecarcnt
numberofstories
finishedsquarefeet15
unitcnt
fireplacecnt
poolcnt
yardbuildingsqft17
threequarterbathnbr
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finishedfloor1squarefeet
finishedsquarefeet50
taxdelinquencyyear
finishedsquarefeet6
hashottuborspa
pooltypeid10
fips
taxdelinquencyflag
decktypeid
regionidcounty
buildingclasstypeid
pooltypeid2
yardbuildingsqft26
poolsizesum
storytypeid
basementsqft
architecturalstyletypeid
typeconstructiontypeid
fireplaceflag
finishedsquarefeet13
assessmentyear
Feature Name
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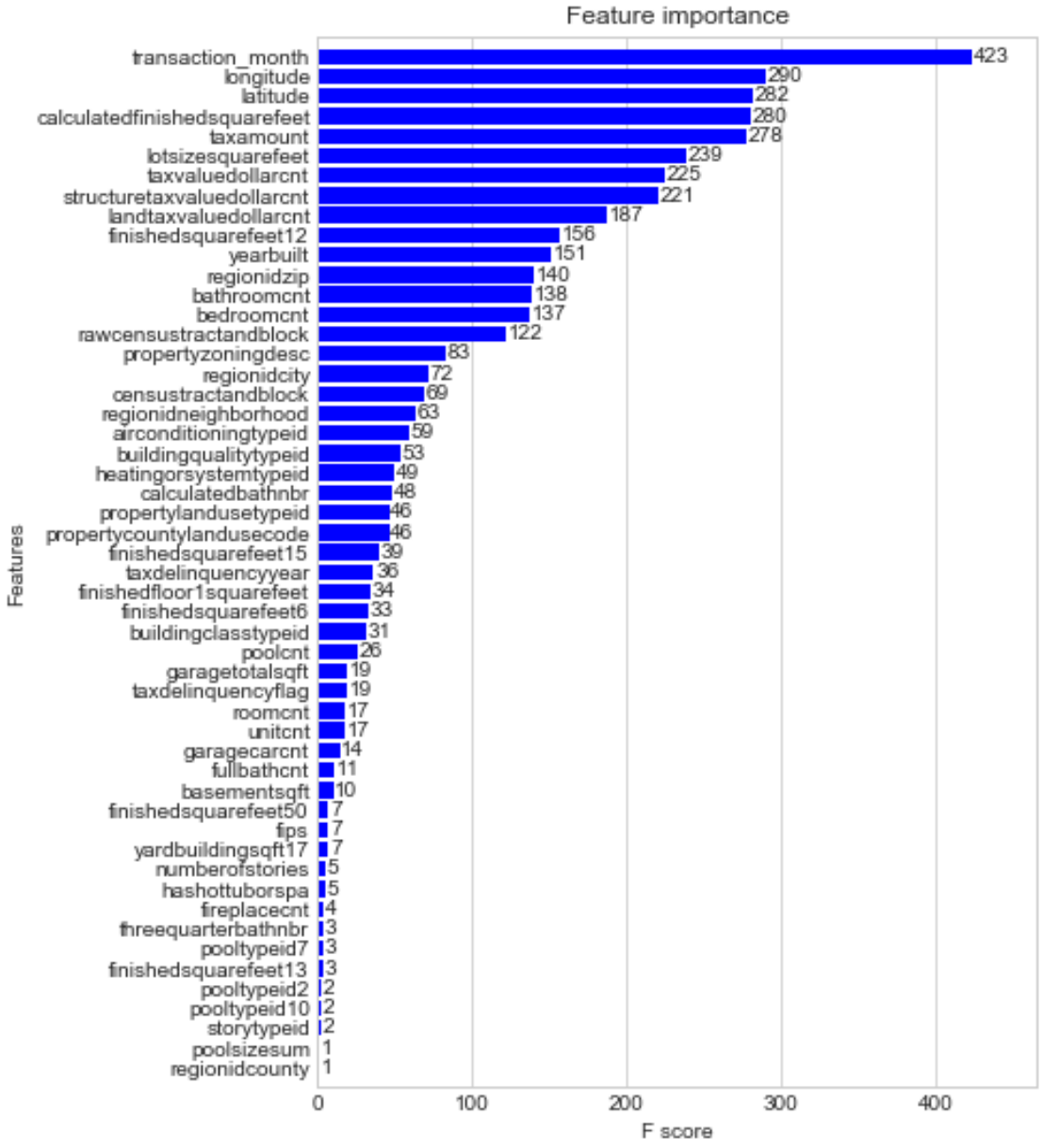
0.01
0.02
0.03
0.04
0.05
0.06
Importance



1.4 Conclusions

In Progress

1.5 Bibliography

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