

# HarvardX PH125.9xData Science: Capstone Choose Your Own!(House Pricing)

Jose Quesada

27/12/2020

## Introduccion

This project consists of determining the value of a house according to its location, property characteristics and payment methods using the data set from kaggle House Prices - Advanced Regression Techniques <https://www.kaggle.com/c/house-prices-advanced-regression-techniques/data> (kaggle competitions download -c house-prices-advanced-regression-techniques).

## Importing Data.

Files:

train.csv - the training set

test.csv - the test set

data\_description.txt - full description of each column, originally prepared by Dean De Cock but lightly

sample\_submission.csv - a benchmark submission from a linear regression on year and month of sale, lot

```
read_csv <- function(file){  
  path_data <- "data"  
  filename <- paste(path_data,file,sep="/")  
  csv__ <- read.csv(filename)  
  csv__  
}
```

```
test_set <-read_csv('test.csv')  
train_set<- read_csv('train.csv')
```

```
#Join datasets, For this project we going to join train and set data for the cleansing and EDA, later w  
df<- bind_rows(train_set,test_set)
```

## EDA

train\_set:

```
* Dimensions: 1460, 81  
* Memory Usage: 0.7 Mb
```

test\_set:

```
* Dimensions: 1459, 80  
* Memory Usage: 0.7 Mb
```

Comparing amount of columns between each dataset we can see that we have 1 more column in the train set vs the test set. **SalePrice** is the additional column in the train set and our **target value** for this model. We going to use the train set to predict **SalePrice** on the test, first we going to make some EDA and data cleaning.

Total categorical columns: 43

Categorical Columns				
MSZoning	Street	Alley	LotShape	LandContour
Utilities	LotConfig	LandSlope	Neighborhood	Condition1
Condition2	BldgType	HouseStyle	RoofStyle	RoofMatl
Exterior1st	Exterior2nd	MasVnrType	ExterQual	ExterCond
Foundation	BsmtQual	BsmtCond	BsmtExposure	BsmtFinType1
BsmtFinType2	Heating	HeatingQC	CentralAir	Electrical
KitchenQual	Functional	FireplaceQu	GarageType	GarageFinish
GarageQual	GarageCond	PavedDrive	PoolQC	Fence
MiscFeature	SaleType	SaleCondition	MSZoning	Street
Alley	LotShape	LandContour	Utilities	LotConfig

Total numeric columns: 38

Numerical Columns			
Id	MSSubClass	LotFrontage	LotArea
OverallQual	OverallCond	YearBuilt	YearRemodAdd
MasVnrArea	BsmtFinSF1	BsmtFinSF2	BsmtUnfSF
TotalBsmtSF	X1stFlrSF	X2ndFlrSF	LowQualFinSF
GrLivArea	BsmtFullBath	BsmtHalfBath	FullBath
HalfBath	BedroomAbvGr	KitchenAbvGr	TotRmsAbvGrd
Fireplaces	GarageYrBlt	GarageCars	GarageArea
WoodDeckSF	OpenPorchSF	EnclosedPorch	X3SsnPorch
ScreenPorch	PoolArea	MiscVal	MoSold
YrSold	SalePrice	Id	MSSubClass

Im going to handle MSSubClass as categorical data although it is shown as numeric column, is actually a categorical data, the numbers in the columns are the type of dwelling involved in the sale, im removing from numeric columns and append as categorical.

## Missing Values

For this analysis we going to select just the columns that have missing values, **if they not in plot or table its because they not have missing values.**

**Description of columns with Missing Values:**

Missing Categorical Columns	
name	prc_na
PoolQC	0.9965742
MiscFeature	0.9640288
Alley	0.9321686
Fence	0.8043851
FireplaceQu	0.4864680
GarageFinish	0.0544707
GarageQual	0.0544707
GarageCond	0.0544707
GarageType	0.0537855
BsmtCond	0.0280918
BsmtExposure	0.0280918
BsmtQual	0.0277492
BsmtFinType2	0.0274066
BsmtFinType1	0.0270641
MasVnrType	0.0082220
MSZoning	0.0013703
Utilities	0.0006852
Functional	0.0006852
Exterior1st	0.0003426
Exterior2nd	0.0003426
Electrical	0.0003426
KitchenQual	0.0003426
SaleType	0.0003426

Missing Numerical Columns	
name	prc_na
SalePrice	0.4998287
LotFrontage	0.1664954
GarageYrBlt	0.0544707
MasVnrArea	0.0078794
BsmtFullBath	0.0006852
BsmtHalfBath	0.0006852
BsmtFinSF1	0.0003426
BsmtFinSF2	0.0003426
BsmtUnfSF	0.0003426
TotalBsmtSF	0.0003426
GarageCars	0.0003426
GarageArea	0.0003426

By looking in the data\_description file, we can determine that we have columns that show us measurements, condition and qualities of additional features of the houses, They are defined with NA when they do not have one of them. To determine if they are really null values, we must compare multiple columns, example if we have NA PoolQC and PoolArea equal to 0 is the NA is not a Missing value, because the house doesnt have a pool, if PoolQC is NA but the PoolArea is greater than 0, we have a missing value.

## Identify associated columns

Related Features		
name_features	dim_features	dtype
<b>MasVnr</b>		
MasVnr	MasVnrArea	numeric
MasVnr	MasVnrType	categorical
<b>Bsmt</b>		
Bsmt	BsmtCond	categorical
Bsmt	BsmtExposure	categorical
Bsmt	BsmtFinSF1	numeric
Bsmt	BsmtFinSF2	numeric
Bsmt	BsmtFinType1	categorical
Bsmt	BsmtFinType2	categorical
Bsmt	BsmtFullBath	numeric
Bsmt	BsmtHalfBath	numeric
Bsmt	BsmtQual	categorical
Bsmt	BsmtUnfSF	numeric
Bsmt	TotalBsmtSF	numeric
<b>Fireplace</b>		
Fireplace	FireplaceQu	categorical
Fireplace	Fireplaces	numeric
<b>Pool</b>		
Pool	PoolArea	numeric
Pool	PoolQC	categorical
<b>Heating</b>		
Heating	Heating	categorical
Heating	HeatingQC	categorical
<b>Misc</b>		
Misc	MiscFeature	categorical
Misc	MiscVal	numeric
<b>Kitchen</b>		
Kitchen	KitchenAbvGr	numeric
Kitchen	KitchenQual	categorical
<b>Exterior</b>		
Exterior	Exterior1st	categorical
Exterior	Exterior2nd	categorical
<b>Garage</b>		
Garage	GarageArea	numeric
Garage	GarageCars	numeric
Garage	GarageCond	categorical
Garage	GarageFinish	categorical
Garage	GarageQual	categorical
Garage	GarageType	categorical
Garage	GarageYrBlt	numeric

## Cleaning set of Quality|Condition|Type where Area or SqrtFeet =0 (Max set of 2 columns)

This step we going to select most obvious **not** null values, features that have 1 or two columns to replace null values. Where we have for example null in Quality or condition Column and 0 in Area or Square feet, we going to replace null values to “None Feature Value”.

- MasVnr

- Pool
- Fireplace
- Fence
- Alley

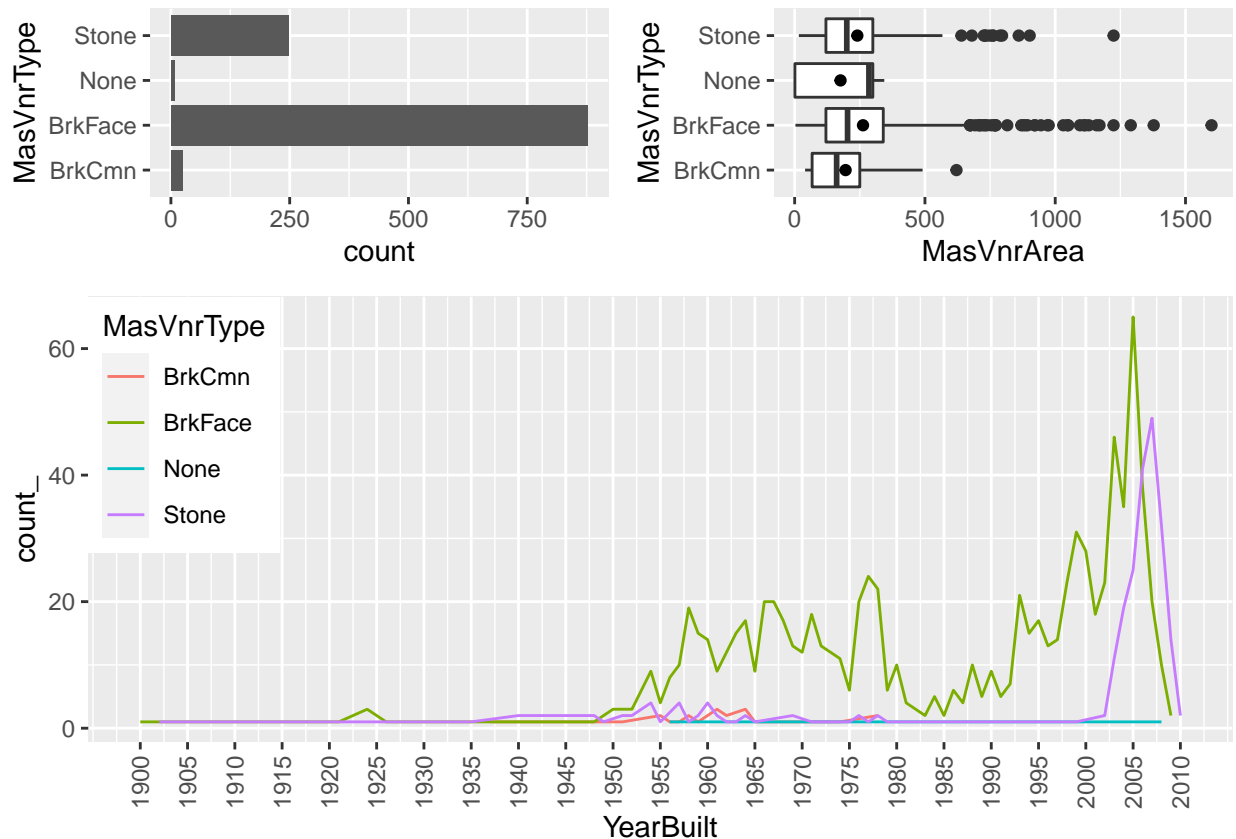
After replacing, as result we still having null values, for those features that are keeping null values we going to take another approach for each one.

name	prc_na	type
MasVnrArea	0.0078794	numerical
PoolQC	0.0010277	categorical
MasVnrType	0.0003426	categorical
Alley	0.0000000	categorical
Fence	0.0000000	categorical
FireplaceQu	0.0000000	categorical
Fireplaces	0.0000000	numerical
PoolArea	0.0000000	numerical

## Masonry veneer

Columns:

1. MasVnrType.
2. MasVnrArea.



This plot show us between 1950 and 2005 BrkFace was the predominant type of MasVnr and after 2005 was

Stone, we going to get the mode in every year and fill Na values with mode by year and look how many null values we get.

Mansory Veneer		
name	prc_na	type
MasVnrArea	0	numerical
MasVnrType	0	categorical

## Basement

If TotalBsmtSF ==0 replace null with No basment in:

- Exposure
- Quality
- FullBath
- HalfBat

If BsmntFinSF 1 & 2== 0, replace null with no BsmntFinType#

- BsmtFinSF 1 & 2

Basement		
name	prc_na	type
BsmtFinType2	0.0274066	categorical
BsmtCond	0.0013703	categorical
BsmtExposure	0.0013703	categorical
BsmtQual	0.0010277	categorical
BsmtFinSF1	0.0003426	numerical
BsmtFinSF2	0.0003426	numerical
BsmtFinType1	0.0003426	categorical
BsmtFullBath	0.0003426	numerical
BsmtHalfBath	0.0003426	numerical
BsmtUnfSF	0.0003426	numerical
TotalBsmtSF	0.0003426	numerical