Data Mining Project

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Understanding the problem:

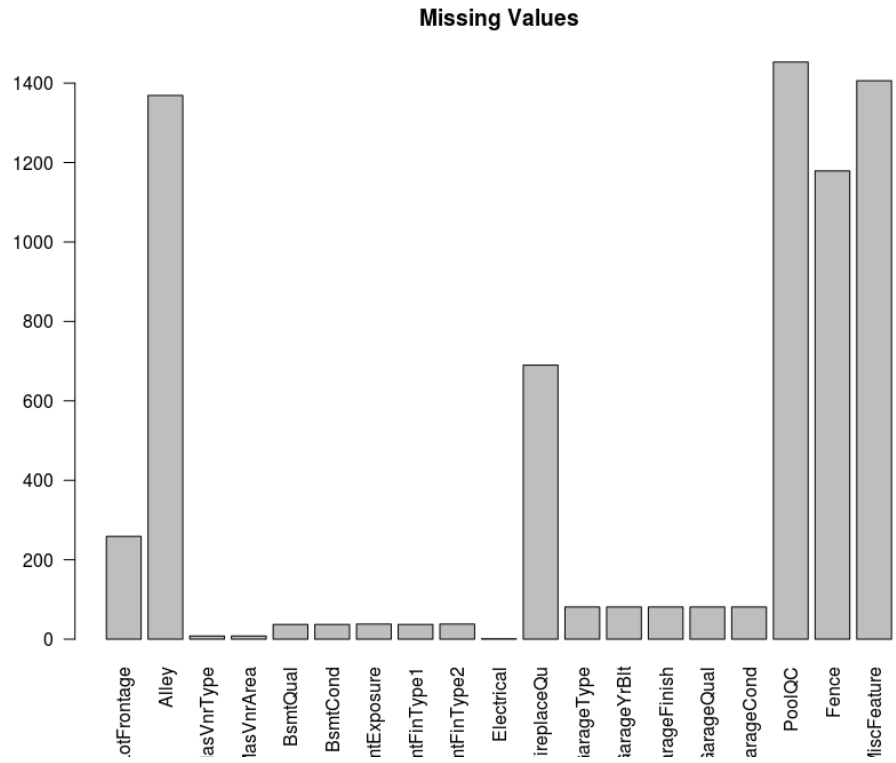
The goal of this problem to expect the prices for the houses. With missing data and a big number of features. The problem from “Kaggle” called “House Prices: Advanced Regression Techniques”.
81 features and 1460 sample with many missing values. So during this project I am trying to deal with the big number of features and find the best model to predict the house prices correctly.

The source code in github with the dataset:
https://github.com/enferas/Predict-House-Price-in-R

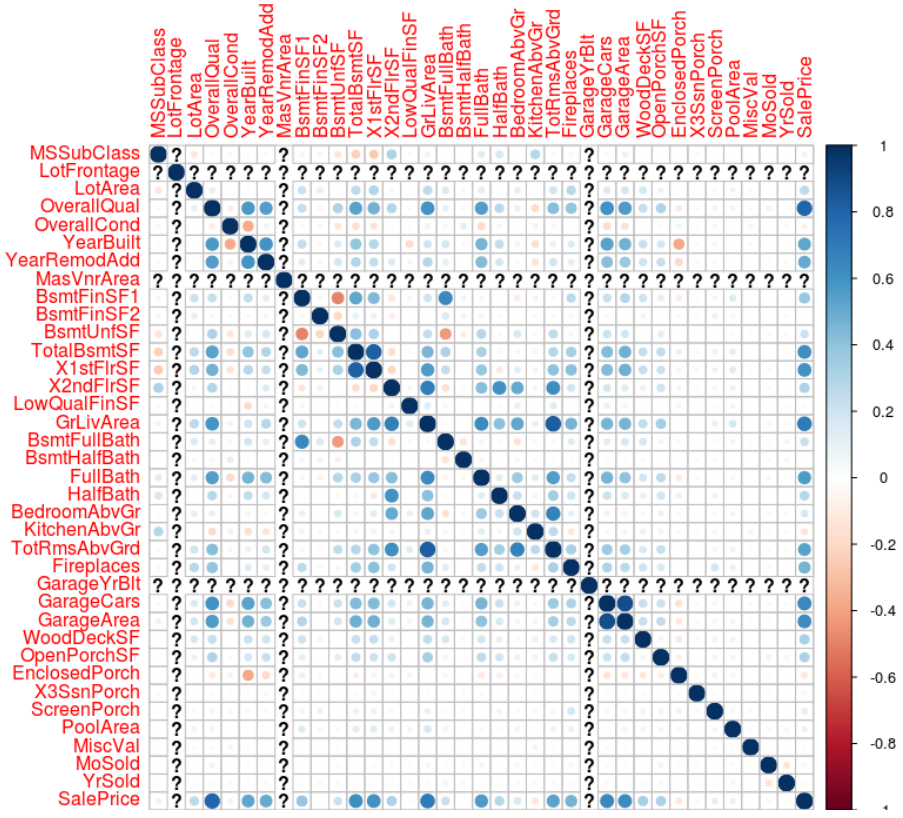
SalePrice - the property's sale price in dollars. This is the target variable that you're trying to predict.
MSSubClass: The building class
MSZoning: The general zoning classification
LotFrontage: Linear feet of street connected to property
LotArea: Lot size in square feet
Street: Type of road access
Alley: Type of alley access
LotShape: General shape of property
LandContour: Flatness of the property
Utilities: Type of utilities available
LotConfig: Lot configuration
LandSlope: Slope of property
Neighborhood: Physical locations within Ames city limits
Condition1: Proximity to main road or railroad
Condition2: Proximity to main road or railroad (if a second is present)
BldgType: Type of dwelling
HouseStyle: Style of dwelling
OverallQual: Overall material and finish quality
OverallCond: Overall condition rating
YearBuilt: Original construction date
YearRemodAdd: Remodel date
RoofStyle: Type of roof
RoofMatl: Roof material
Exterior1st: Exterior covering on house
Exterior2nd: Exterior covering on house (if more than one material)
MasVnrType: Masonry veneer type
MasVnrArea: Masonry veneer area in square feet
ExterQual: Exterior material quality
ExterCond: Present condition of the material on the exterior
Foundation: Type of foundation
BsmtQual: Height of the basement
BsmtCond: General condition of the basement
BsmtExposure: Walkout or garden level basement walls
BsmtFinType1: Quality of basement finished area

BsmtFinSF1: Type 1 finished square feet
BsmtFinType2: Quality of second finished area (if present)
BsmtFinSF2: Type 2 finished square feet
BsmtUnfSF: Unfinished square feet of basement area
TotalBsmtSF: Total square feet of basement area
Heating: Type of heating
HeatingQC: Heating quality and condition
CentralAir: Central air conditioning
Electrical: Electrical system
1stFlrSF: First Floor square feet
2ndFlrSF: Second floor square feet
LowQualFinSF: Low quality finished square feet (all floors)
GrLivArea: Above grade (ground) living area square feet
BsmtFullBath: Basement full bathrooms
BsmtHalfBath: Basement half bathrooms
FullBath: Full bathrooms above grade
HalfBath: Half baths above grade
Bedroom: Number of bedrooms above basement level
Kitchen: Number of kitchens
KitchenQual: Kitchen quality
TotRmsAbvGrd: Total rooms above grade (does not include bathrooms)
Functional: Home functionality rating
Fireplaces: Number of fireplaces
FireplaceQu: Fireplace quality
GarageType: Garage location
GarageYrBlt: Year garage was built
GarageFinish: Interior finish of the garage
GarageCars: Size of garage in car capacity
GarageArea: Size of garage in square feet
GarageQual: Garage quality
GarageCond: Garage condition
PavedDrive: Paved driveway
WoodDeckSF: Wood deck area in square feet
OpenPorchSF: Open porch area in square feet
EnclosedPorch: Enclosed porch area in square feet
3SsnPorch: Three season porch area in square feet
ScreenPorch: Screen porch area in square feet
PoolArea: Pool area in square feet
PoolQC: Pool quality
Fence: Fence quality
MiscFeature: Miscellaneous feature not covered in other categories
MiscVal: $Value of miscellaneous feature
MoSold: Month Sold
YrSold: Year Sold
SaleType: Type of sale
SaleCondition: Condition of sale

The Features with Missing Values:



The correlation between the Features:



We can notice a big similar between the Garage Area and the number of cars in the garage
and between Overall material and finish quality and the price.

Data Prepration:

So to deal with the missing value.
We can notice for example about Garage features the features is null in the same time. when the GarageCars=0 and GarageArea=0. so that's meaning there are no information to the garage for this house.

In this way I will give “None” instead of null for this value in the data.

	GarageType	GarageYrBlt	GarageFinish	GarageCars	GarageArea	GarageQual	GarageCond
1338	<NA>	NA	<NA>	0	0	<NA>	<NA>
1339	BuiltIn	2002	RFn	2	492	TA	TA
1340	Attchd	1972	RFn	1	288	TA	TA
1341	Detchd	1974	Unf	4	480	TA	TA
1342	Detchd	2004	Unf	2	576	TA	TA
1343	Attchd	2002	RFn	2	647	TA	TA
1344	Detchd	1929	Unf	2	342	Fa	Fa
1345	Attchd	2006	Fin	2	440	TA	TA
1346	Detchd	1997	Unf	1	308	TA	TA
1347	Attchd	1968	RFn	2	508	Gd	TA
1348	Attchd	2006	Fin	3	712	TA	TA
1349	Attchd	1998	RFn	2	514	TA	TA
1350	<NA>	NA	<NA>	0	0	<NA>	<NA>

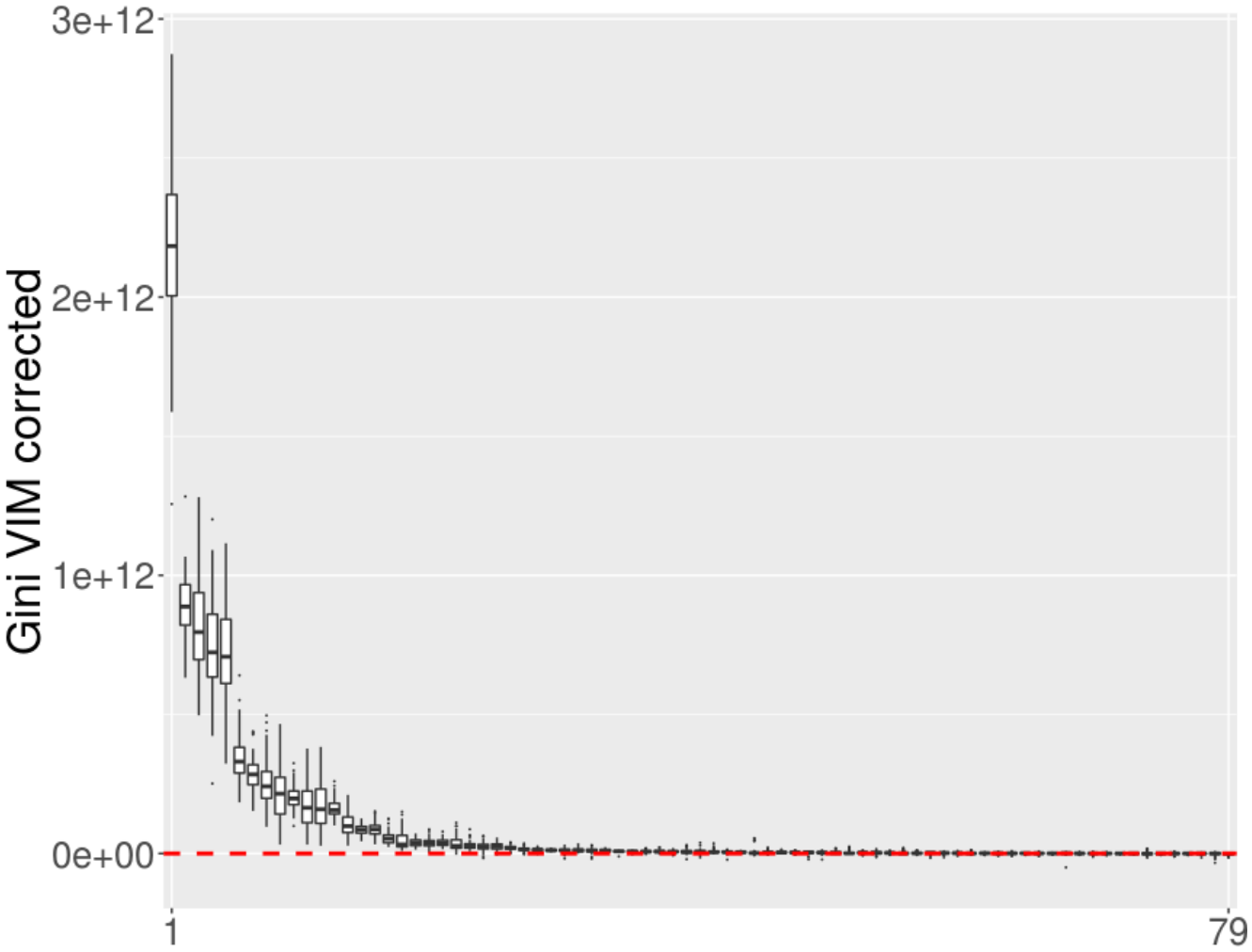
and for example for “LotFrontage” it is integer so I will replace the null value with the median.

And that processing for all the features.

Feature selection:

I used Decision tree in parallel and choose the best 15 feature. After that I saved the features because the code take long time. So the feature after the selection.

```
names_f <- c("OverallQual", "GrLivArea", "Neighborhood", "GarageCars",
"ExterQual",
             "TotalBsmtSF", "X1stFlrSF", "GarageArea", "KitchenQual",
"X2ndFlrSF",
             "BsmtQual", "YearBuilt", "BsmtFinSF1")
```



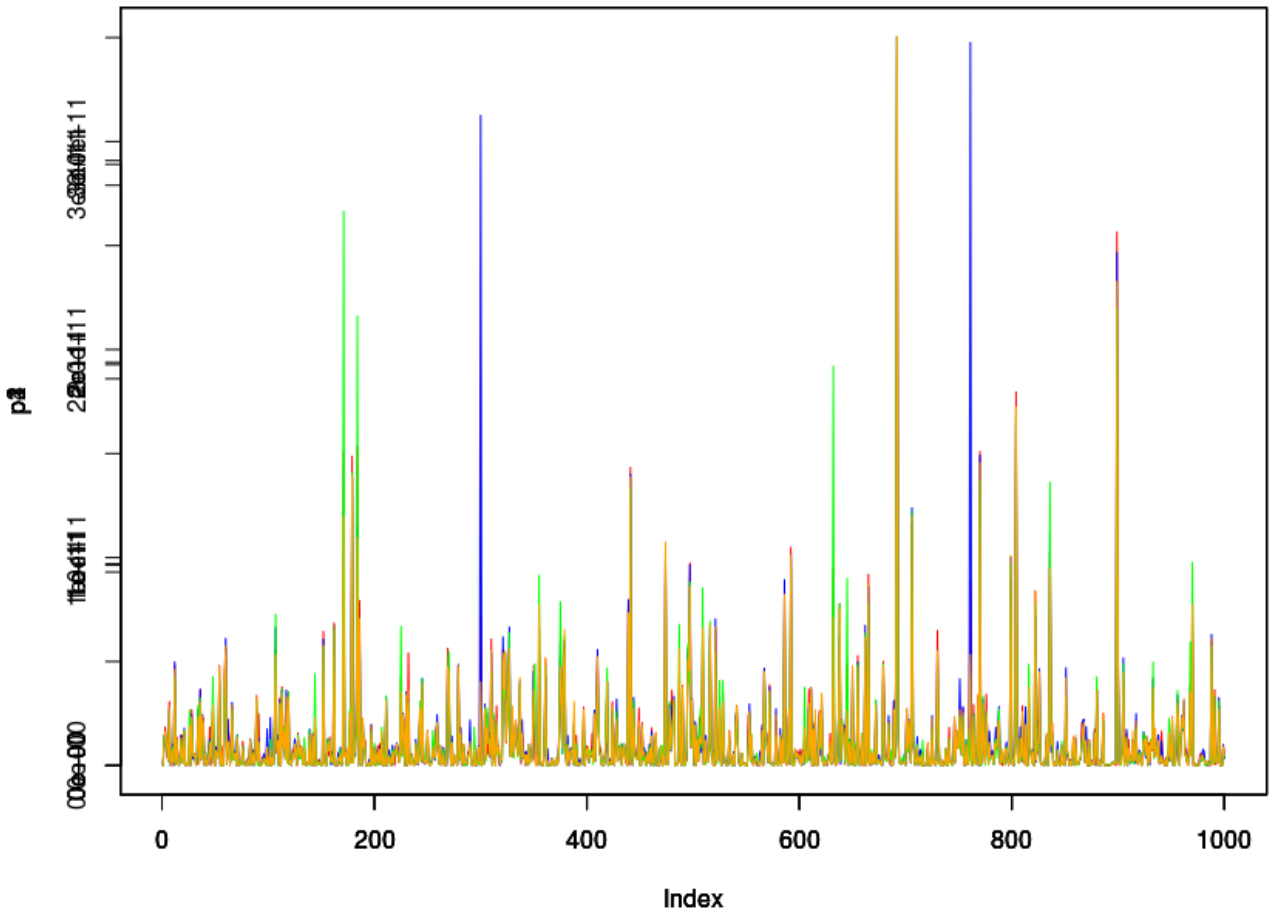
Modeling:

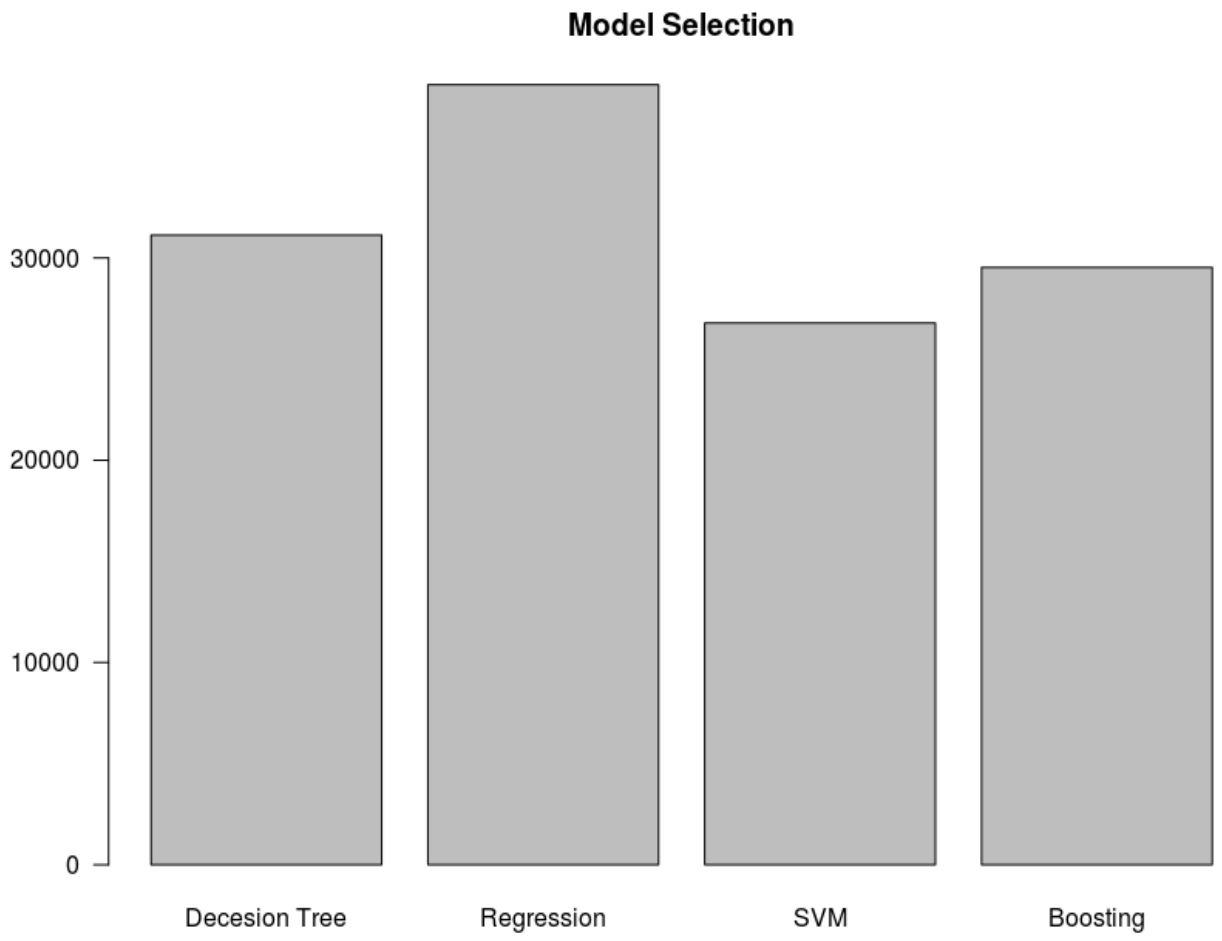
I tried 4 algorithms SVM, Bossting with laplace, Random forest and Regression.

Model Selection:

so at the end I found the SVM is the best model for this problem.

```
#The differnt between the predict value and the real value for all the algorithms
p1 <- (predict-train_label)*(predict-train_label)
p2 <- (predict2-train_label)*(predict2-train_label)
p3 <- (predict3-train_label)*(predict3-train_label)
p4 <- (predict4-train_label)*(predict4-train_label)
plot(p1,type="l",col="red")
par(new=TRUE)
plot(p2,type="l",col="blue")
par(new=TRUE)
plot(p3,type="l",col="green")
par(new=TRUE)
plot(p4,type="l",col="orange")
```





So SVM has the lowest error. And now we can predict the test file for predict the answers.