
Data Cleaning
Techniques

deleting-col-rows

May 18, 2023

1 Methods to handle missing value

```
1) Deleting rows and columns that contains missing value
2) Fill missing value manually
3) Global Constant
4) Measure of central tendency ( Mean, Median, Mode )
5) Measure of central tendency for each class
6) Most probable value
```

1.0.1 1) Deleting rows and columns that contains missing value

Importing necessary libraries

[1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

Loading dataset

[2]:
```
df= pd.read_csv('train.csv')
df.head()
```

[2]:

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	\
0	1	60	RL	65.0	8450	Pave	NaN	Reg	
1	2	20	RL	80.0	9600	Pave	NaN	Reg	
2	3	60	RL	68.0	11250	Pave	NaN	IR1	
3	4	70	RL	60.0	9550	Pave	NaN	IR1	
4	5	60	RL	84.0	14260	Pave	NaN	IR1	

	LandContour	Utilities	…	PoolArea	PoolQC	Fence	MiscFeature	MiscVal	MoSold	\
0	Lvl	AllPub	…	0	NaN	NaN	NaN	0	2	
1	Lvl	AllPub	…	0	NaN	NaN	NaN	0	5	
2	Lvl	AllPub	…	0	NaN	NaN	NaN	0	9	
3	Lvl	AllPub	…	0	NaN	NaN	NaN	0	2	
4	Lvl	AllPub	…	0	NaN	NaN	NaN	0	12	

```
  YrSold  SaleType  SaleCondition  SalePrice
0   2008        WD         Normal     208500
1   2007        WD         Normal     181500
2   2008        WD         Normal     223500
3   2006        WD        Abnorml     140000
4   2008        WD         Normal     250000

[5 rows x 81 columns]
```

[3]:
```
df.shape # Checking the dimesion of the dataset
```

[3]:
```
(1460, 81)
```

[4]:
```
# Dataset has 81 colmns but it shows few column, to see every column we use pd.
 ↪set_option

pd.set_option('display.max_columns',None)
pd.set_option('display.max_rows',None)
```

[5]:
```
df.head(6)
```

[5]:
```
    Id  MSSubClass MSZoning  LotFrontage  LotArea Street Alley LotShape  \
0   1           60       RL         65.0     8450   Pave   NaN      Reg
1   2           20       RL         80.0     9600   Pave   NaN      Reg
2   3           60       RL         68.0    11250   Pave   NaN      IR1
3   4           70       RL         60.0     9550   Pave   NaN      IR1
4   5           60       RL         84.0    14260   Pave   NaN      IR1
5   6           50       RL         85.0    14115   Pave   NaN      IR1

  LandContour Utilities LotConfig LandSlope Neighborhood Condition1  \
0         Lvl    AllPub    Inside       Gtl      CollgCr       Norm
1         Lvl    AllPub       FR2       Gtl      Veenker      Feedr
2         Lvl    AllPub    Inside       Gtl      CollgCr       Norm
3         Lvl    AllPub    Corner       Gtl      Crawfor       Norm
4         Lvl    AllPub       FR2       Gtl      NoRidge       Norm
5         Lvl    AllPub    Inside       Gtl      Mitchel       Norm

  Condition2 BldgType HouseStyle  OverallQual  OverallCond  YearBuilt  \
0       Norm     1Fam     2Story            7            5       2003
1       Norm     1Fam     1Story            6            8       1976
2       Norm     1Fam     2Story            7            5       2001
3       Norm     1Fam     2Story            7            5       1915
4       Norm     1Fam     2Story            8            5       2000
5       Norm     1Fam     1.5Fin            5            5       1993

   YearRemodAdd RoofStyle RoofMatl Exterior1st Exterior2nd MasVnrType  \
0          2003     Gable  CompShg     VinylSd     VinylSd    BrkFace
```

```
1          1976     Gable  CompShg     MetalSd     MetalSd       None
2          2002     Gable  CompShg     VinylSd     VinylSd    BrkFace
3          1970     Gable  CompShg     Wd Sdng     Wd Shng       None
4          2000     Gable  CompShg     VinylSd     VinylSd    BrkFace
5          1995     Gable  CompShg     VinylSd     VinylSd       None

   MasVnrArea ExterQual ExterCond Foundation BsmtQual BsmtCond BsmtExposure  \
0       196.0        Gd        TA      PConc       Gd       TA           No
1         0.0        TA        TA     CBlock       Gd       TA           Gd
2       162.0        Gd        TA      PConc       Gd       TA           Mn
3         0.0        TA        TA     BrkTil       TA       Gd           No
4       350.0        Gd        TA      PConc       Gd       TA           Av
5         0.0        TA        TA       Wood       Gd       TA           No

  BsmtFinType1  BsmtFinSF1 BsmtFinType2  BsmtFinSF2  BsmtUnfSF  TotalBsmtSF  \
0          GLQ         706          Unf           0        150          856
1          ALQ         978          Unf           0        284         1262
2          GLQ         486          Unf           0        434          920
3          ALQ         216          Unf           0        540          756
4          GLQ         655          Unf           0        490         1145
5          GLQ         732          Unf           0         64          796

  Heating HeatingQC CentralAir Electrical  1stFlrSF  2ndFlrSF  LowQualFinSF  \
0    GasA        Ex          Y      SBrkr       856       854             0
1    GasA        Ex          Y      SBrkr      1262         0             0
2    GasA        Ex          Y      SBrkr       920       866             0
3    GasA        Gd          Y      SBrkr       961       756             0
4    GasA        Ex          Y      SBrkr      1145      1053             0
5    GasA        Ex          Y      SBrkr       796       566             0

   GrLivArea  BsmtFullBath  BsmtHalfBath  FullBath  HalfBath  BedroomAbvGr  \
0       1710             1             0         2         1             3
1       1262             0             1         2         0             3
2       1786             1             0         2         1             3
3       1717             1             0         1         0             3
4       2198             1             0         2         1             4
5       1362             1             0         1         1             1

   KitchenAbvGr KitchenQual  TotRmsAbvGrd Functional  Fireplaces FireplaceQu  \
0             1          Gd             8        Typ           0         NaN
1             1          TA             6        Typ           1          TA
2             1          Gd             6        Typ           1          TA
3             1          Gd             7        Typ           1          Gd
4             1          Gd             9        Typ           1          TA
5             1          TA             5        Typ           0         NaN

  GarageType  GarageYrBlt GarageFinish  GarageCars  GarageArea GarageQual  \
```

```
0     Attchd       2003.0          RFn           2         548         TA
1     Attchd       1976.0          RFn           2         460         TA
2     Attchd       2001.0          RFn           2         608         TA
3     Detchd       1998.0          Unf           3         642         TA
4     Attchd       2000.0          RFn           3         836         TA
5     Attchd       1993.0          Unf           2         480         TA

  GarageCond PavedDrive  WoodDeckSF  OpenPorchSF  EnclosedPorch  3SsnPorch  \
0         TA          Y           0           61              0          0
1         TA          Y         298            0              0          0
2         TA          Y           0           42              0          0
3         TA          Y           0           35            272          0
4         TA          Y         192           84              0          0
5         TA          Y          40           30              0        320

   ScreenPorch  PoolArea PoolQC  Fence MiscFeature  MiscVal  MoSold  YrSold  \
0            0         0    NaN    NaN         NaN        0       2    2008
1            0         0    NaN    NaN         NaN        0       5    2007
2            0         0    NaN    NaN         NaN        0       9    2008
3            0         0    NaN    NaN         NaN        0       2    2006
4            0         0    NaN    NaN         NaN        0      12    2008
5            0         0    NaN  MnPrv        Shed      700      10    2009

  SaleType SaleCondition  SalePrice
0       WD        Normal     208500
1       WD        Normal     181500
2       WD        Normal     223500
3       WD       Abnorml     140000
4       WD        Normal     250000
5       WD        Normal     143000
```

[27]:
```
df.info() # info() is to find the information about the dataset like columns,␣
 ↪non_null values, data type etc
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1460 entries, 0 to 1459
Data columns (total 81 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Id             1460 non-null   int64
 1   MSSubClass     1460 non-null   int64
 2   MSZoning       1460 non-null   object
 3   LotFrontage    1201 non-null   float64
 4   LotArea        1460 non-null   int64
 5   Street         1460 non-null   object
 6   Alley          91 non-null     object
 7   LotShape       1460 non-null   object
```

```
8   LandContour    1460 non-null   object
9   Utilities      1460 non-null   object
10  LotConfig      1460 non-null   object
11  LandSlope      1460 non-null   object
12  Neighborhood   1460 non-null   object
13  Condition1     1460 non-null   object
14  Condition2     1460 non-null   object
15  BldgType       1460 non-null   object
16  HouseStyle     1460 non-null   object
17  OverallQual    1460 non-null   int64
18  OverallCond    1460 non-null   int64
19  YearBuilt      1460 non-null   int64
20  YearRemodAdd   1460 non-null   int64
21  RoofStyle      1460 non-null   object
22  RoofMatl       1460 non-null   object
23  Exterior1st    1460 non-null   object
24  Exterior2nd    1460 non-null   object
25  MasVnrType     1452 non-null   object
26  MasVnrArea     1452 non-null   float64
27  ExterQual      1460 non-null   object
28  ExterCond      1460 non-null   object
29  Foundation     1460 non-null   object
30  BsmtQual       1423 non-null   object
31  BsmtCond       1423 non-null   object
32  BsmtExposure   1422 non-null   object
33  BsmtFinType1   1423 non-null   object
34  BsmtFinSF1     1460 non-null   int64
35  BsmtFinType2   1422 non-null   object
36  BsmtFinSF2     1460 non-null   int64
37  BsmtUnfSF      1460 non-null   int64
38  TotalBsmtSF    1460 non-null   int64
39  Heating        1460 non-null   object
40  HeatingQC      1460 non-null   object
41  CentralAir     1460 non-null   object
42  Electrical     1459 non-null   object
43  1stFlrSF       1460 non-null   int64
44  2ndFlrSF       1460 non-null   int64
45  LowQualFinSF   1460 non-null   int64
46  GrLivArea      1460 non-null   int64
47  BsmtFullBath   1460 non-null   int64
48  BsmtHalfBath   1460 non-null   int64
49  FullBath       1460 non-null   int64
50  HalfBath       1460 non-null   int64
51  BedroomAbvGr   1460 non-null   int64
52  KitchenAbvGr   1460 non-null   int64
53  KitchenQual    1460 non-null   object
54  TotRmsAbvGrd   1460 non-null   int64
55  Functional     1460 non-null   object
```

```
 56  Fireplaces     1460 non-null   int64
 57  FireplaceQu    770 non-null    object
 58  GarageType     1379 non-null   object
 59  GarageYrBlt    1379 non-null   float64
 60  GarageFinish   1379 non-null   object
 61  GarageCars     1460 non-null   int64
 62  GarageArea     1460 non-null   int64
 63  GarageQual     1379 non-null   object
 64  GarageCond     1379 non-null   object
 65  PavedDrive     1460 non-null   object
 66  WoodDeckSF     1460 non-null   int64
 67  OpenPorchSF    1460 non-null   int64
 68  EnclosedPorch  1460 non-null   int64
 69  3SsnPorch      1460 non-null   int64
 70  ScreenPorch    1460 non-null   int64
 71  PoolArea       1460 non-null   int64
 72  PoolQC         7 non-null      object
 73  Fence          281 non-null    object
 74  MiscFeature    54 non-null     object
 75  MiscVal        1460 non-null   int64
 76  MoSold         1460 non-null   int64
 77  YrSold         1460 non-null   int64
 78  SaleType       1460 non-null   object
 79  SaleCondition  1460 non-null   object
 80  SalePrice      1460 non-null   int64
dtypes: float64(3), int64(35), object(43)
memory usage: 924.0+ KB
```

[7]:
```
df.isnull().sum() # To check number of null values each column contains
```

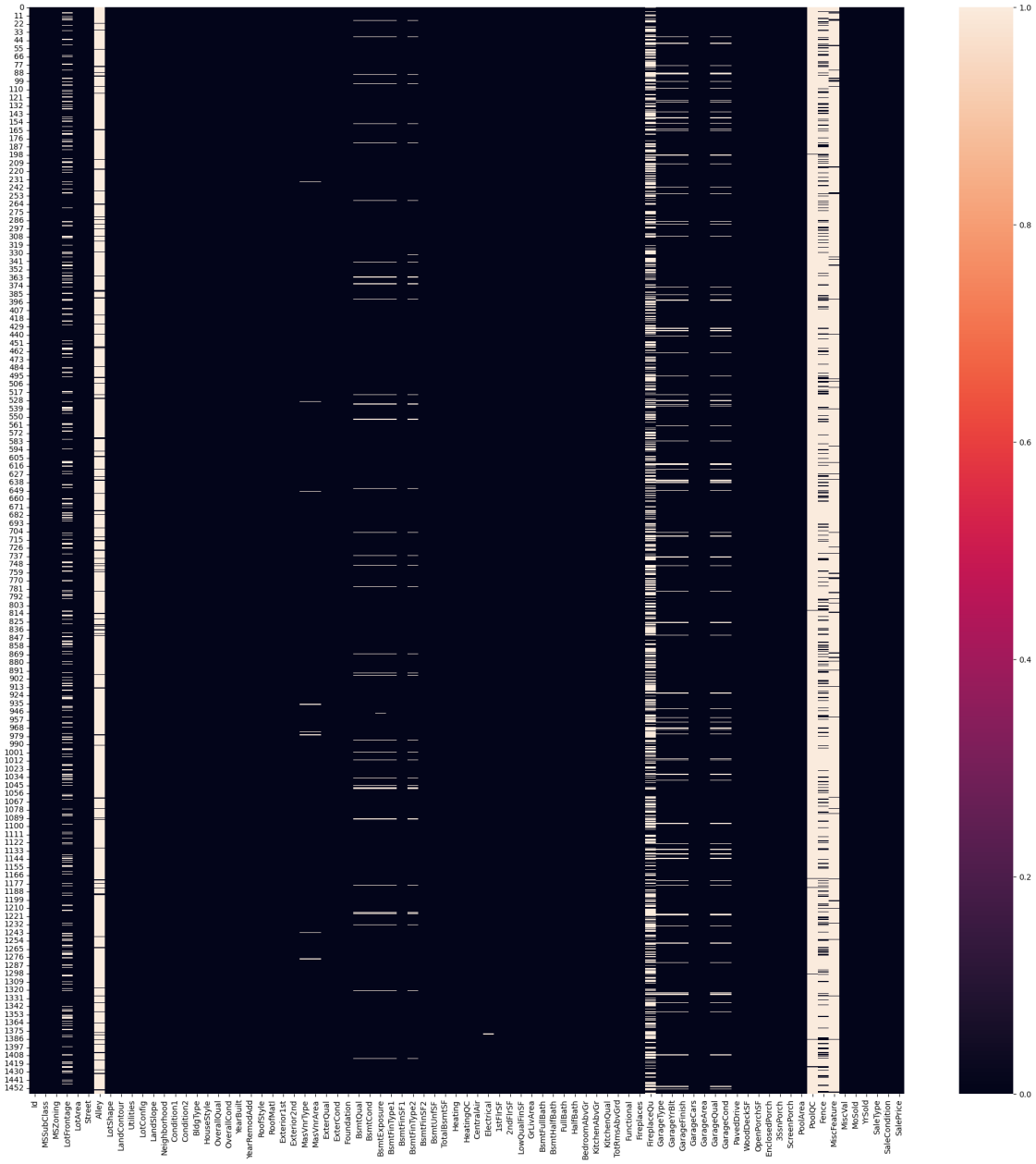
[7]:
```
Id                 0
MSSubClass         0
MSZoning           0
LotFrontage      259
LotArea            0
Street             0
Alley           1369
LotShape           0
LandContour        0
Utilities          0
LotConfig          0
LandSlope          0
Neighborhood       0
Condition1         0
Condition2         0
BldgType           0
HouseStyle         0
```

OverallQual	0
OverallCond	0
YearBuilt	0
YearRemodAdd	0
RoofStyle	0
RoofMatl	0
Exterior1st	0
Exterior2nd	0
MasVnrType	8
MasVnrArea	8
ExterQual	0
ExterCond	0
Foundation	0
BsmtQual	37
BsmtCond	37
BsmtExposure	38
BsmtFinType1	37
BsmtFinSF1	0
BsmtFinType2	38
BsmtFinSF2	0
BsmtUnfSF	0
TotalBsmtSF	0
Heating	0
HeatingQC	0
CentralAir	0
Electrical	1
1stFlrSF	0
2ndFlrSF	0
LowQualFinSF	0
GrLivArea	0
BsmtFullBath	0
BsmtHalfBath	0
FullBath	0
HalfBath	0
BedroomAbvGr	0
KitchenAbvGr	0
KitchenQual	0
TotRmsAbvGrd	0
Functional	0
Fireplaces	0
FireplaceQu	690
GarageType	81
GarageYrBlt	81
GarageFinish	81
GarageCars	0
GarageArea	0
GarageQual	81

```
GarageCond          81
PavedDrive           0
WoodDeckSF           0
OpenPorchSF          0
EnclosedPorch        0
3SsnPorch            0
ScreenPorch          0
PoolArea             0
PoolQC            1453
Fence             1179
MiscFeature       1406
MiscVal              0
MoSold               0
YrSold               0
SaleType             0
SaleCondition        0
SalePrice            0
dtype: int64
```

[8]:
```
# To check distribution of null values in the dataset we use heat map. Here, we need to clean the datset.
plt.figure(figsize=(25,25))
sns.heatmap(df.isnull())
```

[8]:
```
<AxesSubplot:>
```



[9]:
```
null_var= df.isnull().sum()/df.shape[0]*100 # To find the percentage of null values
null_var
```

[9]:
```
Id                0.000000
MSSubClass        0.000000
MSZoning          0.000000
LotFrontage      17.739726
LotArea           0.000000
```

Street	0.000000
Alley	93.767123
LotShape	0.000000
LandContour	0.000000
Utilities	0.000000
LotConfig	0.000000
LandSlope	0.000000
Neighborhood	0.000000
Condition1	0.000000
Condition2	0.000000
BldgType	0.000000
HouseStyle	0.000000
OverallQual	0.000000
OverallCond	0.000000
YearBuilt	0.000000
YearRemodAdd	0.000000
RoofStyle	0.000000
RoofMatl	0.000000
Exterior1st	0.000000
Exterior2nd	0.000000
MasVnrType	0.547945
MasVnrArea	0.547945
ExterQual	0.000000
ExterCond	0.000000
Foundation	0.000000
BsmtQual	2.534247
BsmtCond	2.534247
BsmtExposure	2.602740
BsmtFinType1	2.534247
BsmtFinSF1	0.000000
BsmtFinType2	2.602740
BsmtFinSF2	0.000000
BsmtUnfSF	0.000000
TotalBsmtSF	0.000000
Heating	0.000000
HeatingQC	0.000000
CentralAir	0.000000
Electrical	0.068493
1stFlrSF	0.000000
2ndFlrSF	0.000000
LowQualFinSF	0.000000
GrLivArea	0.000000
BsmtFullBath	0.000000
BsmtHalfBath	0.000000
FullBath	0.000000
HalfBath	0.000000
BedroomAbvGr	0.000000

```
KitchenAbvGr      0.000000
KitchenQual       0.000000
TotRmsAbvGrd      0.000000
Functional        0.000000
Fireplaces        0.000000
FireplaceQu      47.260274
GarageType        5.547945
GarageYrBlt       5.547945
GarageFinish      5.547945
GarageCars        0.000000
GarageArea        0.000000
GarageQual        5.547945
GarageCond        5.547945
PavedDrive        0.000000
WoodDeckSF        0.000000
OpenPorchSF       0.000000
EnclosedPorch     0.000000
3SsnPorch         0.000000
ScreenPorch       0.000000
PoolArea          0.000000
PoolQC           99.520548
Fence            80.753425
MiscFeature      96.301370
MiscVal           0.000000
MoSold            0.000000
YrSold            0.000000
SaleType          0.000000
SaleCondition     0.000000
SalePrice         0.000000
dtype: float64
```

[10]:
```
drop_column = null_var[null_var>17].keys() #Checking for the columns which␣
 ↪contain null values more than 17%
```

[10]:
```
Index(['LotFrontage', 'Alley', 'FireplaceQu', 'PoolQC', 'Fence',
       'MiscFeature'],
      dtype='object')
```

[11]:
```
df2=df.drop(columns=drop_column) # We are dropping all the columns that contain␣
 ↪null values more than 17%
drop_column
```

[12]:
```
df2.shape
```

[12]:
```
(1460, 75)
```

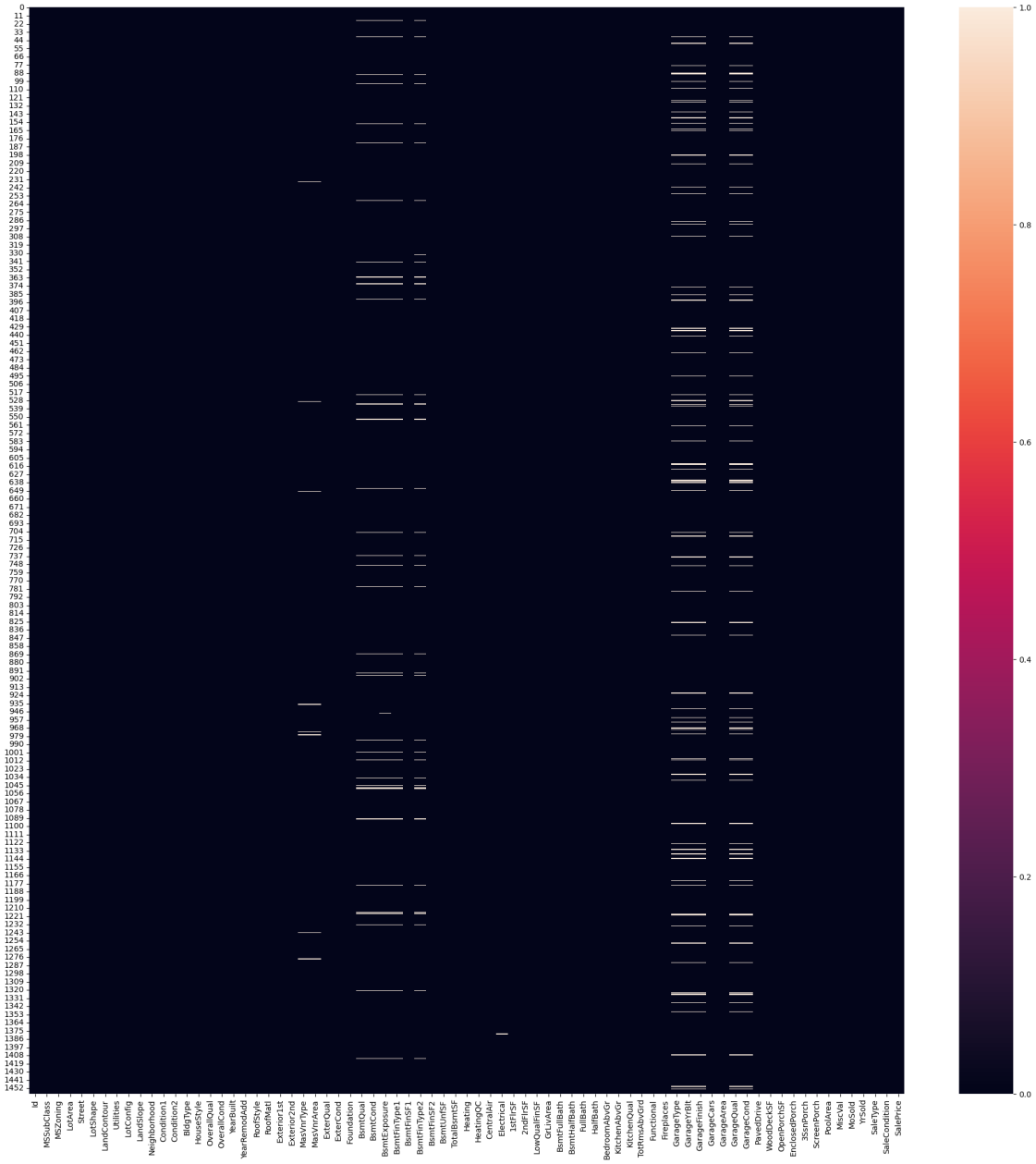
[13]:
```
df2.isnull().sum() # All the column that contains majority of the null values␣
↪are dropped
```

[13]:
```
Id               0
MSSubClass       0
MSZoning         0
LotArea          0
Street           0
LotShape         0
LandContour      0
Utilities        0
LotConfig        0
LandSlope        0
Neighborhood     0
Condition1       0
Condition2       0
BldgType         0
HouseStyle       0
OverallQual      0
OverallCond      0
YearBuilt        0
YearRemodAdd     0
RoofStyle        0
RoofMatl         0
Exterior1st      0
Exterior2nd      0
MasVnrType       8
MasVnrArea       8
ExterQual        0
ExterCond        0
Foundation       0
BsmtQual        37
BsmtCond        37
BsmtExposure    38
BsmtFinType1    37
BsmtFinSF1       0
BsmtFinType2    38
BsmtFinSF2       0
BsmtUnfSF        0
TotalBsmtSF      0
Heating          0
HeatingQC        0
CentralAir       0
Electrical       1
1stFlrSF         0
2ndFlrSF         0
LowQualFinSF     0
```

```
GrLivArea          0
BsmtFullBath       0
BsmtHalfBath       0
FullBath           0
HalfBath           0
BedroomAbvGr       0
KitchenAbvGr       0
KitchenQual        0
TotRmsAbvGrd       0
Functional         0
Fireplaces         0
GarageType        81
GarageYrBlt       81
GarageFinish      81
GarageCars         0
GarageArea         0
GarageQual        81
GarageCond        81
PavedDrive         0
WoodDeckSF         0
OpenPorchSF        0
EnclosedPorch      0
3SsnPorch          0
ScreenPorch        0
PoolArea           0
MiscVal            0
MoSold             0
YrSold             0
SaleType           0
SaleCondition      0
SalePrice          0
dtype: int64
```

[14]:
```
plt.figure(figsize=(25,25)) # Here we can see that the majority of the columns␣
↪that contained null values are handled.
sns.heatmap(df2.isnull())
```

[14]:
```
<AxesSubplot:>
```



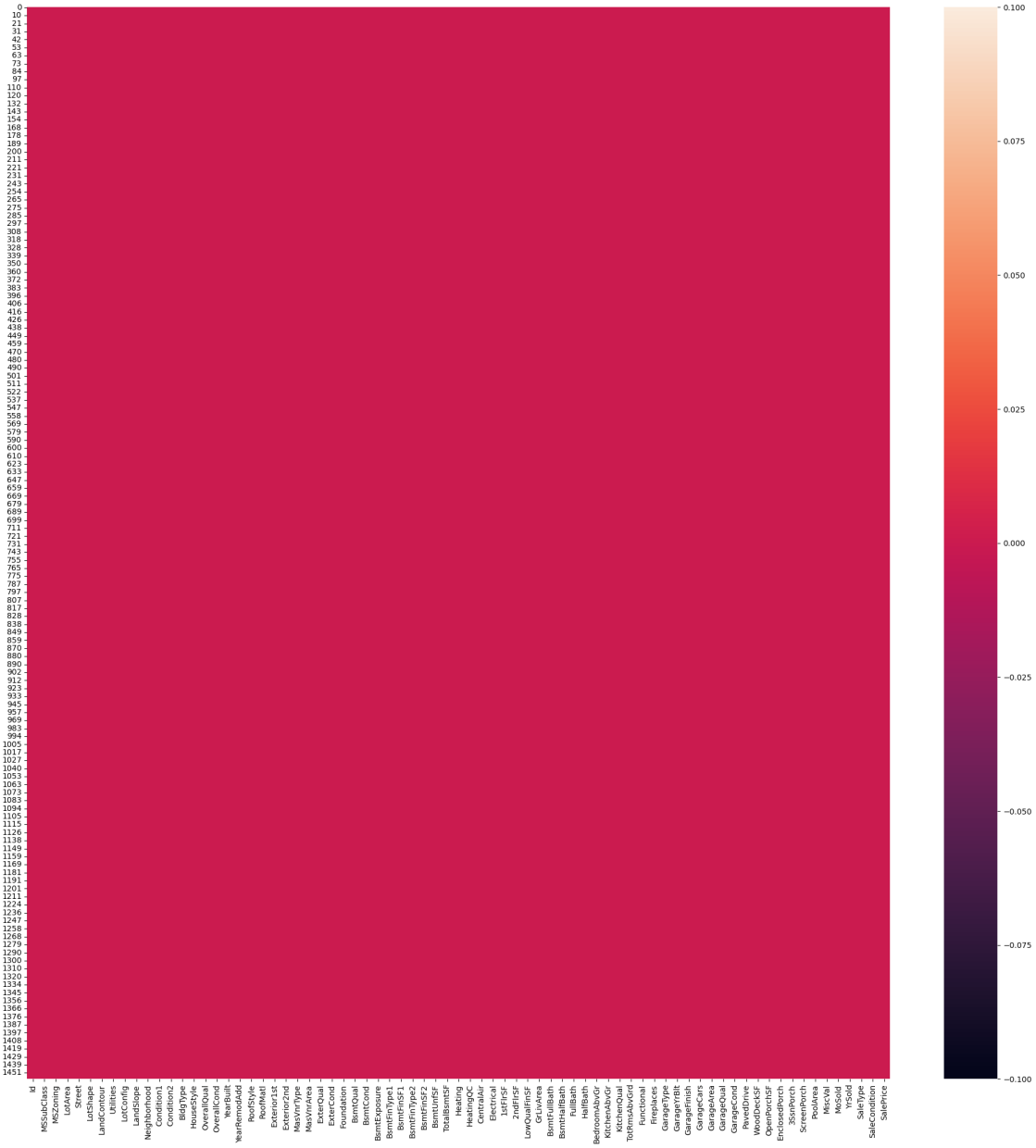
[15]:
```
df3= df2.dropna() # we are deleting the rows that contains null values.
```

[16]:
```
df3.isnull().sum().sum()
```

[16]: 0

[17]:
```
# We can see that null value columns and rows are handled
plt.figure(figsize=(25,25))
sns.heatmap(df3.isnull())
```

[17]: <AxesSubplot:>



To check data distribution of numerical variables

[18]:
```
df3.select_dtypes(include=['int64','float64']).columns.tolist() # Checking for␣
↪the numerical columns.
```

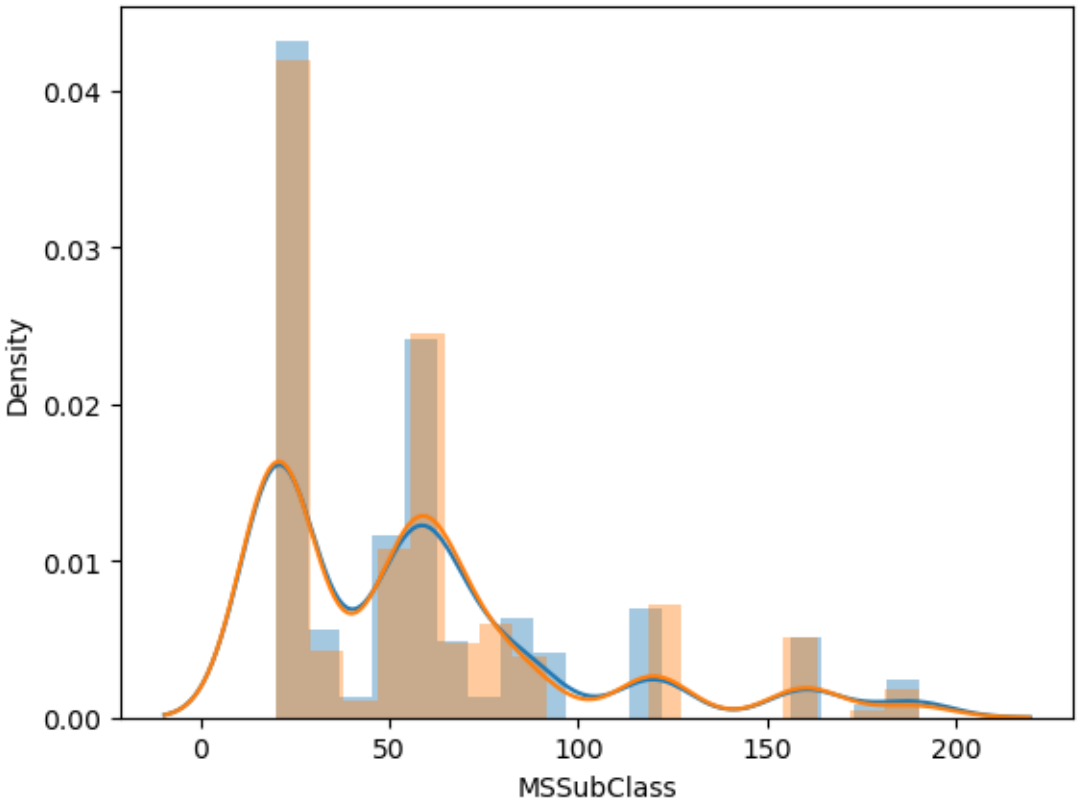
[18]:
```
['Id',
 'MSSubClass',
 'LotArea',
```

```
 'OverallQual',
 'OverallCond',
 'YearBuilt',
 'YearRemodAdd',
 'MasVnrArea',
 'BsmtFinSF1',
 'BsmtFinSF2',
 'BsmtUnfSF',
 'TotalBsmtSF',
 '1stFlrSF',
 '2ndFlrSF',
 'LowQualFinSF',
 'GrLivArea',
 'BsmtFullBath',
 'BsmtHalfBath',
 'FullBath',
 'HalfBath',
 'BedroomAbvGr',
 'KitchenAbvGr',
 'TotRmsAbvGrd',
 'Fireplaces',
 'GarageYrBlt',
 'GarageCars',
 'GarageArea',
 'WoodDeckSF',
 'OpenPorchSF',
 'EnclosedPorch',
 '3SsnPorch',
 'ScreenPorch',
 'PoolArea',
 'MiscVal',
 'MoSold',
 'YrSold',
 'SalePrice']
```

[20]:
```
### Checking data distribution of one column before and after handling the␣
 ↪missing values

sns.distplot(df['MSSubClass'])
sns.distplot(df3['MSSubClass'])
```

[20]:
```
<AxesSubplot:xlabel='MSSubClass', ylabel='Density'>
```



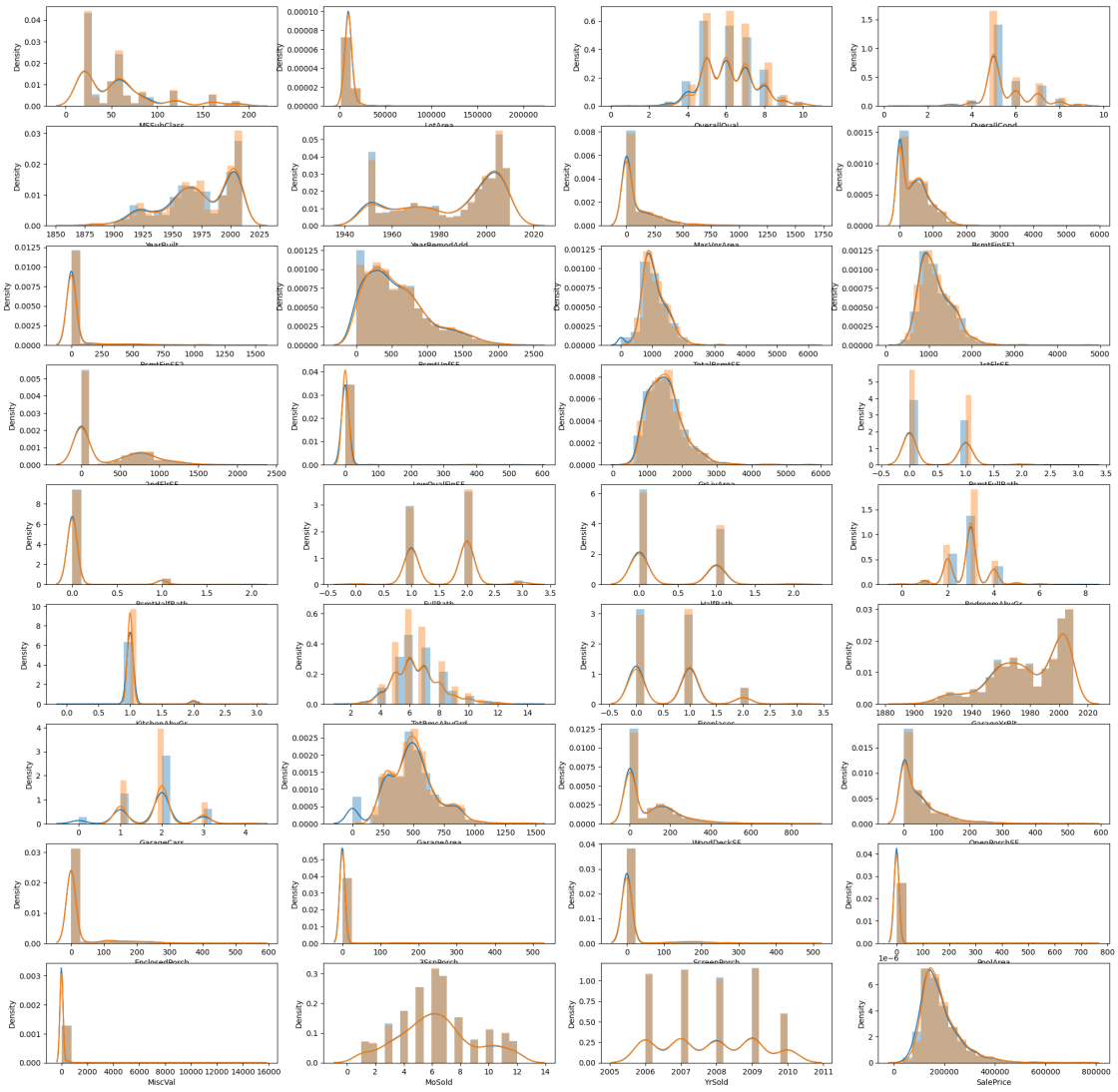
[21]:
```
# All the columns with numerical datatype are stored in a varibale.

num_var= [
 'MSSubClass',
 'LotArea',
 'OverallQual',
 'OverallCond',
 'YearBuilt',
 'YearRemodAdd',
 'MasVnrArea',
 'BsmtFinSF1',
 'BsmtFinSF2',
 'BsmtUnfSF',
 'TotalBsmtSF',
 '1stFlrSF',
 '2ndFlrSF',
 'LowQualFinSF',
 'GrLivArea',
 'BsmtFullBath',
 'BsmtHalfBath',
 'FullBath',
```

```
 'HalfBath',
 'BedroomAbvGr',
 'KitchenAbvGr',
 'TotRmsAbvGrd',
 'Fireplaces',
 'GarageYrBlt',
 'GarageCars',
 'GarageArea',
 'WoodDeckSF',
 'OpenPorchSF',
 'EnclosedPorch',
 '3SsnPorch',
 'ScreenPorch',
 'PoolArea',
 'MiscVal',
 'MoSold',
 'YrSold',
 'SalePrice']
```

[23]:
```
# Checking the data distribution of the numerical variable. To know if we␣
 ↪cleaned the data in a proper way.
plt.figure(figsize=(25,25))

for i, var in enumerate(num_var):
    plt.subplot(9,4,i+1)
    sns.distplot(df[var], bins=20)
    sns.distplot(df3[var], bins=20)
```


Density
MSSubClass
LotArea
OverallQual
OverallCond
YearBuilt
YearRemodAdd
MasVnrArea
BsmtFinSF1
BsmtFinSF2
BsmtUnfSF
TotalBsmtSF
1stFlrSF
2ndFlrSF
LowQualFinSF
GrLivArea
BsmtFullBath
BsmtHalfBath
FullBath
HalfBath
BedroomAbvGr
KitchenAbvGr
TotRmsAbvGrd
Fireplaces
GarageYrBlt
GarageCars
GarageArea
WoodDeckSF
OpenPorchSF
EnclosedPorch
3SsnPorch
ScreenPorch
PoolArea
MiscVal
MoSold
YrSold
SalePrice