Missing values Imputation -Categorical variable

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

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

Out[2]:

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	LandContour	Utilities	...	PoolArea	PoolQC	Fence	Mis
0	1	60	RL	65.0	8450	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	
1	2	20	RL	80.0	9600	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	
2	3	60	RL	68.0	11250	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	
3	4	70	RL	60.0	9550	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	
4	5	60	RL	84.0	14260	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	

5 rows × 81 columns

In [3]:
```
cat_vars=df.select_dtypes(include='object')
cat_vars.head()
```

Out[3]:

	MSZoning	Street	Alley	LotShape	LandContour	Utilities	LotConfig	LandSlope	Neighborhood	Condition1	...	GarageType	Garage
0	RL	Pave	NaN	Reg	Lvl	AllPub	Inside	Gtl	CollgCr	Norm	...	Attchd	
1	RL	Pave	NaN	Reg	Lvl	AllPub	FR2	Gtl	Veenker	Feedr	...	Attchd	
2	RL	Pave	NaN	IR1	Lvl	AllPub	Inside	Gtl	CollgCr	Norm	...	Attchd	
3	RL	Pave	NaN	IR1	Lvl	AllPub	Corner	Gtl	Crawfor	Norm	...	Detchd	
4	RL	Pave	NaN	IR1	Lvl	AllPub	FR2	Gtl	NoRidge	Norm	...	Attchd	

5 rows × 43 columns

In [4]:
```
miss_val_per=cat_vars.isnull().mean()*100
miss_val_per
```

Out[4]:
```
MSZoning          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
RoofStyle         0.000000
RoofMatl          0.000000
Exterior1st       0.000000
Exterior2nd       0.000000
MasVnrType        0.547945
ExterQual         0.000000
ExterCond         0.000000
Foundation        0.000000
BsmtQual          2.534247
BsmtCond          2.534247
BsmtExposure      2.602740
BsmtFinType1      2.534247
BsmtFinType2      2.602740
Heating           0.000000
HeatingQC         0.000000
CentralAir        0.000000
Electrical        0.068493
KitchenQual       0.000000
Functional        0.000000
FireplaceQu      47.260274
GarageType        5.547945
GarageFinish      5.547945
```

```
GarageQual        5.547945
GarageCond        5.547945
PavedDrive        0.000000
PoolQC           99.520548
Fence            80.753425
MiscFeature      96.301370
SaleType          0.000000
SaleCondition     0.000000
dtype: float64
```

In [5]:
```
drop_vars=['Alley','FireplaceQu','PoolQC','Fence','MiscFeature']
cat_vars.drop(columns=drop_vars,axis=1,inplace=True)
cat_vars.head()
```

```
c:\python3.8.3\lib\site-packages\pandas\core\frame.py:4160: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html
turning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
a-view-versus-a-copy)
  return super().drop(
```

Out[5]:

	MSZoning	Street	LotShape	LandContour	Utilities	LotConfig	LandSlope	Neighborhood	Condition1	Condition2	...	Electrical	Kit
0	RL	Pave	Reg	Lvl	AllPub	Inside	Gtl	CollgCr	Norm	Norm	...	SBrkr	
1	RL	Pave	Reg	Lvl	AllPub	FR2	Gtl	Veenker	Feedr	Norm	...	SBrkr	
2	RL	Pave	IR1	Lvl	AllPub	Inside	Gtl	CollgCr	Norm	Norm	...	SBrkr	
3	RL	Pave	IR1	Lvl	AllPub	Corner	Gtl	Crawfor	Norm	Norm	...	SBrkr	
4	RL	Pave	IR1	Lvl	AllPub	FR2	Gtl	NoRidge	Norm	Norm	...	SBrkr	

5 rows × 38 columns

In [6]:
```
cat_vars.shape
```

Out[6]:
```
(1460, 38)
```

In [7]:
```
isnull_per = cat_vars.isnull().mean()*100
miss_vars=isnull_per[isnull_per >0 ].keys()
miss_vars
```

Out[7]:
```
Index(['MasVnrType', 'BsmtQual', 'BsmtCond', 'BsmtExposure', 'BsmtFinType1',
       'BsmtFinType2', 'Electrical', 'GarageType', 'GarageFinish',
       'GarageQual', 'GarageCond'],
      dtype='object')
```

In [8]:
```
# cat_vars['MasVnrType'].fillna("missing")
```

In [9]:
```
cat_vars['MasVnrType'].mode()
```

Out[9]:
```
0    None
dtype: object
```

In [10]:
```
cat_vars['MasVnrType'].value_counts()
```

Out[10]:
```
None       864
BrkFace    445
Stone      128
BrkCmn      15
Name: MasVnrType, dtype: int64
```

In [11]:
```
cat_vars['MasVnrType'].fillna(cat_vars['MasVnrType'].mode()[0])
```

Out[11]:
```
0       BrkFace
1          None
2       BrkFace
3          None
4       BrkFace
          ...
1455       None
1456      Stone
1457       None
1458       None
1459       None
Name: MasVnrType, Length: 1460, dtype: object
```

In [12]:
```
for var in miss_vars:
    cat_vars[var].fillna(cat_vars[var].mode()[0],inplace=True)
    print(var,"=",cat_vars[var].mode()[0])
```

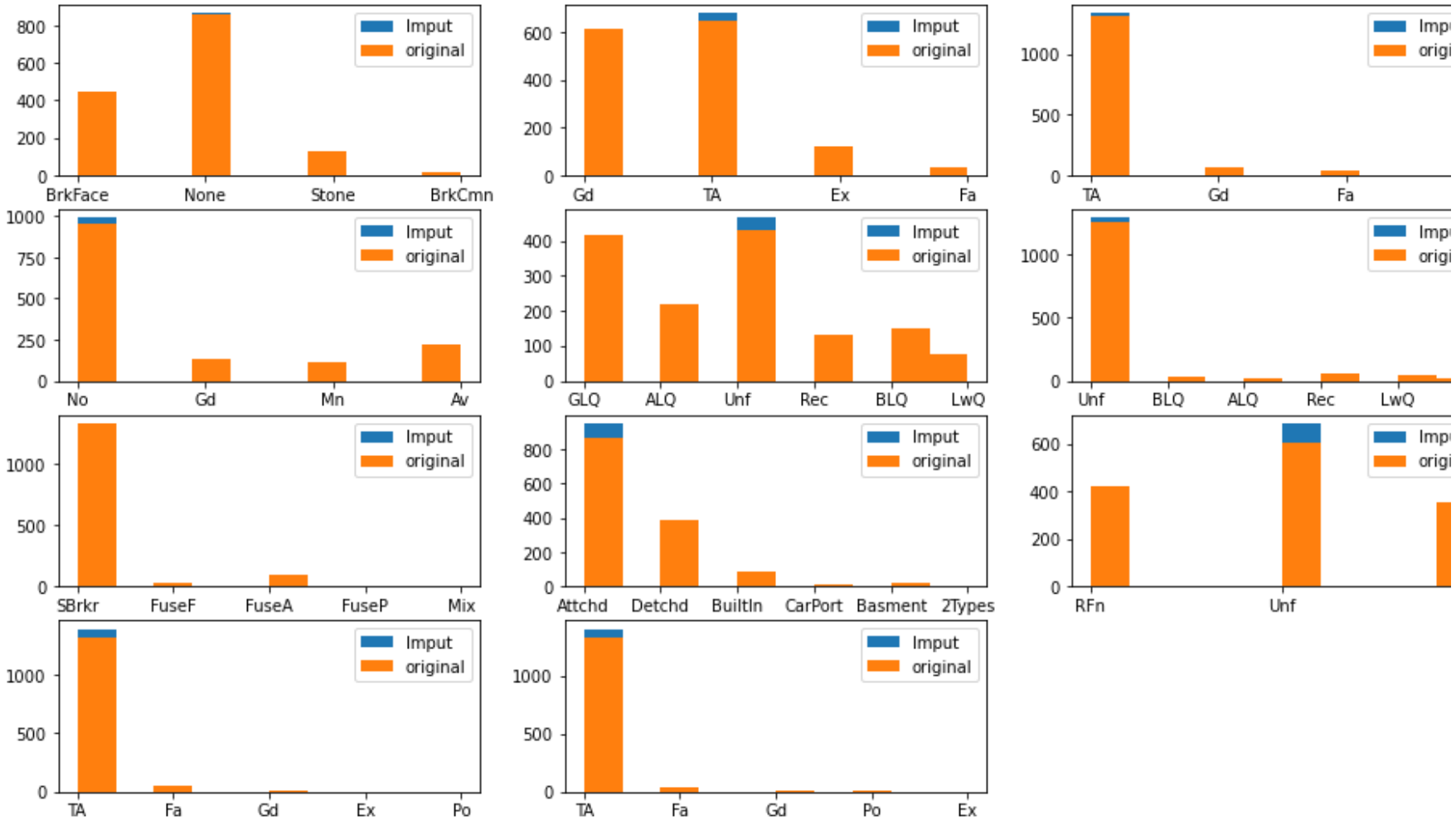
```
MasVnrType = None
BsmtQual = TA
BsmtCond = TA
BsmtExposure = No
BsmtFinType1 = Unf
BsmtFinType2 = Unf
Electrical = SBrkr
GarageType = Attchd
GarageFinish = Unf
GarageQual = TA
GarageCond = TA

c:\python3.8.3\lib\site-packages\pandas\core\series.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html
turning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
a-view-versus-a-copy)
  return super().fillna(
```

In [13]:
```
cat_vars.isnull().sum()
```

Out[13]:
```
MSZoning         0
Street           0
LotShape         0
LandContour      0
Utilities        0
LotConfig        0
LandSlope        0
Neighborhood     0
Condition1       0
Condition2       0
BldgType         0
HouseStyle       0
RoofStyle        0
RoofMatl         0
Exterior1st      0
Exterior2nd      0
MasVnrType       0
ExterQual        0
ExterCond        0
Foundation       0
BsmtQual         0
BsmtCond         0
BsmtExposure     0
BsmtFinType1     0
BsmtFinType2     0
Heating          0
HeatingQC        0
CentralAir       0
Electrical       0
KitchenQual      0
Functional       0
GarageType       0
GarageFinish     0
GarageQual       0
GarageCond       0
PavedDrive       0
```

```
SaleType         0
SaleCondition    0
dtype: int64
```

In [14]:
```
plt.figure(figsize=(16,9))
for i,var in enumerate (miss_vars):
    plt.subplot(4,3,i+1)
    plt.hist(cat_vars[var],label= 'Imput')
    plt.hist(df[var].dropna(),label= 'original')
    plt.legend()
```



In [15]:
```
df.update(cat_vars)
df.drop(columns=drop_vars,inplace=True)
```

In [16]:
```
df.select_dtypes(include='object').isnull().sum()
```

Out[16]:
```
MSZoning         0
Street           0
LotShape         0
LandContour      0
Utilities        0
LotConfig        0
LandSlope        0
Neighborhood     0
Condition1       0
Condition2       0
BldgType         0
HouseStyle       0
RoofStyle        0
RoofMatl         0
Exterior1st      0
Exterior2nd      0
MasVnrType       0
ExterQual        0
ExterCond        0
Foundation       0
BsmtQual         0
BsmtCond         0
BsmtExposure     0
BsmtFinType1     0
BsmtFinType2     0
Heating          0
HeatingQC        0
CentralAir       0
Electrical       0
KitchenQual      0
Functional       0
GarageType       0
GarageFinish     0
GarageQual       0
GarageCond       0
PavedDrive       0
```

```
SaleType         0
SaleCondition    0
dtype: int64
```