Following actions should be performed:

- If for any column(s), the variance is equal to zero, then you need to remove those variable(s).
- Check for null and unique values for test and train sets
- Apply label encoder.
- Perform dimensionality reduction.
- Predict your test_df values using xgboost

Importing the libraries

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

Importing the datasets

```
df_train = pd.read_csv('train.csv')
df_test = pd.read_csv('test.csv')
```

```
df_train.head()
```

```
   ID       y  X0 X1  X2 X3 X4 X5 X6 X8  ...  X375  X376  X377  X378
X379  \
0   0  130.81   k  v  at  a  d  u  j  o  ...     0     0     1     0
0
1   6   88.53   k  t  av  e  d  y  l  o  ...     1     0     0     0
0
2   7   76.26  az  w   n  c  d  x  j  x  ...     0     0     0     0
0
3   9   80.62  az  t   n  f  d  x  l  e  ...     0     0     0     0
0
4  13   78.02  az  v   n  f  d  h  d  n  ...     0     0     0     0
0

   X380  X382  X383  X384  X385
0     0     0     0     0     0
1     0     0     0     0     0
2     0     1     0     0     0
3     0     0     0     0     0
4     0     0     0     0     0

[5 rows x 378 columns]
```

Separating y column from training set

```
y = df_train.pop('y')
```

```
y
```

```
0       130.81
1        88.53
2        76.26
3        80.62
4        78.02
         ...
4204    107.39
4205    108.77
4206    109.22
4207     87.48
4208    110.85
Name: y, Length: 4209, dtype: float64
```

```
df_test.head()
```

```
   ID  X0 X1  X2 X3 X4 X5 X6 X8  X10  ...  X375  X376  X377  X378
X379  X380  \
0   1  az  v   n  f  d  t  a  w    0  ...     0     0     0     1
0     0
1   2   t  b  ai  a  d  b  g  y    0  ...     0     0     1     0
0     0
2   3  az  v  as  f  d  a  j  j    0  ...     0     0     0     1
0     0
3   4  az  l   n  f  d  z  l  n    0  ...     0     0     0     1
0     0
4   5   w  s  as  c  d  y  i  m    0  ...     1     0     0     0
0     0

   X382  X383  X384  X385
0     0     0     0     0
1     0     0     0     0
2     0     0     0     0
3     0     0     0     0
4     0     0     0     0

[5 rows x 377 columns]
```

Info about datasets

```
print('df_train:',df_train.shape)
print('df_test :',df_test.shape)
```

```
df_train: (4209, 377)
df_test : (4209, 377)
```

```
print('df_train:',df_train.info(),'\n')
print('df_test :',df_test.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4209 entries, 0 to 4208
Columns: 377 entries, ID to X385
dtypes: int64(369), object(8)
```

```
memory usage: 12.1+ MB
df_train: None

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4209 entries, 0 to 4208
Columns: 377 entries, ID to X385
dtypes: int64(369), object(8)
memory usage: 12.1+ MB
df_test : None
```

Training set has 8 object

Finding if any columns has variance which equals zero, removing if zero

```
df_train_var = df_train.var()
```

Narrowed down and found the columns which had variance which equaled to zero

```
df_train.var()[df_train_var<=0]
```

```
X11     0.0
X93     0.0
X107    0.0
X233    0.0
X235    0.0
X268    0.0
X289    0.0
X290    0.0
X293    0.0
X297    0.0
X330    0.0
X347    0.0
dtype: float64
```

Dropping the columns which had zero variance

```
df_train.drop(columns=['X11','X93','X107','X233','X235','X268','X289',
'X290','X293','X297','X330','X347'],inplace=True)
```

```
df_train.var()[df_train_var<=0]
```

```
Series([], dtype: float64)
```

```
# Dropping ID column
ID = df_train.pop('ID')
ID
```

```
0          0
1          6
2          7
3          9
4         13
        ...
4204    8405
```

```
4205    8406
4206    8412
4207    8415
4208    8417
Name: ID, Length: 4209, dtype: int64
```

Checking for null in train and test datasets

```
df_train.isna().sum().any()
```

```
False
```

```
df_test.isna().sum().any()
```

```
False
```

Checking for unique in train and test datasets

```
print(df_train.apply(lambda col: col.unique()))
```

```
X0      [k, az, t, al, o, w, j, h, s, n, ay, f, x, y, ...
X1      [v, t, w, b, r, l, s, aa, c, a, e, h, z, j, o,...
X2      [at, av, n, e, as, aq, r, ai, ak, m, a, k, ae,...
X3                                  [a, e, c, f, d, b, g]
X4                                           [d, b, c, a]
                              ...
X380                                               [0, 1]
X382                                               [0, 1]
X383                                               [0, 1]
X384                                               [0, 1]
X385                                               [0, 1]
Length: 364, dtype: object
```

```
print(df_test.apply(lambda col: col.unique()))
```

```
ID      [1, 2, 3, 4, 5, 8, 10, 11, 12, 14, 15, 16, 17,...
X0      [az, t, w, y, x, f, ap, o, ay, al, h, z, aj, d...
X1      [v, b, l, s, aa, r, a, i, p, c, o, m, z, e, h,...
X2      [n, ai, as, ae, s, b, e, ak, m, a, aq, ag, r, ...
X3                                  [f, a, c, e, d, g, b]
                              ...
X380                                               [0, 1]
X382                                               [0, 1]
X383                                               [0, 1]
X384                                               [0, 1]
X385                                               [0, 1]
Length: 377, dtype: object
```

Applying label Encoder for categorical columns

Finding columns which have categoraical values

```
categorical_col = df_train.select_dtypes(include=['object']).columns
```

```
categorical_col
```

```
Index(['X0', 'X1', 'X2', 'X3', 'X4', 'X5', 'X6', 'X8'],
dtype='object')
```

Applying LabelEncoding for the categorical columns

```
from sklearn.preprocessing import LabelEncoder

le = LabelEncoder()

df_train['X0'] = le.fit_transform(df_train.X0)
df_train['X1'] = le.fit_transform(df_train.X1)
df_train['X2'] = le.fit_transform(df_train.X2)
df_train['X3'] = le.fit_transform(df_train.X3)
df_train['X4'] = le.fit_transform(df_train.X4)
df_train['X5'] = le.fit_transform(df_train.X5)
df_train['X6'] = le.fit_transform(df_train.X6)
df_train['X8'] = le.fit_transform(df_train.X8)

df_train.head()
```

```
   X0  X1  X2  X3  X4  X5  X6  X8  X10  X12  ...  X375  X376  X377
X378  \
0  32  23  17   0   3  24   9  14    0    0  ...     0     0     1
0
1  32  21  19   4   3  28  11  14    0    0  ...     1     0     0
0
2  20  24  34   2   3  27   9  23    0    0  ...     0     0     0
0
3  20  21  34   5   3  27  11   4    0    0  ...     0     0     0
0
4  20  23  34   5   3  12   3  13    0    0  ...     0     0     0
0

   X379  X380  X382  X383  X384  X385
0     0     0     0     0     0     0
1     0     0     0     0     0     0
2     0     0     1     0     0     0
3     0     0     0     0     0     0
4     0     0     0     0     0     0

[5 rows x 364 columns]
```

```
df_train.shape
```

```
(4209, 364)
```

```
y = y.values

y = y.reshape(len(y),1)

print(df_train.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4209 entries, 0 to 4208
Columns: 364 entries, X0 to X385
dtypes: int32(8), int64(356)
memory usage: 11.6 MB
None
```

Performing Dimensionality Reduction

```
from sklearn.decomposition import PCA

pca = PCA(n_components = 0.95)

pca.fit(df_train,y)
```

```
PCA(n_components=0.95)
```

```
df_train_trans = pca.transform(df_train)

df_train_trans.shape
```

```
(4209, 6)
```

Predicting values with xgboost

Importing the required libraries

```
import xgboost as xgb
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score, mean_absolute_error,
mean_squared_error
from math import sqrt
```

Splitting the data into training and testing set

```
X_train, X_test, y_train, y_test = train_test_split(df_train_trans,y,
test_size=0.3)

print('\n','X_train:',X_train.shape, '\n','X_test:',X_test.shape,
      '\n','y_train:',y_train.shape, '\n', 'y_test:',y_test.shape)
```

```

 X_train: (2946, 6)
 X_test: (1263, 6)
 y_train: (2946, 1)
 y_test: (1263, 1)
```

```
xgb_regress = xgb.XGBRegressor(objective='reg:linear' ,n_estimator =
100)

xgb_regress.fit(X_train,y_train)
```

```
[23:15:43] WARNING: C:/Users/Administrator/workspace/xgboost-
win64_release_1.5.1/src/objective/regression_obj.cu:188: reg:linear is
now deprecated in favor of reg:squarederror.
[23:15:43] WARNING: C:/Users/Administrator/workspace/xgboost-
```

```
win64_release_1.5.1/src/learner.cc:576: 
Parameters: { "n_estimator" } might not be used.

  This could be a false alarm, with some parameters getting used by
language bindings but
  then being mistakenly passed down to XGBoost core, or some parameter
actually being used
  but getting flagged wrongly here. Please open an issue if you find
any such cases.
```

```
XGBRegressor(base_score=0.5, booster='gbtree', colsample_bylevel=1,
             colsample_bynode=1, colsample_bytree=1,
enable_categorical=False,
             gamma=0, gpu_id=-1, importance_type=None,
             interaction_constraints='', learning_rate=0.300000012,
             max_delta_step=0, max_depth=6, min_child_weight=1,
missing=nan,
             monotone_constraints='()', n_estimator=100,
n_estimators=100,
             n_jobs=4, num_parallel_tree=1, objective='reg:linear',
             predictor='auto', random_state=0, reg_alpha=0,
reg_lambda=1,
             scale_pos_weight=1, subsample=1, tree_method='exact',
             validate_parameters=1, verbosity=None)
```

Calculating Mean Squared error

```
print('RMSE = ',
sqrt(mean_squared_error(xgb_regress.predict(X_test),y_test)))
```

```
RMSE =  9.827058745016439
```

```
y_pred = xgb_regress.predict(X_test)
```

```
y_pred.shape
```

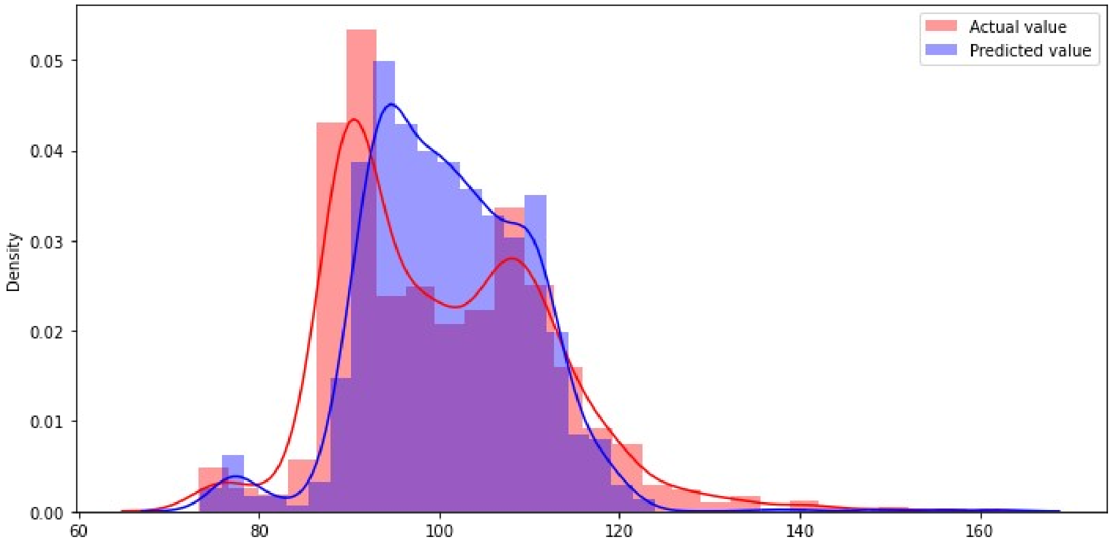
```
(1263,)
```

Plotting a distribution plot for y_test and y_pred

```
plt.figure(figsize=(10,5))

sns.distplot(y_test, color="red", label="Actual value")
sns.distplot(y_pred , color="blue", label="Predicted value")
plt.legend()

plt.tight_layout()
```



Predicting test set

Checking for null values

```
df_test.isna().any().sum()

0

df_test.shape

(4209, 377)

df_test.head()

   ID  X0 X1  X2 X3 X4 X5 X6 X8  X10  ...  X375  X376  X377  X378
X379  X380  \
0   1  az  v   n  f  d  t  a  w    0  ...     0     0     0     1
0     0
1   2   t  b  ai  a  d  b  g  y    0  ...     0     0     1     0
0     0
2   3  az  v  as  f  d  a  j  j    0  ...     0     0     0     1
0     0
3   4  az  l   n  f  d  z  l  n    0  ...     0     0     0     1
0     0
4   5   w  s  as  c  d  y  i  m    0  ...     1     0     0     0
0     0

   X382  X383  X384  X385
0     0     0     0     0
1     0     0     0     0
2     0     0     0     0
3     0     0     0     0
4     0     0     0     0

[5 rows x 377 columns]
```

Preprocessing the data for prediction

```
test_ID = df_test.pop('ID')

df_test.select_dtypes(include='object').columns

Index(['X0', 'X1', 'X2', 'X3', 'X4', 'X5', 'X6', 'X8'],
dtype='object')

df_test['X0'] = le.fit_transform(df_test['X0'])
df_test['X1'] = le.fit_transform(df_test['X1'])
df_test['X2'] = le.fit_transform(df_test['X2'])
df_test['X3'] = le.fit_transform(df_test['X3'])
df_test['X4'] = le.fit_transform(df_test['X4'])
df_test['X5'] = le.fit_transform(df_test['X5'])
df_test['X6'] = le.fit_transform(df_test['X6'])
df_test['X8'] = le.fit_transform(df_test['X8'])

df_test.select_dtypes(include='object').columns

Index([], dtype='object')

df_test.drop(columns=['X11','X93','X107','X233','X235','X268','X289','
X290','X293','X297','X330','X347'],inplace=True)

df_test.head()

   X0  X1  X2  X3  X4  X5  X6  X8  X10  X12  ...  X375  X376  X377
X378  \
0  21  23  34   5   3  26   0  22    0    0  ...     0     0     0
1
1  42   3   8   0   3   9   6  24    0    0  ...     0     0     1
0
2  21  23  17   5   3   0   9   9    0    0  ...     0     0     0
1
3  21  13  34   5   3  31  11  13    0    0  ...     0     0     0
1
4  45  20  17   2   3  30   8  12    0    0  ...     1     0     0
0

   X379  X380  X382  X383  X384  X385
0     0     0     0     0     0     0
1     0     0     0     0     0     0
2     0     0     0     0     0     0
3     0     0     0     0     0     0
4     0     0     0     0     0     0

[5 rows x 364 columns]

pca.fit(df_test)

PCA(n_components=0.95)
```

```
df_test_trans = pca.fit_transform(df_test)
```

```
df_test_trans.shape
```

```
(4209, 6)
```

```
test_pred = xgb_regress.predict(df_test_trans)
```

```
test_pred.shape
```

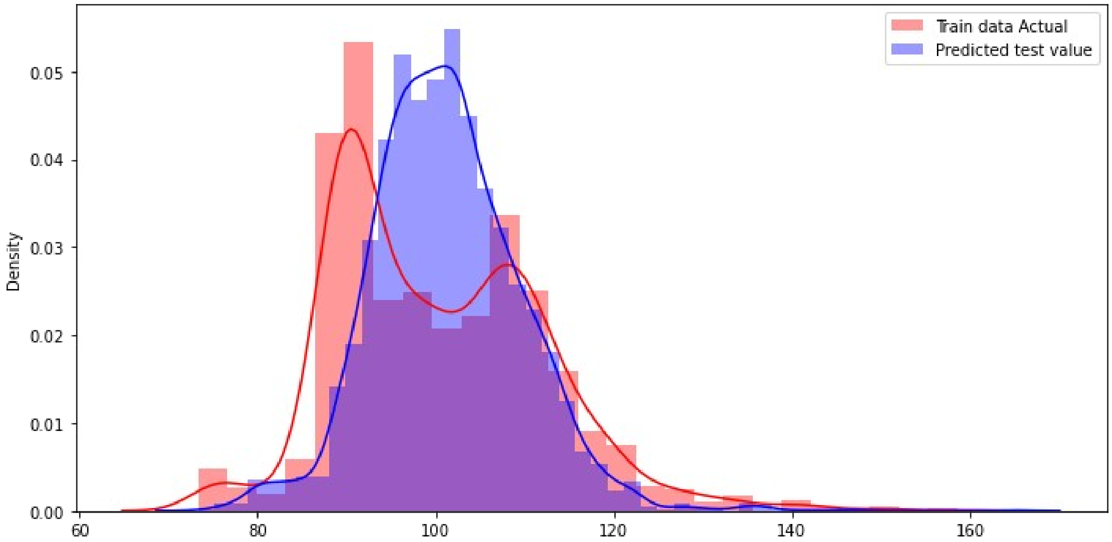
```
(4209,)
```

Plotting the distribution plot for y_test and test_pred

```
plt.figure(figsize=(10,5))

sns.distplot(y_test, color="red", label="Train data Actual")
sns.distplot(test_pred, color="blue", label="Predicted test value")
plt.legend()

plt.tight_layout()
```



Making use of whole train data and predicting test data

```
xgb_regress.fit(df_train_trans,y)
```

```
[23:15:47] WARNING: C:/Users/Administrator/workspace/xgboost-
win64_release_1.5.1/src/objective/regression_obj.cu:188: reg:linear is
now deprecated in favor of reg:squarederror.
[23:15:47] WARNING: C:/Users/Administrator/workspace/xgboost-
win64_release_1.5.1/src/learner.cc:576:
Parameters: { "n_estimator" } might not be used.

  This could be a false alarm, with some parameters getting used by
language bindings but
  then being mistakenly passed down to XGBoost core, or some parameter
```

```
actually being used
  but getting flagged wrongly here. Please open an issue if you find
any such cases.
```

```
XGBRegressor(base_score=0.5, booster='gbtree', colsample_bylevel=1,
             colsample_bynode=1, colsample_bytree=1,
enable_categorical=False,
             gamma=0, gpu_id=-1, importance_type=None,
             interaction_constraints='', learning_rate=0.300000012,
             max_delta_step=0, max_depth=6, min_child_weight=1,
missing=nan,
             monotone_constraints='()', n_estimator=100,
n_estimators=100,
             n_jobs=4, num_parallel_tree=1, objective='reg:linear',
             predictor='auto', random_state=0, reg_alpha=0,
reg_lambda=1,
             scale_pos_weight=1, subsample=1, tree_method='exact',
             validate_parameters=1, verbosity=None)
```

```
df_test_pred_full = xgb_regress.predict(df_test_trans)
```

Calculating Mse for train and test

```
sqrt(mean_squared_error(y,df_test_pred_full))
```

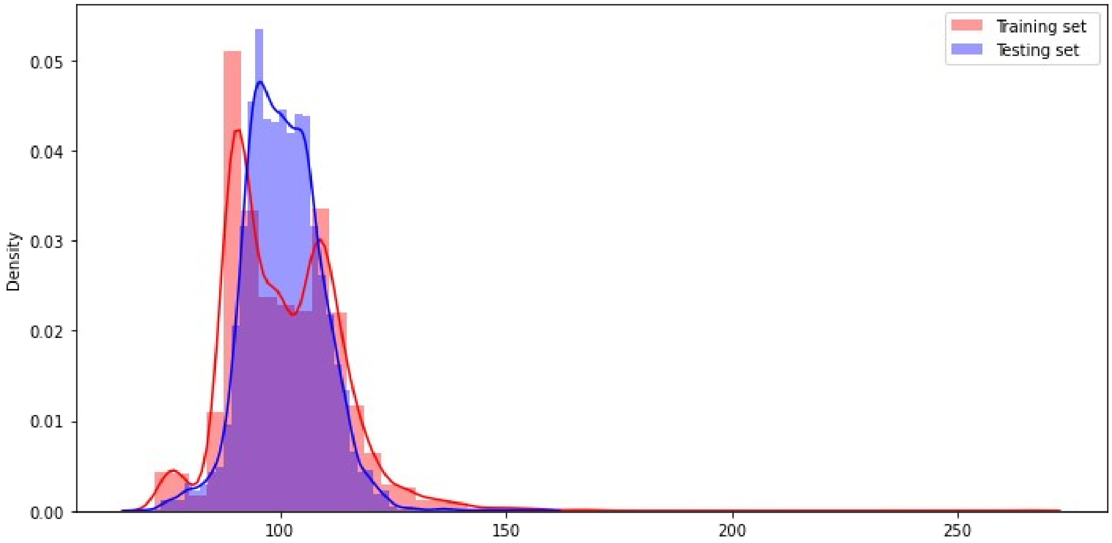
```
15.170848187406504
```

PLotting distribution plot fro train and test

```
plt.figure(figsize=(10,5))

sns.distplot(y, color="red", label="Training set ")
sns.distplot(df_test_pred_full, color="blue", label="Testing set")
plt.legend()

plt.tight_layout()
```



```
df_test_pred_full
```

```
array([ 74.01814 ,  91.05353 , 100.688675, ...,  95.88404 ,
104.61238 ,
        95.24522 ], dtype=float32)
```