```
import pandas as pd
import numpy as np
from sklearn.model selection import train test split
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make column transformer
from sklearn.feature selection import SelectFromModel, SelectKBest,
SelectPercentile, RFE
from sklearn.model selection import GridSearchCV, StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import RandomForestClassifier,
RandomForestRegressor
from sklearn.svm import SVC, SVR
from sklearn.metrics import classification report, confusion matrix,
ConfusionMatrixDisplay
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.pipeline import Pipeline
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear model import LogisticRegression
from sklearn.metrics import mean squared error, mean absolute error
from pandas.api.types import is numeric dtype
from sklearn.linear model import Ridge, Lasso
import matplotlib.pyplot as plt
properti = pd.read_csv('/Users/saktiyoga/Downloads/UTS PMDPM/Dataset
UTS Gasal 2425.csv')
properti.head(100)
# from google.colab import drive
# drive.mount('/content/drive')
# properti=pd.read csv('/content/drive/MyDrive/Colab
Notebooks/paris housing.csv')
# properti.head(100)
    squaremeters
                                                   floors
                  numberofrooms hasyard haspool
                                                           citycode \
0
                                                       63
           75523
                               3
                                                               9373
                                      no
                                              yes
1
                              58
                                                       19
           55712
                                      no
                                              yes
                                                              34457
2
           86929
                             100
                                                       11
                                                              98155
                                     yes
                                              no
3
           51522
                               3
                                                       61
                                                               9047
                                      no
                                               no
4
           96470
                              74
                                                       21
                                                              92029
                                     ves
                                               no
                                      . . .
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                                                      . . .
                             . . .
95
           98868
                                                              85917
                              41
                                                       67
                                      no
                                              yes
96
                              43
                                                       75
                                                              55046
           83110
                                     yes
                                              no
97
           71154
                              67
                                      no
                                              yes
                                                       53
                                                               8762
98
           90841
                              48
                                                       15
                                                              25300
                                     yes
                                               no
99
                              87
                                                       48
           68416
                                                              60979
                                     yes
                                   made isnewbuilt hasstormprotector
    citypartrange
                    numprevowners
basement \
0
                3
                                8
                                   2005
                                                old
                                                                   yes
4313
                6
                                8
                                                old
1
                                  2021
                                                                    no
```

2937		_				
2 6326	3	4	2003	ne	ew	no
3 632	8	3	2012	ne	ew .	yes
4 5414	4	2	2011	ne	ew	yes
95	7	3	2021	ne	ew .	yes
2146 96	7	10	2001	ne	ew .	no
4108 97	2	6	2021	ne	ew .	yes
8418 98	6	5	2003	ol	Ld	no
3333 99	8	7	2010	01	Ч	no
1811	O	,	2010	01	Lu	no
properti2	956 135 654 807 716 623 380 706 842	no yes no yes yes yes no no	-	estroom 7 9 10 5 9 3 7 8 9 6	price 7559081.5 5574642.1 8696869.3 5154055.2 9652258.1 9892300.1 8321631.1 7122699.1 9086177.3 6846709.6	Middle Luxury Middle Luxury Luxury Luxury Luxury Luxury Luxury Luxury Luxury Luxury
squar 0 1 2 3 4 95 96 97 98 99	emeters number 75523 55712 86929 51522 96470 98868 83110 71154 90841 68416	erofrooms ha 3 58 100 3 74 41 43 67 48 87	syard no no yes no yes no yes no yes	haspool yes yes no no no yes no yes no	floors 63 19 11 61 21 67 75 53 15 48	citycode \ 9373 34457 98155 9047 92029 85917 55046 8762 25300 60979

	itypar	range i	numprevowners	made	isnewbuilt hasstorm	protector
	nent \	2	0	2005	-1.4	
0 4313		3	8	2005	old	yes
1		6	8	2021	old	no
2937		U	O .	2021	otu	110
2		3	4	2003	new	no
6326						
3		8	3	2012	new	yes
632						
4		4	2	2011	new	yes
5414						
					• • • •	
95		7	3	2021	new	yes
2146		,	5	2021	new	ycs
96		7	10	2001	new	no
4108						
97		2	6	2021	new	yes
8418						
98		6	5	2003	old	no
3333		0	7	2010	.1.1	
99 1811		8	7	2010	old	no
9 1 2 3 4 95 96 97 98 99	9005 8852 4748 5792 1172 1077 5663 7187 149 6776	956 135 654 807 716 623 380 706 842 424	no yes no yes yes yes yes no no no no	hasgu	9 Middle 10 Luxury 5 Middle 9 Luxury 3 Luxury 7 Luxury 8 Luxury 9 Luxury 9 Middle	
[100	rows x	17 colu	mns]			
print	("data	kosong '	", properti2.i \n", properti2 , properti2.is	.empty	()	
	aremete erofroom ard		0 0 0 0			

```
floors
                      0
                      0
citycode
citypartrange
                      0
                      0
numprevowners
                      0
made
isnewbuilt
                      0
                      0
hasstormprotector
                      0
basement
                      0
attic
                      0
garage
                      0
hasstorageroom
                      0
hasguestroom
                      0
category
dtype: int64
data kosong
False
data nan
                      0
 squaremeters
                      0
numberofrooms
                      0
hasvard
                      0
haspool
floors
                      0
                      0
citycode
                      0
citypartrange
                      0
numprevowners
                      0
made
isnewbuilt
                      0
                      0
hasstormprotector
                      0
basement
attic
                      0
                     0
garage
                      0
hasstorageroom
                      0
hasguestroom
                      0
category
dtype: int64
print("Sebelum drop missing value", properti2.shape)
properti2 = properti2.dropna(how="any", inplace=False)
print("Setelah drop missing value", properti2.shape)
Sebelum drop missing value (10000, 17)
Setelah drop missing value (10000, 17)
print("Sebelum Pengecekan data duplikat", properti2.shape)
properti3 = properti2.drop duplicates(keep='last')
print("Setelah Pengecekan data duplikat", properti3.shape)
Sebelum Pengecekan data duplikat (10000, 17)
Setelah Pengecekan data duplikat (10000, 17)
```

```
kolom_kategori=['hasyard', 'haspool', 'isnewbuilt',
           'hasstormprotector', 'hasstorageroom']
transform = make column transformer(
    (OneHotEncoder(), kolom kategori),
    remainder = 'passthrough'
)
x=properti3.drop('category',axis=1)
y=properti3.category
x train, x test, y train, y test = train test split(x, y,
test size=0.20, random state=84)
print(x train.shape)
print(x test.shape)
(8000, 16)
(2000, 16)
x_train_enc = transform.fit_transform(x_train)
x test enc = transform.fit transform(x test)
df train enc = pd.DataFrame (x_train_enc,
columns=transform.get feature names out())
df test enc = pd.DataFrame (x test enc,
columns=transform.get feature names out())
df train enc.head(10)
df test enc.head(10)
   onehotencoder hasyard no
                               onehotencoder hasyard yes \
0
                          0.0
                                                       1.0
                          0.0
1
                                                       1.0
2
                          0.0
                                                       1.0
3
                          1.0
                                                       0.0
4
                          0.0
                                                       1.0
5
                          1.0
                                                       0.0
6
                          0.0
                                                       1.0
7
                          1.0
                                                       0.0
8
                          1.0
                                                       0.0
9
                          0.0
                                                       1.0
   onehotencoder haspool no
                               onehotencoder haspool yes \
0
                          0.0
                                                       1.0
1
                          0.0
                                                       1.0
2
                          0.0
                                                       1.0
3
                          0.0
                                                       1.0
4
                          0.0
                                                       1.0
5
                          0.0
                                                       1.0
6
                          0.0
                                                       1.0
7
                          1.0
                                                       0.0
```

```
8
                           1.0
                                                          0.0
9
                           0.0
                                                          1.0
                                     onehotencoder isnewbuilt old \
   onehotencoder isnewbuilt new
0
                                0.0
                                                                  1.0
1
2
3
                                1.0
                                                                  0.0
                                1.0
                                                                  0.0
                                1.0
                                                                  0.0
4
                                1.0
                                                                  0.0
5
                                1.0
                                                                  0.0
6
                                                                  0.0
                                1.0
7
                                                                  0.0
                                1.0
8
                                1.0
                                                                  0.0
9
                                1.0
                                                                  0.0
   onehotencoder__hasstormprotector_no
onehotencoder_hasstormprotector_yes \
0
                                      0.0
1.0
1
                                      1.0
0.0
                                      1.0
2
0.0
                                      1.0
3
0.0
                                      0.0
1.0
                                      0.0
5
1.0
                                      1.0
6
0.0
                                      0.0
7
1.0
8
                                      1.0
0.0
9
                                      1.0
0.0
   onehotencoder hasstorageroom no onehotencoder hasstorageroom yes
                                                                          0.0
                                   1.0
0
. . .
                                   1.0
                                                                          0.0
1
. . .
2
                                   0.0
                                                                          1.0
. . .
                                   1.0
                                                                          0.0
3
. . .
                                   1.0
                                                                          0.0
4
```

5			Θ	.0			1.0
6			Θ	.0			1.0
7			1	.0			0.0
8			0	.0			1.0
9			Θ	.0			1.0
76 0 1 2 3 4 5 6 7 8	emainder_	76 72 46 47 54 42 93	oms rema 7.0 5.0 2.0 5.0 4.0 7.0 4.0 2.0 7.0	inder	51.0 54.0 26.0 51.0 30.0 14.0 15.0 50.0 3.0 26.0	remainder_	_citycode \ 62899.0 82737.0 7812.0 91317.0 8424.0 50927.0 61691.0 50833.0 68804.0 67302.0
	emainder_	_citypartra	nge rema	inder	numprev	owners rem	aindermade
0			1.0			9.0	1990.0
1		-	7.0			3.0	1998.0
2		(5.0			3.0	1995.0
3		į	5.0			3.0	2020.0
4		4	1.0			10.0	2003.0
5		(9.0			6.0	1993.0
6		2	2.0			2.0	2002.0
7		3	3.0			8.0	2009.0
8		10	0.0			5.0	1991.0
9		(5.0			2.0	2005.0
re 0 1 2	emainder_	_basement 4110.0 4010.0 6972.0	remainder	attic 1675.0 8343.0 3804.0)	ndergarag 599. 260. 828.	0 0

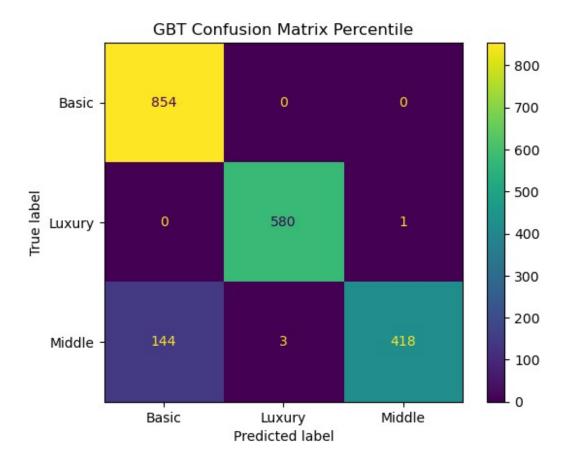
```
3
                                   7250.0
                3337.0
                                                        337.0
4
                5655.0
                                   1684.0
                                                        453.0
5
                4078.0
                                    315.0
                                                        767.0
6
                5925.0
                                   9705.0
                                                        342.0
7
                9320.0
                                   5752.0
                                                        936.0
8
                5804.0
                                   2070.0
                                                        846.0
9
                                    771.0
                                                        500.0
                6111.0
   remainder_hasguestroom
0
                       4.0
1
                       10.0
2
                       8.0
3
                        1.0
4
                       8.0
5
                       10.0
6
                       8.0
7
                       3.0
8
                       9.0
                       10.0
[10 rows x 21 columns]
pipe GBT kbest = Pipeline([
    ('scaler', StandardScaler()),
    ('feature_selection', SelectKBest()),
    ('classifier', GradientBoostingClassifier(random state=84))
1)
pipe GBT percentile = Pipeline([
    ('scaler', StandardScaler()),
    ('feature_selection', SelectPercentile()),
    ('classifier', GradientBoostingClassifier(random state=84))
1)
param grid GBT kbest = {
    'feature selection k': [3, 5],
    'classifier n estimators': [50, 100],
    'classifier learning rate': [0.005, 0.01],
    'classifier max depth': [3]
}
param grid GBT percentile = {
    'feature selection percentile': [30, 50],
    'classifier n estimators': [50, 100],
    'classifier_learning_rate': [0.005, 0.01],
    'classifier max depth': [3]
}
gscv_GBT_kbest = GridSearchCV(pipe_GBT_kbest, param_grid_GBT_kbest,
cv=StratifiedKFold(n splits=5))
```

```
gscv GBT kbest.fit(x train enc, y train)
print("GSCV finished")
gscv GBT percentile = GridSearchCV(pipe_GBT_percentile,
param grid GBT percentile, cv=StratifiedKFold(n splits=5))
gscv GBT percentile.fit(x train enc, y train)
print("GSCV finished")
GSCV finished
GSCV finished
mask =
gscv GBT kbest.best estimator .named steps['feature selection'].get su
pport()
print("Best model:{}".format(gscv GBT kbest.best estimator ))
print("Selected features:{}".format(df train enc.columns[mask]))
print("Best CV score: {:.2f}".format(gscv GBT kbest.best score ))
print("Train set score:
{:.2f}".format(gscv GBT kbest.score(x test enc,y test)))
GBT pred = gscv GBT kbest.predict(x test enc)
import matplotlib.pyplot as plt
cm = confusion matrix(y test, GBT pred,
labels=gscv GBT kbest.classes )
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=gscv GBT kbest.classes )
disp.plot()
plt.title("GBT Confusion Matrix KBest")
plt.show()
#tampilkan classification report
print("Classification report GBT KBest: \n",
classification report(y test,GBT pred))
mask =
gscv GBT percentile.best estimator .named steps['feature selection'].g
et support()
print("Best model:{}".format(gscv GBT percentile.best estimator ))
print("Selected features:{}".format(df train enc.columns[mask]))
print("Best CV score: {:.2f}".format(gscv GBT percentile.best score ))
print("Train set score:
{:.2f}".format(gscv GBT percentile.score(x test enc,y test)))
GBT pred = gscv GBT percentile.predict(x test enc)
import matplotlib.pyplot as plt
cm = confusion_matrix(y_test, GBT pred,
```

```
labels=gscv GBT percentile.classes )
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=gscv GBT percentile.classes )
disp.plot()
plt.title("GBT Confusion Matrix Percentile")
plt.show()
#tampilkan classification report
print("Classification report GBT Percentile: \n",
classification report(y test,GBT pred))
Best model:Pipeline(steps=[('scaler', StandardScaler()),
                ('feature_selection', SelectKBest(k=3)),
                ('classifier',
                 GradientBoostingClassifier(learning rate=0.005,
                                            n estimators=50,
                                            random state=84))])
Selected features:Index(['onehotencoder haspool no',
'onehotencoder haspool yes',
       'remainder__squaremeters'],
      dtype='object')
Best CV score: 0.94
Train set score: 0.93
```



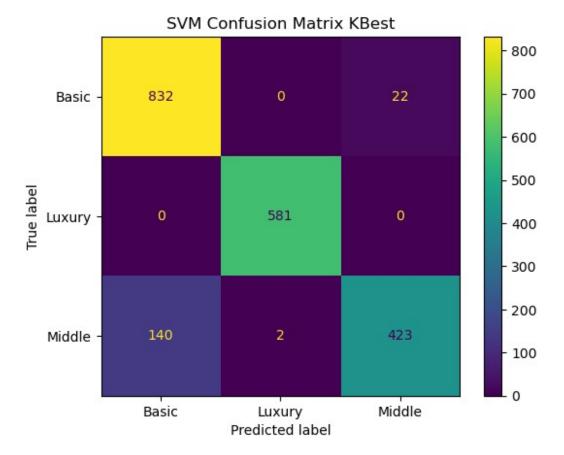
```
Classification report GBT KBest:
                precision
                               recall f1-score
                                                    support
        Basic
                     0.86
                                1.00
                                           0.92
                                                       854
                     0.99
                                1.00
                                           1.00
                                                        581
      Luxury
      Middle
                     1.00
                                0.74
                                           0.85
                                                       565
                                           0.93
                                                      2000
    accuracy
                                           0.92
   macro avq
                     0.95
                                0.91
                                                      2000
weighted avg
                     0.94
                                0.93
                                           0.92
                                                      2000
Best model:Pipeline(steps=[('scaler', StandardScaler()),
                  ('feature selection',
SelectPercentile(percentile=30)),
                  ('classifier',
                   GradientBoostingClassifier(learning rate=0.005,
                                                 n estimators=50,
                                                 random state=84))])
Selected features: Index(['onehotencoder hasyard no',
'onehotencoder hasyard yes',
        'onehotencoder__haspool_no', 'onehotencoder__haspool_yes', 'onehotencoder__isnewbuilt_new', 'remainder__squaremeters'],
      dtype='object')
Best CV score: 0.94
Train set score: 0.93
```



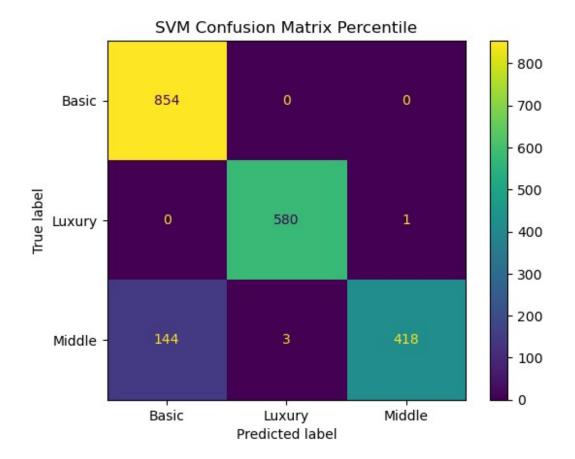
Classification	report GBT precision		e: fl-score	support				
Basic Luxury Middle	0.86 0.99 1.00	1.00 1.00 0.74	0.92 1.00 0.85	854 581 565				
accuracy macro avg weighted avg	0.95 0.94	0.91 0.93		2000 2000 2000				
<pre>weighted avg 0.94 0.93 0.92 2000 pipe_svm_percentile = Pipeline([('scaler', StandardScaler()), ('feature_selection', SelectPercentile()), ('classifier', SVC(random_state=84))])</pre>								
<pre>pipe_svm_kbest = Pipeline([('scaler', MinMaxScaler()), ('feature_selection', SelectKBest()), ('classifier', SVC(random_state=84))])</pre>								

```
param grid svm kbest = {
    'feature selection k': [2, 3, 5],
    'classifier__C': [0.01, 0.1, 1],
    'classifier kernel': ['rbf', 'linear']
}
param_grid_svm_percentile = {
    'feature_selection percentile': [20, 30, 50],
    'classifier__C': [0.01, 0.1, 1],
    'classifier__kernel': ['rbf', 'linear']
}
gscv SVM kbest = GridSearchCV(pipe svm kbest, param grid svm kbest,
cv=StratifiedKFold(n splits=5))
gscv SVM kbest.fit(x train enc, y train)
print("GSCV finished")
gscv SVM percentile = GridSearchCV(pipe svm percentile,
param grid svm percentile, cv=StratifiedKFold(n splits=5))
gscv SVM percentile.fit(x train enc, y train)
print("GSCV finished")
GSCV finished
GSCV finished
mask =
gscv SVM kbest.best estimator .named steps['feature selection'].get su
pport()
print("Best model:{}".format(gscv_SVM_kbest.best_estimator_))
print("Selected features:{}".format(df train enc.columns[mask]))
print("Best CV score: {:.2f}".format(gscv SVM kbest.best score ))
print("Train set score:
{:.2f}".format(gscv SVM kbest.score(x test enc,y test)))
SVM pred = gscv SVM kbest.predict(x test enc)
import matplotlib.pyplot as plt
cm = confusion matrix(y test, SVM pred,
labels=gscv_GBT_kbest.classes_)
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=qscv SVM kbest.classes )
disp.plot()
plt.title("SVM Confusion Matrix KBest")
plt.show()
#tampilkan classification report
print("Classification report SVM KBest: \n",
classification report(y test,SVM pred))
```

```
mask =
gscv SVM percentile.best estimator .named steps['feature selection'].g
et support()
print("Best model:{}".format(gscv SVM percentile.best estimator ))
print("Selected features:{}".format(df_train_enc.columns[mask]))
print("Best CV score: {:.2f}".format(gscv SVM percentile.best score ))
print("Train set score:
{:.2f}".format(gscv SVM percentile.score(x test enc,y test)))
SVM pred = gscv SVM percentile.predict(x_test_enc)
import matplotlib.pyplot as plt
cm = confusion matrix(y test, GBT pred,
labels=gscv SVM percentile.classes )
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=gscv SVM percentile.classes )
disp.plot()
plt.title("SVM Confusion Matrix Percentile")
plt.show()
#tampilkan classification report
print("Classification report SVM Percentile: \n",
classification report(y test,SVM pred))
('classifier', SVC(C=1, random_state=84))])
Selected features:Index(['onehotencoder haspool yes',
'remainder squaremeters'], dtype='object')
Best CV score: 0.93
Train set score: 0.92
```



Classification	•							
	precision	recall	f1-score	support				
	0.86			854				
Luxury	1.00	1.00	1.00	581				
Middle	0.95	0.75	0.84	565				
accuracy			0.92	2000				
macro avg	0.93	0.91	0.92	2000				
weighted avg	0.92	0.92	0.92	2000				
Best model:Pipe	line(steps= ('feature s		•	<pre>IScaler()),</pre>				
SelectPercentil	e(percentile	e=30)),						
	(ˈclassifie	er', SVC(C=1, random	state=84))])			
Selected featur								
'onehotencoder								
_	'onehotencoder haspool no', 'onehotencoder haspool yes',							
'onehotencoder isnewbuilt new', 'remainder squaremeters'],								
dtype='ob		_	,	<u></u> '	- /			
Best CV score:								
Train set score								



Classification	report SVM precision			cupport			
	precision	recatt	11-50016	Support			
_	0.99	0.99 0.99 0.98		854 581 565			
accuracy macro avg weighted avg	0.98 0.99	0.98 0.98		2000 2000 2000			
<pre>import pickle best_model = g</pre>	scv_SVM_perc	entile.be	st_estimato	or_			
<pre>with open('BestModel_CLF_gscv_SVM_percentile_matplotlib.pkl', 'wb') as f:</pre>							
<pre>pickle.dump(best_model, f) print("Model Terbaik berhasil disimpan ke 'BestModel_CLF_gscv_SVM_percentile_matplotlib.pkl.pkl'")</pre>							
Model Terbaik berhasil disimpan ke 'BestModel_CLF_gscv_SVM_percentile_matplotlib.pkl.pkl'							

```
import pandas as pd
import numpy as np
from sklearn.model selection import train test split
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make column transformer
from sklearn.feature selection import SelectFromModel, SelectKBest,
SelectPercentile, RFE
from sklearn.model selection import GridSearchCV, StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import RandomForestClassifier,
RandomForestRegressor
from sklearn.svm import SVC, SVR
from sklearn.metrics import classification report, confusion matrix,
ConfusionMatrixDisplay
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.pipeline import Pipeline
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear model import LogisticRegression
from sklearn.metrics import mean squared error, mean absolute error
from pandas.api.types import is numeric dtype
from sklearn.linear model import Ridge, Lasso
import matplotlib.pyplot as plt
properti = pd.read_csv('Dataset UTS Gasal 2425.csv')
properti.head(100)
                  numberofrooms hasyard haspool floors
    squaremeters
                                                           citycode \
0
           75523
                               3
                                      no
                                                       63
                                                               9373
                                              yes
1
           55712
                              58
                                                       19
                                                              34457
                                      no
                                              yes
2
                             100
           86929
                                     yes
                                               no
                                                       11
                                                              98155
3
           51522
                               3
                                                       61
                                      no
                                               no
                                                               9047
4
           96470
                              74
                                                       21
                                                              92029
                                     yes
                                               no
                                      . . .
                                              . . .
95
           98868
                              41
                                                       67
                                                              85917
                                      no
                                              yes
96
                              43
           83110
                                     yes
                                                       75
                                                              55046
                                               no
97
           71154
                              67
                                                       53
                                                               8762
                                      no
                                              yes
98
           90841
                              48
                                                       15
                                                              25300
                                     yes
                                               no
99
           68416
                              87
                                                       48
                                                              60979
                                     yes
                                               no
    citypartrange
                   numprevowners
                                   made isnewbuilt hasstormprotector
basement
                3
                                8
                                   2005
                                                old
                                                                   yes
4313
                6
                                8
                                   2021
                                                old
1
                                                                    no
2937
                3
                                4
                                   2003
                                                new
                                                                    no
6326
3
                8
                                3
                                   2012
                                                new
                                                                   yes
632
                4
                                2
                                   2011
                                                new
                                                                   yes
```

5414							
95 2146		7	3	2021	new		yes
96 4108		7	10	2001	new		no
97 8418		2	6	2021	new		yes
98 3333		6	5	2003	old		no
99 1811		8	7	2010	old		no
0 1 2 3 4	attic 9005 8852 4748 5792 1172	garage 956 135 654 807 716	hasstorageroom no yes no yes yes	hasgue	9 55 10 86 5 51	price 59081.5 74642.1 96869.3 54055.2 52258.1	category Luxury Middle Luxury Middle Luxury
95 96 97 98 99	1077 5663 7187 149 6776	623 380 706 842 424	yes yes no no no		7 83 8 71 9 90	92300.1 21631.1 22699.1 86177.3 46709.0	Luxury Luxury Luxury Luxury Middle
[100) rows	x 18 col	umns]				
		= proper head(<mark>100</mark>	rti.drop('price' <mark>)</mark>)	', axis	=1)		
0 1 2 3 4	square	meters 75523 55712 86929 51522 96470	numberofrooms h 3 58 100 3 74	nasyard no no yes no yes	haspool f yes yes no no	63 19 11 61 21	9373 9373 34457 98155 9047 92029
95 96 97 98 99		98868 83110 71154 90841 68416	41 43 67 48 87	no yes no yes yes	yes no yes no no	67 75 53 15 48	85917 55046 8762 25300 60979
hase		rtrange \	numprevowners	made :	isnewbuilt	hasstorr	mprotector
0 4313		3	8	2005	old		yes
1		6	8	2021	old		no

```
2937
                  3
                                      2003
2
                                                   new
                                                                         no
6326
                                   3
3
                  8
                                      2012
                                                   new
                                                                        yes
632
                                  2
                  4
                                      2011
                                                   new
                                                                        yes
5414
. .
                                                                        . . .
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                                      2021
95
                  7
                                  3
                                                   new
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2146
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96
                                                   new
                                                                         no
4108
97
                  2
                                  6
                                      2021
                                                   new
                                                                        yes
8418
                  6
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98
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3333
99
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1811
                                      hasguestroom category
    attic
            garage hasstorageroom
0
     9005
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                                                  7
                                                       Luxury
1
     8852
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2
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                                                       Luxury
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3
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4
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                                                       Luxury
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      . . .
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95
     1077
               623
                                                  3
                                                       Luxury
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96
                                                  7
     5663
               380
                                yes
                                                       Luxury
97
     7187
               706
                                                  8
                                                       Luxury
                                 no
                                                  9
98
      149
               842
                                 no
                                                       Luxury
99
     6776
               424
                                                  6
                                                       Middle
                                 no
[100 rows x 17 columns]
print("data null \n", properti2.isnull().sum())
print("data kosong \n", properti2.empty)
print("data nan \n", properti2.isna().sum())
data null
                        0
 squaremeters
numberofrooms
                       0
                       0
hasyard
                       0
haspool
                       0
floors
                       0
citycode
                       0
citypartrange
                       0
numprevowners
made
                       0
isnewbuilt
                       0
```

```
hasstormprotector
                     0
basement
                     0
attic
                     0
                     0
garage
                     0
hasstorageroom
                     0
hasguestroom
                     0
category
dtype: int64
data kosong
False
data nan
 squaremeters
                      0
numberofrooms
                     0
                     0
hasvard
haspool
                     0
                     0
floors
citycode
                     0
                     0
citypartrange
                     0
numprevowners
                     0
made
isnewbuilt
                     0
hasstormprotector
                     0
                     0
basement
                     0
attic
garage
                     0
                     0
hasstorageroom
                     0
hasguestroom
                     0
category
dtype: int64
print("Sebelum drop missing value", properti2.shape)
properti2 = properti2.dropna(how="any", inplace=False)
print("Setelah drop missing value", properti2.shape)
Sebelum drop missing value (10000, 17)
Setelah drop missing value (10000, 17)
print("Sebelum Pengecekan data duplikat", properti2.shape)
properti3 = properti2.drop duplicates(keep='last')
print("Setelah Pengecekan data duplikat", properti3.shape)
Sebelum Pengecekan data duplikat (10000, 17)
Setelah Pengecekan data duplikat (10000, 17)
kolom_kategori=['hasyard', 'haspool', 'isnewbuilt',
          'hasstormprotector', 'hasstorageroom']
transform = make column transformer(
    (OneHotEncoder(), kolom kategori),
    remainder = 'passthrough'
)
```

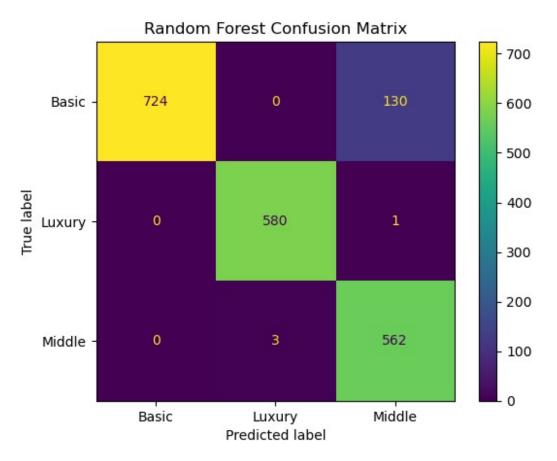
```
x=properti3.drop('category',axis=1)
y=properti3.category
x_train, x_test, y_train, y_test = train_test_split(x, y,
test size=0.20, random state=84)
print(x train.shape)
print(x test.shape)
(8000, 16)
(2000, 16)
x train enc = transform.fit transform(x train)
x test enc = transform.fit transform(x test)
df train enc = pd.DataFrame (x train enc,
columns=transform.get_feature_names_out())
df test enc = pd.DataFrame (x test enc,
columns=transform.get feature names out())
df train enc.head(10)
df test enc.head(10)
   onehotencoder hasyard no onehotencoder hasyard yes \
0
                          0.0
                                                       1.0
1
                          0.0
                                                       1.0
2
                          0.0
                                                       1.0
3
                          1.0
                                                       0.0
4
                          0.0
                                                       1.0
5
                          1.0
                                                       0.0
6
                          0.0
                                                       1.0
7
                          1.0
                                                       0.0
8
                          1.0
                                                       0.0
9
                          0.0
                                                       1.0
   onehotencoder haspool no
                               onehotencoder haspool yes \
0
                          0.0
                                                       1.0
1
                          0.0
                                                       1.0
2
                          0.0
                                                       1.0
3
                          0.0
                                                       1.0
4
                          0.0
                                                       1.0
5
                          0.0
                                                       1.0
6
                          0.0
                                                       1.0
7
                          1.0
                                                       0.0
8
                          1.0
                                                       0.0
9
                          0.0
                                                       1.0
                                  onehotencoder__isnewbuilt_old \
   onehotencoder__isnewbuilt_new
0
                              0.0
                                                               1.0
                              1.0
1
                                                               0.0
2
                              1.0
                                                               0.0
```

3 4 5 6 7 8 9	1.0 1.0 1.0 1.0 1.0 1.0		0.0 0.0 0.0 0.0 0.0 0.0	
onehotencode 0 1.0 1 0.0 2 0.0 3 0.0 4 1.0 5 1.0 6 0.0 7 1.0 8 0.0 9	coderhasstormprotector_noerhasstormprotector_yes erhasstormprotector_yes 0.0 1.0 1.0 0.0 0.0 1.0 1.0 1.0 1.0 1.0	3 3 3 3 3 3 3		
0.0				
onehoten \	coderhasstorageroom_no d 1.0	onehotencoder_	_hasstorageroom_yes 0.0	
1	1.0		0.0	
2	0.0		1.0	
3	1.0		0.0	
4	1.0		0.0	
5	0.0		1.0	
6	0.0		1.0	
7	1.0		0.0	

8		0.0		1.0
9	•	0.0		1.0
0 1 2 3 4 5 6 7 8 9	remaindernumberofrooms 97.0 76.0 72.0 46.0 4.0 47.0 54.0 42.0 97.0 18.0	remainder_	_floors remain 45.0 54.0 26.0 51.0 30.0 14.0 15.0 50.0 3.0 26.0	ndercitycode \ 62899.0 82737.0 7812.0 91317.0 8424.0 50927.0 61691.0 50833.0 68804.0 67302.0
\	remaindercitypartrange	remainder_	_numprevowners	remaindermade
ò	1.0		9.0	1990.0
1	7.0		3.0	1998.0
2	6.0		3.0	1995.0
3	5.0		3.0	2020.0
4	4.0		10.0	2003.0
5	9.0		6.0	1993.0
6	2.0		2.0	2002.0
7	3.0		8.0	2009.0
8	10.0		5.0	1991.0
9	6.0		2.0	2005.0
0 1 2 3 4 5 6 7 8	remainderbasement rema 4110.0 4010.0 6972.0 3337.0 5655.0 4078.0 5925.0 9320.0 5804.0	inderattic 1675.0 8343.0 3804.0 7250.0 1684.0 315.0 9705.0 5752.0		garage \ 599.0 260.0 828.0 337.0 453.0 767.0 342.0 936.0 846.0

```
9
                6111.0
                                   771.0
                                                       500.0
   remainder hasquestroom
0
                       4.0
1
                      10.0
2
                       8.0
3
                       1.0
4
                       8.0
5
                      10.0
6
                       8.0
7
                       3.0
8
                       9.0
9
                      10.0
[10 rows x 21 columns]
#import Library yang dibutuhkan
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.feature selection import SelectKBest, SelectPercentile
from sklearn.ensemble import RandomForestClassifier
from sklearn.pipeline import Pipeline
from sklearn.model selection import GridSearchCV, StratifiedKFold
import numpy as np
#buat rancangan pipeline mulai dari data scaling hingga classifier
pipe RF = [
    ('data scaling', StandardScaler()),
    ('feature select', SelectKBest()),
    ('clf', RandomForestClassifier(random state=84,
class weight='balanced'))
#buat parameter grid untuk step feature selection dan classifier
params qrid RF = [
    {
        'data scaling': [StandardScaler()],
        'feature select__k': np.arange(2, 6),
        'clf max depth': np.arange(4, 6), # Ubah dari 4-5 menjadi 4-
6
        'clf__n_estimators': [50, 100]  # Ubah dari 100, 150 menjadi
50, 100
    },
    {
        'data scaling': [MinMaxScaler()],
        'feature select k': np.arange(2, 6),
        'clf max depth': np.arange(4, 6), # Ubah dari 4-5 menjadi 4-
6
        'clf n estimators': [50, 100] # Ubah dari 100, 150 menjadi
50, 100
```

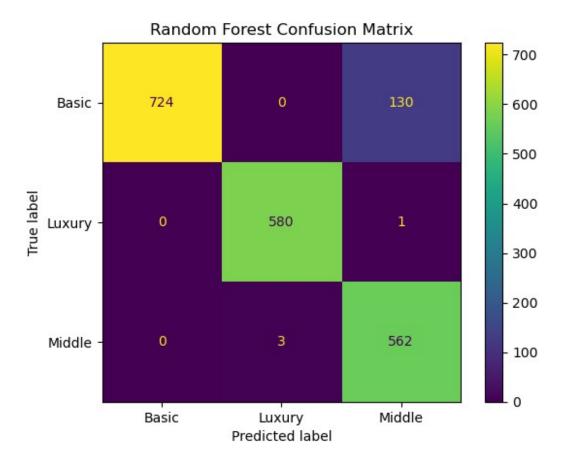
```
},
1
#muat tancangan pipeline ke dalam objek pipeline
estimator RF = Pipeline(pipe RF)
#muat pipeline dan parameter grid ke dalam objek GSCV dengan
Stratified 5-fold CV
SKF = StratifiedKFold(n splits=5, shuffle=True, random state=84) #
RANDOM STATE MENGGUNAKAN 2 atau 1 DIGIT
GSCV RF = GridSearchCV(estimator RF, params grid RF, cv=SKF)
#jalankan objek GSCV untuk melatih model dengan train set menggunakan
fungsi fit
GSCV RF.fit(x train enc, y train)
print("GSCV training finished")
GSCV training finished
#tampilkan skor cross-validation
print("CV Score: {}".format(GSCV RF.best score ))
#tampilkan skor model terbaik GSCV pada test set
print("Test Score:
{}".format(GSCV RF.best estimator .score(x test enc, y test)))
#tampilkan best model dan best features
print("Best model:", GSCV RF.best estimator )
mask = GSCV RF.best estimator .named steps['feature
select'].get support()
print("Best features:", df train enc.columns[mask])
#buat prediksi dari test set
RF pred = GSCV RF.predict(x test enc)
import matplotlib.pyplot as plt
#buat confusion matrix
cm = confusion_matrix(y_test, RF_pred, labels=GSCV RF.classes )
#buat confusion matrix display
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display_labels=GSCV_RF.classes )
disp.plot()
plt. title("Random Forest Confusion Matrix")
plt.show()
#tampilkan Classification report
print("Classification report RF: \n", classification report(y test,
RF pred))
CV Score: 0.937875
Test Score: 0.933
Best model: Pipeline(steps=[('data scaling', StandardScaler()),
```



Classification	report RF: precision	recall	f1-score	support
Basic Luxury Middle	1.00 0.99 0.81	0.85 1.00 0.99	0.92 1.00 0.89	854 581 565
accuracy macro avg weighted avg	0.94 0.95	0.95 0.93	0.93 0.94 0.93	2000 2000 2000

```
#import Library yang dibutuhkan
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.feature selection import SelectPercentile
from sklearn.ensemble import RandomForestClassifier
from sklearn.pipeline import Pipeline
from sklearn.model selection import GridSearchCV, StratifiedKFold
import numpy as np
# Buat rancangan pipeline mulai dari data scaling hingga classifier
pipe RF percentil = [('data scaling', StandardScaler()),
                     ('feature_select', SelectPercentile()),
                     ('clf', RandomForestClassifier(random state=84,
class weight='balanced'))]
# Buat parameter grid untuk step feature selection dan classifier
params grid RF percentil = [{
                    'data scaling': [StandardScaler()],
                    'feature select': [SelectPercentile()],
                    'feature_select__percentile': np.arange(30, 51),
                    'clf max depth': np.arange(4, 6),
                    'clf__n_estimators': [50, 100, 150, 200]
                    },
                'data scaling': [MinMaxScaler()],
                'feature select': [SelectPercentile()],
                'feature select percentile': np.arange(30, 51),
                'clf max depth': np.arange(4, 6),
                'clf n estimators': [50, 100, 150, 200]
                }]
# Definisikan StratifiedKFold
SKF = StratifiedKFold(n splits=5, shuffle=True, random state=84)
# Muat tancangan pipeline ke dalam objek pipeline
estimator RF = Pipeline(pipe RF percentil)
# Muat pipeline dan parameter grid ke dalam objek GSCV dengan
Stratified 5-fold CV
GSCV RF = GridSearchCV(estimator RF, params grid RF percentil, cv=SKF)
# Jalankan objek GSCV untuk melatih model dengan train set menggunakan
funasi fit
GSCV RF.fit(x train enc, y train)
print("GSCV training finished")
GSCV training finished
#tampilkan skor cross-validation
print("CV Score: {}".format(GSCV RF.best score ))
#tampilkan skor model terbaik GSCV pada test set
```

```
print("Test Score:
{}".format(GSCV RF.best estimator .score(x test enc, y test)))
#tampilkan best model dan best features
print("Best model:", GSCV RF.best estimator )
mask = GSCV RF.best estimator .named steps['feature
select'].get support()
print("Best features:", df train enc.columns[mask])
#buat prediksi dari test set
RF pred = GSCV RF.predict(x test enc)
import matplotlib.pyplot as plt
#buat confusion matrix
cm = confusion matrix(y test, RF pred, labels=GSCV RF.classes )
#buat confusion matrix display
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=GSCV RF.classes )
disp.plot()
plt. title("Random Forest Confusion Matrix")
plt.show()
#tampilkan Classification report
print("Classification report RF: \n", classification report(y test,
RF pred))
CV Score: 0.937875
Test Score: 0.933
Best model: Pipeline(steps=[('data scaling', StandardScaler()),
                ('feature select', SelectKBest(k=4)),
                ('clf',
                 RandomForestClassifier(class weight='balanced',
max depth=4,
                                        n estimators=50,
random state=84))])
Best features: Index(['onehotencoder hasyard yes',
'onehotencoder haspool no',
       'onehotencoder haspool yes', 'remainder squaremeters'],
      dtype='object')
```



Classification	wassat DE.				
Classification			£1		
	precision	recall	f1-score	support	
D ' -	1 00	0.05	0.00	0.5.4	
Basic	1.00	0.85	0.92	854	
Luxury	0.99	1.00	1.00	581	
Middle	0.81	0.99	0.89	565	
accuracy			0.93	2000	
macro avg	0.94	0.95	0.94	2000	
weighted avg	0.95	0.93	0.93	2000	
#import Library from sklearn.pr from sklearn.lr from sklearn.lr from sklearn.pr from sklearn.mr import numpy as # Buat rancanga pipe_LR_percent	reprocessing eature_select inear_model i ipeline impor odel_selection in pipeline i iii = [('data	import Maion import Lort Pipelion import mulai dar a_scaling	rt SelectPe gisticRegre ne GridSearch <i>i data scal</i> ', Standard	ercentile ession CV, Stratified ing hingga cla	KFold essifier

```
('clf', LogisticRegression(random state=84,
class weight='balanced', solver='liblinear'))]
# Buat parameter grid untuk step feature selection dan classifier
params grid LR percentil = [{
                    'data scaling': [StandardScaler()],
                    'feature_select': [SelectPercentile()],
                    'feature select percentile': np.arange(30, 51),
                    'clf__C': [0.01, 0.1, 1, 10],
                    'clf penalty': ['l1', 'l2']
                    },
                {
                'data scaling': [MinMaxScaler()],
                'feature select': [SelectPercentile()],
                'feature select percentile': np.arange(30, 51),
                'clf__C': [0.01, 0.1, 1, 10],
                'clf penalty': ['l1', 'l2']
                }]
# Definisikan StratifiedKFold
SKF = StratifiedKFold(n splits=5, shuffle=True, random state=84)
# Muat tancangan pipeline ke dalam objek pipeline
estimator LR = Pipeline(pipe LR percentil)
# Muat pipeline dan parameter grid ke dalam objek GSCV dengan
Stratified 5-fold CV
GSCV LR = GridSearchCV(estimator LR, params grid LR percentil, cv=SKF)
# Jalankan objek GSCV untuk melatih model dengan train set menggunakan
funasi fit
GSCV LR.fit(x train enc, y train)
print("GSCV training finished")
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
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of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
```

```
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
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c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\_base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\_base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
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c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
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c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
```

```
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\_base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
  warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\_base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
of iterations.
 warnings.warn(
c:\Users\capsl\anaconda3\Lib\site-packages\sklearn\svm\ base.py:1237:
ConvergenceWarning: Liblinear failed to converge, increase the number
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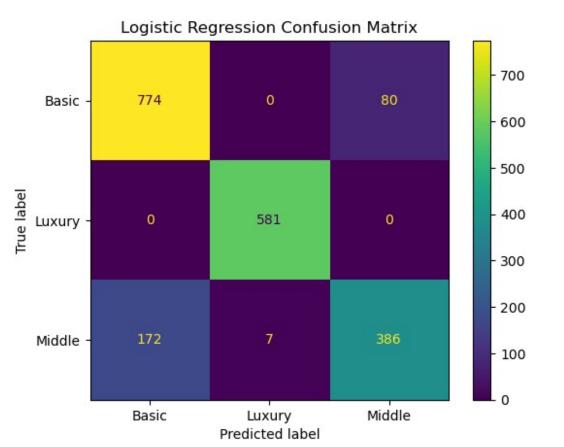
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of iterations.
 warnings.warn(
# tampilkan skor cross-validation
print("CV Score: {}".format(GSCV LR.best score ))
# tampilkan skor model terbaik GSCV pada test set
print("Test Score:
{}".format(GSCV LR.best estimator .score(x test enc, y test)))
# tampilkan best model dan best features
print("Best model:", GSCV LR.best estimator )
# Mendapatkan fitur terbaik berdasarkan seleksi fitur
mask =
GSCV_LR.best_estimator_.named_steps['feature_select'].get_support()
print("Best features:", df train enc.columns[mask])
# buat prediksi dari test set
LR pred = GSCV LR.predict(x test enc)
import matplotlib.pyplot as plt
from sklearn.metrics import confusion matrix, ConfusionMatrixDisplay,
classification report
# buat confusion matrix
cm = confusion matrix(y test, LR pred, labels=GSCV LR.classes )
# buat confusion matrix display
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display labels=GSCV LR.classes )
disp.plot()
plt.title("Logistic Regression Confusion Matrix")
plt.show()
# tampilkan Classification report
```

```
print("Classification report LR: \n", classification_report(y_test,
LR pred))
CV Score: 0.88025
Test Score: 0.8705
Best model: Pipeline(steps=[('data scaling', StandardScaler()),
                ('feature_select', SelectPercentile(percentile=41)),
                ('clf',
                 LogisticRegression(C=10, class weight='balanced',
penalty='l1',
                                    random_state=84,
solver='liblinear'))])
Best features: Index(['onehotencoder hasyard no',
'onehotencoder__hasyard_yes',
       'onehotencoder haspool no', 'onehotencoder haspool yes',
       'onehotencoder isnewbuilt new',
'onehotencoder__isnewbuilt_old',
       'remainder__squaremeters', 'remainder__numberofrooms',
       'remainder basement'],
      dtype='object')
```



```
Classification report LR:
                            recall f1-score support
               precision
                   0.82
                             0.91
                                       0.86
                                                  854
       Basic
                   0.99
                             1.00
                                       0.99
                                                  581
     Luxury
     Middle
                   0.83
                             0.68
                                       0.75
                                                  565
                                       0.87
                                                 2000
    accuracy
   macro avq
                   0.88
                             0.86
                                       0.87
                                                 2000
weighted avg
                   0.87
                             0.87
                                       0.87
                                                 2000
#import Library yang dibutuhkan
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.feature selection import SelectKBest
from sklearn.linear model import LogisticRegression
from sklearn.pipeline import Pipeline
from sklearn.model selection import GridSearchCV, StratifiedKFold
import numpy as np
# buat rancangan pipeline mulai dari data scaling hingga classifier
pipe LR = [
    ('data scaling', StandardScaler()),
    ('feature select', SelectKBest()),
    ('clf', LogisticRegression(random state=84,
class weight='balanced', solver='liblinear')) # Menentukan solver
# buat parameter grid untuk step feature selection dan classifier
params grid LR = [
    {
        'data scaling': [StandardScaler()],
        'feature select__k': np.arange(2, 6),
        'clf C': [0.01, 0.1, 1, 10], # Regularization strength
        'clf__penalty': ['l1', 'l2'] # Jenis penalty
    },
        'data scaling': [MinMaxScaler()],
        'feature select k': np.arange(2, 6),
        'clf C': [0.01, 0.1, 1, 10],
        'clf penalty': ['l1', 'l2']
    },
]
# muat tancangan pipeline ke dalam objek pipeline
estimator LR = Pipeline(pipe LR)
# muat pipeline dan parameter grid ke dalam objek GSCV dengan
Stratified 5-fold CV
SKF = StratifiedKFold(n_splits=5, shuffle=True, random state=84)
```

```
GSCV LR = GridSearchCV(estimator LR, params grid LR, cv=SKF)
# jalankan objek GSCV untuk melatih model dengan train set menggunakan
fungsi fit
GSCV LR.fit(x train enc, y train)
print("GSCV training finished")
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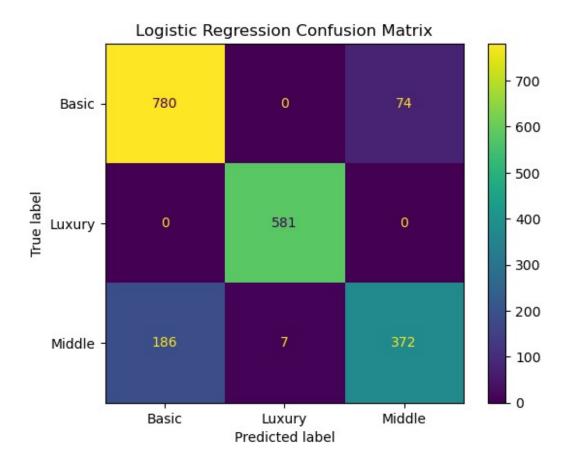
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# tampilkan skor cross-validation
print("CV Score: {}".format(GSCV LR.best score ))
# tampilkan skor model terbaik GSCV pada test set
print("Test Score:
{}".format(GSCV LR.best estimator .score(x test enc, y test)))
# tampilkan best model dan best features
print("Best model:", GSCV LR.best estimator )
# Mendapatkan fitur terbaik berdasarkan seleksi fitur
mask = GSCV LR.best estimator .named steps['feature
```

```
select'].get support()
print("Best features:", df train enc.columns[mask])
# buat prediksi dari test set
LR pred = GSCV LR.predict(x test enc)
import matplotlib.pyplot as plt
from sklearn.metrics import confusion matrix, ConfusionMatrixDisplay,
classification report
# buat confusion matrix
cm = confusion matrix(y test, LR pred, labels=GSCV LR.classes )
# buat confusion matrix display
disp = ConfusionMatrixDisplay(confusion matrix=cm,
display_labels=GSCV LR.classes )
disp.plot()
plt.title("Logistic Regression Confusion Matrix")
plt.show()
# tampilkan Classification report
print("Classification report LR: \n", classification report(y test,
LR pred))
CV Score: 0.882
Test Score: 0.8665
Best model: Pipeline(steps=[('data scaling', StandardScaler()),
                ('feature select', SelectKBest(k=5)),
                ('clf',
                 LogisticRegression(C=10, class weight='balanced',
penalty='l1',
                                    random state=84,
solver='liblinear'))])
Best features: Index(['onehotencoder hasyard no',
'onehotencoder hasyard yes',
       'onehotencoder haspool no', 'onehotencoder haspool yes',
       'remainder squaremeters'],
      dtype='object')
```



Classification	report LR: precision	recall	f1-score	support
Basic Luxury Middle	0.81 0.99 0.83	0.91 1.00 0.66	0.86 0.99 0.74	854 581 565
accuracy macro avg weighted avg	0.88 0.87	0.86 0.87	0.87 0.86 0.86	2000 2000 2000

```
import pandas as pd
import numpy as np
from sklearn.model selection import train test split
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make column transformer
from sklearn.feature selection import SelectFromModel, SelectKBest,
SelectPercentile, RFE
from sklearn.model selection import GridSearchCV, StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import RandomForestClassifier,
RandomForestRegressor
from sklearn.svm import SVC, SVR
from sklearn.metrics import classification report, confusion matrix,
ConfusionMatrixDisplay
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.pipeline import Pipeline
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear model import LogisticRegression
from sklearn.metrics import mean squared error, mean absolute error
from pandas.api.types import is numeric dtype
from sklearn.linear model import Ridge, Lasso
import matplotlib.pyplot as plt
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pd.read csv('/Users/saktiyoga/Downloads/UTS PMDPM/Dataset UTS Gasal
2425.csv')
properti price.head(100)
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,			0	2005	0.0	u	y C 3

431: 1	3	6	8	2021		old		no	
293	7					otu		no	
2 632	6	3	4	2003		new		no	
3		8	3	2012		new		yes	
632 4		4	2	2011		new		yes	
541	4								
				2021		• • • •			
95 214	6	7	3	2021		new		yes	
96		7	10	2001		new		no	
4108 97	5	2	6	2021		new		yes	
8418 98	8	6	5	2003		old		no	
333	3								
99 181	1	8	7	2010		old		no	
			h 	h					
0 1 2 3 4	9005 8852 4748 5792 1172	garage 956 135 654 807 716	hasstorageroom no yes no yes yes	nasgi	uestroo 1	7 755 9 557 10 869 5 515	price 59081.5 74642.1 96869.3 54055.2 52258.1		
95 96 97 98 99	1077 5663 7187 149 6776	623 380 706 842 424	yes yes no no no			3 989 7 832 8 712 9 908	2300.1 21631.1 22699.1 36177.3		
[10	o rows	x 17 col	umns]						
pro	perti p	rice2.in	fo						
<box< td=""><td>und met</td><td></td><td>Frame.info of</td><td></td><td>squarem</td><td>neters</td><td>numbero</td><td>frooms</td><td></td></box<>	und met		Frame.info of		squarem	neters	numbero	frooms	
0 1 2 3 4		75523 55712 86929 51522 96470	58 100 3	3 3) <u>y</u>	no no /es no /es	yes yes no no no	63 19 11 61 21	9373 34457 98155 9047 92029	
9999 9999 9999	6	341 21514 1726	83 5 89	} 5	no no no	no yes yes	8 11 5	1960 91373 73133	

9998 9999		403 440		29 84	yes no		yes no	12 49	34606 18412
	citypartr	ange r	numprevow	ners	made	isne	wbuilt	hasstor	mprotector
0		3		8	2005		old		yes
1		6		8	2021		old		no
2		3		4	2003		new		no
3		8		3	2012		new		yes
4		4		2	2011		new		yes
9995		4		4	1993		new		yes
9996		1		1	1999		old		no
9997		7		6	2009		old		yes
9998		9		4	1990		old		yes
9999		6		10	1994		new		no
	hacamant	2++16	a2 r2 a0	hacc+	. 0 . 5 . 5 . 6 . 6		hacau	actroom	price
0	basement	attic	garage	nasst	or ager		nasgue	estroom	price
0	4313	9005	956			no		7	7559081.5
1	2937	8852	135			yes		9	5574642.1
2	6326	4748	654			no		10	8696869.3
3	632	5792	807			yes		5	5154055.2
4	5414	1172	716			yes		9	9652258.1
9995	2366	4016	229			yes		5	35371.3
9996	2584	5266	787			no		3	2153602.9
9997	9311	1698	218			no		4	176425.9
9998	9061	1742	230			no		0	4448474.0
9999	8485	2024	278			yes		6	146708.4

[10000 rows x 17 columns]> properti price2.describe() numberofrooms floors citycode squaremeters citypartrange \ 10000.00000 10000.000000 10000.000000 10000.000000 count 10000.000000 49870.13120 50.358400 50.276300 50225.486100 mean 5.510100 28774.37535 28.816696 28.889171 29006.675799 std 2.872024 min 89.00000 1.000000 1.000000 3.000000 1.000000 25% 25098.50000 25.000000 25.000000 24693.750000 3.000000 50% 50105.50000 50.000000 50.000000 50693.000000 5.000000 75% 75,000000 76.000000 75683,250000 74609.75000 8.000000 99999.00000 100.000000 100.000000 99953.000000 max 10.000000 numprevowners made basement attic garage count 10000.000000 10000.00000 10000.000000 10000.00000 10000.00000 5.521700 2005.48850 5033.103900 5028.01060 mean 553.12120 2876.729545 std 2.856667 9.30809 2894.33221 262.05017 1.000000 1990.00000 0.000000 1.00000 min 100.00000 25% 3.000000 1997.00000 2559.750000 2512.00000 327.75000 50% 5.000000 2005.50000 5092.500000 5045.00000 554.00000 75% 8.000000 2014.00000 7511.250000 7540.50000 777.25000 10.000000 2021.00000 10000.000000 10000.00000 max 1000.00000 hasquestroom price 10000.00000 1.000000e+04 count 4.99460 4.993448e+06 mean std 3.17641 2.877424e+06 0.00000 1.031350e+04 min 2.00000 2.516402e+06 25%

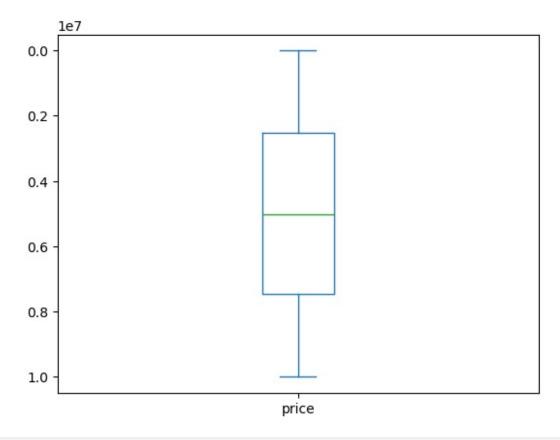
5.016180e+06

5.00000

50%

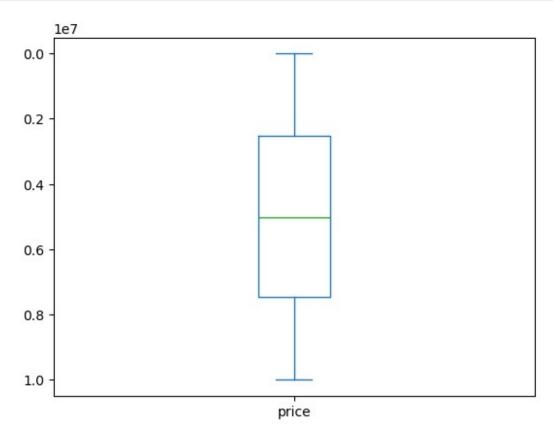
```
75%
            8.00000
                      7.469092e+06
           10.00000
                      1.000677e+07
max
print(properti_price2['price'].value_counts())
price
7559081.5
             1
2600292.1
              1
3804577.4
              1
              1
3658559.7
2316639.4
              1
5555606.6
             1
5501007.5
             1
9986201.2
             1
              1
9104801.8
             1
146708.4
Name: count, Length: 10000, dtype: int64
print("data null \n", properti_price2.isnull().sum())
print("data kosong \n", properti_price2.empty)
print("data nan \n", properti price2.isna().sum())
data null
 squaremeters
                       0
                      0
numberofrooms
hasyard
                      0
haspool
                      0
                      0
floors
                      0
citycode
                      0
citypartrange
numprevowners
                      0
made
                      0
                      0
isnewbuilt
hasstormprotector
                      0
                      0
basement
attic
                      0
                      0
garage
                      0
hasstorageroom
                      0
hasguestroom
                      0
price
dtype: int64
data kosong
 False
data nan
                       0
 squaremeters
                      0
numberofrooms
                      0
hasyard
haspool
                      0
floors
                      0
```

```
citycode
                      0
citypartrange
                      0
                      0
numprevowners
                      0
made
                      0
isnewbuilt
                      0
hasstormprotector
                      0
basement
attic
                      0
                      0
garage
                      0
hasstorageroom
                      0
hasguestroom
                      0
price
dtype: int64
properti price2.price.plot(kind='box')
plt.gca().invert_yaxis()
plt.show()
```



```
def remove_outlier(df_in):
    for col_name in list(df_in):
        if is_numeric_dtype(df_in[col_name]):
        q1 = df_in[col_name].quantile(0.25)
        q3 = df_in[col_name].quantile(0.75)
```

```
iqr = q3-q1
      batas atas = q3+(iqr*1.5)
      batas\_bawah = q1-(iqr*1.5)
      df out = df in.loc[(df in[col name]>=batas bawah) &
(df_in[col_name]<=batas_atas)]</pre>
  return df out
properti_price_clean = remove_outlier(properti_price2)
print("Jumlah baris DataFrame sebelum di
outlier",properti_price2.shape[0])
print("Jumlah baris DataFrame sesudah di
outlier",properti_price_clean.shape[0])
properti price clean.price.plot(kind='box', vert=True)
plt.gca().invert_yaxis()
plt.show()
Jumlah baris DataFrame sebelum di outlier 10000
Jumlah baris DataFrame sesudah di outlier 10000
```



```
print("data null \n", properti_price_clean.isnull().sum())
print("data kosong \n", properti_price_clean.empty)
print("data nan \n", properti_price_clean.isna().sum())
data null
                       0
 squaremeters
numberofrooms
                      0
                      0
hasyard
                      0
haspool
floors
                      0
                      0
citycode
citypartrange
                      0
                      0
numprevowners
                      0
made
isnewbuilt
                      0
                      0
hasstormprotector
basement
                      0
                      0
attic
                      0
garage
                      0
hasstorageroom
                      0
hasquestroom
price
                      0
dtype: int64
data kosong
False
data nan
                       0
 squaremeters
numberofrooms
                      0
hasyard
                      0
                      0
haspool
floors
                      0
citycode
                      0
citypartrange
                      0
                      0
numprevowners
                      0
made
isnewbuilt
                      0
hasstormprotector
                      0
basement
                      0
                      0
attic
                      0
garage
hasstorageroom
                      0
                      0
hasguestroom
price
                      0
dtype: int64
X_regress=properti_price_clean.drop('price',axis=1)
y regress=properti price clean.price
X_train_price, X_test_price, y_train_price, y_test_price =
```

```
train test split(X regress, y regress, test size=0.20,
random state=84)
X regress=properti price clean.drop('price',axis=1)
y regress=properti price clean.price
X_train_ins, X_test_ins, y_train_ins, y_test_ins =
train test split(X regress, y regress, test size=0.20,
random state=84)
cat cols =
X train ins.select dtypes(include=['object']).columns.tolist()
print("Kolom kategorik:",cat cols)
transformer = make column transformer(
    (OneHotEncoder(), cat cols),
    remainder = 'passthrough'
)
X train enc = transformer.fit transform(X train ins)
X test enc = transformer.transform(X test ins)
df train enc = pd.DataFrame (X train enc,
columns=transformer.get feature names out())
df test enc = pd.DataFrame (X test enc,
columns=transformer.get feature names out())
df train enc.head(10)
df test enc.head(10)
Kolom kategorik: ['hasyard', 'haspool', 'isnewbuilt',
'hasstormprotector', 'hasstorageroom']
   onehotencoder hasyard no onehotencoder hasyard yes \
0
                         0.0
                                                       1.0
1
                         0.0
                                                      1.0
2
                         0.0
                                                      1.0
3
                         1.0
                                                      0.0
4
                         0.0
                                                      1.0
5
                         1.0
                                                      0.0
6
                         0.0
                                                      1.0
7
                         1.0
                                                      0.0
8
                         1.0
                                                      0.0
9
                         0.0
                                                      1.0
   onehotencoder haspool no
                              onehotencoder haspool yes \
0
                         0.0
                         0.0
                                                      1.0
1
2
                         0.0
                                                      1.0
3
                         0.0
                                                      1.0
4
                         0.0
                                                      1.0
5
                         0.0
                                                      1.0
```

```
6
7
                           0.0
                                                          1.0
                           1.0
                                                          0.0
8
                           1.0
                                                          0.0
9
                           0.0
                                                          1.0
   onehotencoder__isnewbuilt_new
                                     onehotencoder__isnewbuilt_old \
0
                                0.0
                                                                 1.0
1
                                                                 0.0
                               1.0
2
                                1.0
                                                                 0.0
3
                                                                 0.0
                               1.0
4
                                                                 0.0
                                1.0
5
6
                                                                 0.0
                               1.0
                               1.0
                                                                 0.0
7
                               1.0
                                                                 0.0
8
                               1.0
                                                                 0.0
9
                               1.0
                                                                 0.0
   onehotencoder__hasstormprotector_no
onehotencoder__hasstormprotector_yes \
                                      0.0
1.0
                                      1.0
1
0.0
                                      1.0
2
0.0
                                      1.0
3
0.0
                                      0.0
4
1.0
                                      0.0
5
1.0
6
                                      1.0
0.0
7
                                      0.0
1.0
                                      1.0
8
0.0
                                      1.0
9
0.0
   onehotencoder_hasstorageroom_no onehotencoder_hasstorageroom_yes
... \
                                                                         0.0
0
                                   1.0
. . .
                                   1.0
                                                                         0.0
1
. . .
                                   0.0
                                                                         1.0
2
                                   1.0
                                                                         0.0
3
```

4		1.0			0.0
5		0.0			1.0
6		0.0			1.0
7		1.0			0.0
8		0.0			1.0
9		0.0			1.0
0	remaindernumberofrooms 97.0 76.0 72.0	remainder	floors 45.0 54.0 26.0	remainder	citycode \ 62899.0 82737.0 7812.0
2 3 4 5 6 7	46.0 4.0 47.0 54.0 42.0		51.0 30.0 14.0 15.0 50.0		91317.0 8424.0 50927.0 61691.0 50833.0
8 9	97.0 18.0		3.0 26.0		68804.0 67302.0
\	remaindercitypartrange	remainderr	numprevo		indermade
0	1.0			9.0	1990.0
	7 0			2.0	1000 0
	7.0			3.0	1998.0
2	6.0			3.0	1995.0
2	6.0 5.0			3.0	1995.0 2020.0
2 3 4	6.0 5.0 4.0			3.0 3.0 10.0	1995.0 2020.0 2003.0
2 3 4 5	6.0 5.0 4.0 9.0			3.0 3.0 10.0 6.0	1995.0 2020.0 2003.0 1993.0
2 3 4 5 6	6.0 5.0 4.0 9.0 2.0			3.0 3.0 10.0 6.0 2.0	1995.0 2020.0 2003.0 1993.0 2002.0
2 3 4 5 6 7	6.0 5.0 4.0 9.0 2.0 3.0			3.0 3.0 10.0 6.0 2.0 8.0	1995.0 2020.0 2003.0 1993.0 2002.0 2009.0
2 3 4 5 6 7 8	6.0 5.0 4.0 9.0 2.0 3.0 10.0			3.0 3.0 10.0 6.0 2.0 8.0 5.0	1995.0 2020.0 2003.0 1993.0 2002.0 2009.0 1991.0
2 3 4 5 6 7	6.0 5.0 4.0 9.0 2.0 3.0 10.0 6.0	ainder attic	remain	3.0 3.0 10.0 6.0 2.0 8.0	1995.0 2020.0 2003.0 1993.0 2002.0 2009.0 1991.0 2005.0

```
1
                4010.0
                                                        260.0
                                   8343.0
2
                6972.0
                                   3804.0
                                                        828.0
3
                3337.0
                                   7250.0
                                                        337.0
4
                5655.0
                                   1684.0
                                                        453.0
5
                4078.0
                                    315.0
                                                        767.0
6
                5925.0
                                   9705.0
                                                        342.0
7
                9320.0
                                   5752.0
                                                        936.0
8
                5804.0
                                   2070.0
                                                        846.0
9
                6111.0
                                    771.0
                                                        500.0
   remainder hasguestroom
0
                        4.0
1
                       10.0
2
                        8.0
3
                        1.0
4
                        8.0
5
                       10.0
6
                        8.0
7
                        3.0
8
                        9.0
9
                       10.0
[10 rows x 21 columns]
from sklearn.linear model import Lasso
from sklearn.model selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectKBest, f regression
from sklearn.metrics import mean_absolute_error, mean_squared_error
pipe_Lasso_KBest = Pipeline(steps=[
            ('scale', StandardScaler()),
            ('feature selection',
SelectKBest(score func=f regression)),
            ('reg', Lasso(max_iter=1000)) #max_iter digunakan untuk
menen
            1)
param_grid_Lasso_KBest = {
    'reg alpha': [0.01,0.1,1,10,100],
    'feature selection k': np.arange(1,20)
}
GSCV Lasso = GridSearchCV(pipe Lasso KBest, param grid Lasso KBest,
cv=5, scoring='neg mean squared error')
GSCV_Lasso.fit(X_train_enc, y_train_price)
print("Best model:{}".format(GSCV Lasso.best estimator ))
print("Lasso best parameters: {}".format(GSCV Lasso.best params ))
```

```
print("Koefisien/bobot:
{}".format(GSCV Lasso.best_estimator_.named_steps['reg'].coef_))
print("Intercept/bias:
{}".format(GSCV_Lasso.best estimator .named steps['reg'].intercept ))
Lasso predict = GSCV Lasso.predict(X test enc)
mse Lasso = mean squared error(y test price, Lasso predict)
mae_Lasso = mean_absolute_error(y_test_price, Lasso_predict)
print("Lasso Mean Squared Error (MSE): {}".format(mse Lasso))
print("Lasso Mean Absolute Error (MAE): {}".format(mae Lasso))
print("Lasso Root Mean Squared Error: {}".format(np.sqrt(mse Lasso)))
Best model:Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectKBest(k=19,
                             score func=<function f regression at
0x12e0b7380>)),
                ('reg', Lasso(alpha=10))])
Lasso best parameters: {'feature selection k': 19, 'reg alpha': 10}
Koefisien/bobot: [-1.48625529e+03 \quad 7.334165\overline{28}e-12 \quad -1.5022\overline{51}15e+03]
1.53522706e-12
  7.27030018e+01 - 1.23691279e-13 - 6.74320323e+01  0.00000000e+00
 -3.53814701e+00 1.93569576e-10 2.88436146e+06 0.00000000e+00
 1.58134765e+03 1.38057483e+02 -3.70828982e+00 -8.77399024e+00
 -1.03200436e+00 2.18869143e+01 -0.00000000e+001
Intercept/bias:5008877.6749249995
Lasso Mean Squared Error (MSE): 3535757.3574986807
Lasso Mean Absolute Error (MAE): 1462.234583543154
Lasso Root Mean Squared Error: 1880.3609646816967
# df results['Lasso KBest Prediction']=Lasso predict
df results = pd.DataFrame(y test price)
df results['Lasso KBest Prediction']=Lasso predict
df results['Selisih Price Lasso KBest'] = df results['Lasso KBest
Prediction'] - df results['price']
df results.head()
          price Lasso KBest Prediction
                                          Selisih Price Lasso KBest
      6033313.0
2457
                           6.035400e+06
                                                        2087.414519
                                                       -4733.001285
4865 5290006.8
                           5.285274e+06
                           9.234512e+06
5288 9235289.5
                                                        -777.323262
1063
     7616002.0
                           7.616129e+06
                                                         126.814548
5197 9390420.3
                           9.391625e+06
                                                        1204.251593
df results.describe()
```

```
Lasso KBest Prediction Selisih Price Lasso KBest
              price
count 2.000000e+03
                               2.000000e+03
                                                           2000.000000
mean
      4.931727e+06
                               4.931789e+06
                                                             61.835861
      2.848679e+06
                               2.848584e+06
                                                           1879.813963
std
min
      2.381840e+04
                               2.881419e+04
                                                          -6905.546378
25%
                                                          -1087.464237
      2.494605e+06
                               2.493396e+06
50%
      5.014176e+06
                               5.014615e+06
                                                             39.206169
75% 7.338401e+06
                                                           1234.037636
                               7.338065e+06
max 9.994474e+06
                               9.994805e+06
                                                           6211.922919
from sklearn.linear model import Lasso
from sklearn.model_selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectPercentile, f regression
from sklearn.metrics import mean absolute error, mean squared error
pipe Lasso percentile = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature selection', SelectPercentile(score func=f regression)),
# Menggunakan SelectPercentile
    ('reg', Lasso(max iter=1000))
])
param grid Lasso percentile = {
    'reg alpha': [0.01, 0.1, 1, 10, 100],
    'feature_selection__percentile': np.arange(10, 100, 10) #
Menggunakan persentase fitur terbaik
GSCV Lasso = GridSearchCV(pipe Lasso percentile,
param grid Lasso percentile, cv=5, scoring='neg mean squared error')
# Fit ke data latih
GSCV Lasso.fit(X train enc, y train price)
# Hasil dari GridSearch
print("Best model:{}".format(GSCV_Lasso.best_estimator_))
print("Lasso best parameters: {}".format(GSCV Lasso.best params ))
# Koefisien dan intercept dari model terbaik
print("Koefisien/bobot:
{}".format(GSCV Lasso.best estimator .named steps['reg'].coef ))
print("Intercept/bias:
{}".format(GSCV_Lasso.best_estimator_.named_steps['reg'].intercept_))
# Prediksi terhadap data uji
Lasso predict = GSCV Lasso.predict(X test enc)
# Menghitung error
```

```
mse Lasso = mean_squared_error(y_test_price, Lasso_predict)
mae Lasso = mean absolute error(y test price, Lasso predict)
print("Lasso Mean Squared Error (MSE): {}".format(mse Lasso))
print("Lasso Mean Absolute Error (MAE): {}".format(mae_Lasso))
print("Lasso Root Mean Squared Error: {}".format(np.sqrt(mse Lasso)))
Best model:Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectPercentile(percentile=90,
                                  score func=<function f regression at
0x12e0b7380>)),
                ('reg', Lasso(alpha=10))])
Lasso best parameters: {'feature selection percentile': 90,
'reg alpha': 10}
Koefisien/bobot: [ 1.48625529e+03 -1.50225115e+03 1.32422429e-12
7.27030018e+01
 -2.91038305e-14 -6.74320323e+01 0.00000000e+00 -3.53814701e+00
  1.93609594e-10 2.88436146e+06 0.00000000e+00 1.58134765e+03
  1.38057483e+02 -3.70828982e+00 -8.77399024e+00 -1.03200436e+00
  2.18869143e+01 -0.00000000e+001
Intercept/bias:5008877.6749249995
Lasso Mean Squared Error (MSE): 3535757.3574986784
Lasso Mean Absolute Error (MAE): 1462.2345835431515
Lasso Root Mean Squared Error: 1880.360964681696
df results['Lasso Percentile Prediction']=Lasso predict
df_results = pd.DataFrame(y_test_price)
df results['Lasso Percentile Prediction']=Lasso predict
df results['Selisih Price Lasso Percentile'] = df results['Lasso
Percentile Prediction'] - df results['price']
df results.head()
          price Lasso Percentile Prediction Selisih Price Lasso
Percentile
                                6.035400e+06
2457 6033313.0
2087.414519
4865 5290006.8
                                5.285274e+06
4733.001285
5288 9235289.5
                                9.234512e+06
777.323262
1063 7616002.0
                                7.616129e+06
126.814548
5197 9390420.3
                                9.391625e+06
1204.251593
df results.describe()
              price Lasso Percentile Prediction \
count 2.000000e+03
                                    2.000000e+03
```

```
4.931727e+06
                                   4.931789e+06
mean
std
      2.848679e+06
                                   2.848584e+06
min
     2.381840e+04
                                   2.881419e+04
25% 2.494605e+06
                                   2.493396e+06
50% 5.014176e+06
                                   5.014615e+06
75% 7.338401e+06
                                   7.338065e+06
max 9.994474e+06
                                   9.994805e+06
      Selisih Price Lasso Percentile
                         2000.000000
count
                           61.835861
mean
std
                         1879.813963
min
                        -6905.546378
25%
                        -1087.464237
50%
                           39.206169
75%
                         1234.037636
                         6211.922919
max
from sklearn.ensemble import RandomForestRegressor
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectPercentile, f regression
from sklearn.model selection import GridSearchCV
from sklearn.metrics import mean absolute error, mean squared error
import numpy as np
# Pipeline for Random Forest Regressor
pipe RF = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature_selection', SelectPercentile(score_func=f_regression)),
# Pilih top percentile fitur
    ('reg', RandomForestRegressor(random state=84)) # Random Forest
Regressor
])
# Parameter grid untuk GridSearchCV
param_grid RF = {
    'reg n estimators': [100, 200], # Jumlah pohon lebih
sedikit
    'reg max depth': [2,3], # Variasi kedalaman terbatas
    'feature selection percentile': np.arange(10, 50) # Langkah 10
untuk persentil
}
# GridSearchCV to find the best parameters
GSCV RF = GridSearchCV(pipe RF, param grid RF, cv=5,
scoring='neg mean squared error')
# Fit to the training data
GSCV_RF.fit(X_train_enc, y_train_price)
```

```
# Best model and parameters
print("Best model:{}".format(GSCV RF.best estimator ))
print("Random Forest best parameters:
{}".format(GSCV RF.best params ))
# Make predictions on the test set
RF predict = GSCV RF.predict(X test enc)
# Calculate metrics
mse RF = mean_squared_error(y_test_price, RF_predict)
mae RF = mean absolute error(y test price, RF predict)
print("Random Forest Mean Squared Error (MSE): {}".format(mse RF))
print("Random Forest Mean Absolute Error (MAE): {}".format(mae RF))
print("Random Forest Root Mean Squared Error:
{}".format(np.sqrt(mse RF)))
Best model:Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectPercentile(percentile=41,
                                  score func=<function f regression at
0x12e0b7380>)),
                ('reg', RandomForestRegressor(max depth=3,
random state=84))])
Random Forest best parameters: {'feature selection percentile': 41,
'reg__max_depth': 3, 'reg__n estimators': 100}
Random Forest Mean Squared Error (MSE): 111333999223.2568
Random Forest Mean Absolute Error (MAE): 289241.46874328353
Random Forest Root Mean Squared Error: 333667.4980025127
df results['Random Forest Percentile Prediction']=RF predict
df results = pd.DataFrame(y test price)
df results['Random Forest Percentile Prediction']=RF predict
df results['Selisih Price RF Percentile'] = df results['Random Forest
Percentile Prediction'] - df results['price']
df results.head()
                 Random Forest Percentile Prediction \
          price
2457
     6033313.0
                                        5.610185e+06
4865
     5290006.8
                                        5.610185e+06
5288
     9235289.5
                                        9.373249e+06
1063 7616002.0
                                        8.145797e+06
5197 9390420.3
                                        9.373249e+06
      Selisih Price RF Percentile
2457
                   -423128.277191
4865
                    320177.922809
5288
                    137959.866135
```

```
1063
                    529794.777347
5197
                    -17170.933865
from sklearn.ensemble import RandomForestRegressor
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectKBest, f regression
from sklearn.model selection import GridSearchCV
from sklearn.metrics import mean absolute error, mean squared error
import numpy as np
# Pipeline for Random Forest Regressor
pipe RF Kbest = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature selection', SelectKBest(score func=f regression)), #
Pilih top percentile fitur
    ('reg', RandomForestRegressor(random_state=84)) # Random Forest
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# Parameter grid untuk GridSearchCV
param grid RF Kbest = {
    'reg__n_estimators': [100, 200], # Jumlah pohon lebih
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}
# GridSearchCV to find the best parameters
GSCV_RF = GridSearchCV(pipe_RF_Kbest, param_grid_RF_Kbest, cv=5,
scoring='neg mean squared error')
# Fit to the training data
GSCV RF.fit(X train enc, y train price)
# Best model and parameters
print("Best model:{}".format(GSCV_RF.best_estimator_))
print("Random Forest best parameters:
{}".format(GSCV RF.best params ))
# Make predictions on the test set
RF predict = GSCV RF.predict(X test enc)
# Calculate metrics
mse RF = mean squared error(y test price, RF predict)
mae RF = mean absolute error(y test price, RF predict)
print("Random Forest Mean Squared Error (MSE): {}".format(mse RF))
print("Random Forest Mean Absolute Error (MAE): {}".format(mae RF))
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print("Random Forest Root Mean Squared Error:
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Best model:Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectKBest(k=15,
                             score func=<function f regression at
0x12e0b7380>)),
                ('reg', RandomForestRegressor(max depth=3,
random state=84))])
Random Forest best parameters: {'feature selection k': 15,
'reg__max_depth': 3, 'reg__n_estimators': 100}
Random Forest Mean Squared Error (MSE): 111333999223.2568
Random Forest Mean Absolute Error (MAE): 289241.46874328353
Random Forest Root Mean Squared Error: 333667.4980025127
df results['Random Forest KBest Prediction']=RF predict
df results = pd.DataFrame(y_test_price)
df_results['Random Forest KBest Prediction']=RF predict
```

```
df results['Selisih Price RF KBest'] = df results['Random Forest KBest']
Prediction'] - df results['price']
df results.head()
          price Random Forest KBest Prediction Selisih Price RF
KBest
2457 6033313.0
                                   5.610185e+06
423128.277191
4865 5290006.8
                                   5.610185e+06
320177.922809
5288 9235289.5
                                   9.373249e+06
137959.866135
                                   8.145797e+06
1063 7616002.0
529794.777347
5197 9390420.3
                                   9.373249e+06
17170.933865
import pandas as pd
import matplotlib.pyplot as plt
# Misalkan Ridge predict dan SVR predict sudah didefinisikan
sebelumnya
# Ridge predict = model ridge.predict(X test)
# SVR predict = model svr.predict(X test)
# Mengonversi y test price menjadi DataFrame
df results = pd.DataFrame(y test price)
# Menambahkan kolom prediksi
df results['Lasso KBest Prediction']=Lasso predict
df results['Random Forest KBest Prediction']=RF predict
# Jika ada kolom lain yang perlu ditambahkan
df results['Lasso Percentile Prediction']=Lasso predict
df results['Random Forest Percentile Prediction']=RF predict
# Menghitung selisih
df results['Selisih Price Lasso KBest'] = df results['Lasso KBest
Prediction'] - df_results['price']
df results['Selisih Price RF KBest'] = df results['Random Forest KBest']
Prediction'] - df results['price']
# Menampilkan beberapa data teratas
print(df results.head())
# Membuat plot
plt.figure(figsize=(20, 5))
data_len = range(len(y_test_price))
plt.scatter(data_len, df_results['price'], label="Actual",
```

```
color="blue")
plt.plot(data len, df results['Lasso KBest Prediction'], label="Lasso
KBest Prediction", color="green", linewidth=1, linestyle="dashed")
plt.plot(data len, df results['Lasso Percentile Prediction'],
label="Lasso Percentile Prediction", color="red", linewidth=1,
linestyle="dashed")
plt.plot(data len, df results['Random Forest KBest Prediction'],
label="Random Forest KBest Prediction", color="yellow", linewidth=1,
linestyle="-.")
plt.plot(data len, df results['Random Forest Percentile Prediction'],
label="Random Forest Percentile Prediction", color="black",
linewidth=1, linestyle="-.")
# Menambahkan legenda dan menampilkan plot
plt.legend()
plt.show()
          price Lasso KBest Prediction Random Forest KBest
Prediction \
2457 6033313.0
                           6.035400e+06
5.610185e+06
4865 5290006.8
                           5.285274e+06
5.610185e+06
5288 9235289.5
                           9.234512e+06
9.373249e+06
                           7.616129e+06
1063 7616002.0
8.145797e+06
5197 9390420.3
                           9.391625e+06
9.373249e+06
      Lasso Percentile Prediction Random Forest Percentile Prediction
2457
                     6.035400e+06
                                                          5.610185e+06
4865
                     5.285274e+06
                                                          5.610185e+06
5288
                     9.234512e+06
                                                          9.373249e+06
                     7.616129e+06
                                                          8.145797e+06
1063
5197
                     9.391625e+06
                                                          9.373249e+06
      Selisih Price Lasso KBest Selisih Price RF KBest
2457
                    2087.414519
                                         -423128.277191
4865
                   -4733.001285
                                          320177.922809
5288
                    -777.323262
                                          137959.866135
1063
                     126.814548
                                          529794.777347
5197
                    1204.251593
                                          -17170.933865
```

```
import pickle
best_model = GSCV_RF.best_estimator_
with open('BestModel_REG_GSCV_RF_matplotlib.pkl', 'wb') as f:
    pickle.dump(best_model, f)
print("Model Terbaik berhasil disimpan ke
'BestModel_REG_GSCV_RF_matplotlib.pkl")

Model Terbaik berhasil disimpan ke
'BestModel_REG_GSCV_RF_matplotlib.pkl
```

```
import pandas as pd
import numpy as np
from sklearn.model selection import train test split
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make column transformer
from sklearn.feature selection import SelectFromModel, SelectKBest,
SelectPercentile, RFE
from sklearn.model selection import GridSearchCV, StratifiedKFold
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.ensemble import RandomForestClassifier,
RandomForestRegressor
from sklearn.svm import SVC, SVR
from sklearn.metrics import classification report, confusion matrix,
ConfusionMatrixDisplay
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.pipeline import Pipeline
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear model import LogisticRegression
from sklearn.metrics import mean squared error, mean absolute error
from pandas.api.types import is numeric dtype
from sklearn.linear model import Ridge, Lasso
import matplotlib.pyplot as plt
properti price = pd.read csv('Dataset UTS Gasal 2425.csv')
properti price.head(100)
    squaremeters numberofrooms hasyard haspool
                                                   floors
                                                           citycode \
0
           75523
                               3
                                      no
                                                       63
                                                               9373
                                              yes
1
           55712
                              58
                                                       19
                                                              34457
                                      no
                                              yes
2
                             100
           86929
                                     yes
                                               no
                                                       11
                                                              98155
3
           51522
                               3
                                                       61
                                      no
                                               no
                                                               9047
4
           96470
                              74
                                                       21
                                                              92029
                                     yes
                                               no
                                      . . .
                                              . . .
95
           98868
                              41
                                                       67
                                                              85917
                                      no
                                              yes
96
                              43
           83110
                                     yes
                                                       75
                                                              55046
                                               no
97
           71154
                              67
                                                       53
                                                               8762
                                      no
                                              yes
98
           90841
                              48
                                                       15
                                                              25300
                                     yes
                                               no
99
           68416
                              87
                                                       48
                                                              60979
                                     yes
                                               no
    citypartrange
                   numprevowners
                                   made isnewbuilt hasstormprotector
basement
                3
                                8
                                   2005
                                                old
                                                                   yes
4313
                6
                                8
                                   2021
                                                old
1
                                                                    no
2937
                3
                                4
                                   2003
                                                new
                                                                    no
6326
3
                8
                                3
                                   2012
                                                new
                                                                   yes
632
                4
                                2
                                   2011
                                                new
                                                                   yes
```

5414	ı					
95		7	3	2021	new	yes
2146		7	10	2001		-
96 4108	}	7	10	2001	new	no
97		2	6	2021	new	yes
8418 98		6	5	2003	old	no
3333		0	7	2010	a.1 d	
99 1811		8	7	2010	old	no
			h	h = = =		
0 1 2 3 4	9005 8852 4748 5792	956 135 654 807	hasstorageroom no yes no yes	nasgue	7 755908 9 557464 10 869686 5 515405	2.1 Middle 9.3 Luxury 5.2 Middle
4	1172	716	yes 		9 965225	8.1 Luxury
95 96 97 98 99	1077 5663 7187 149 6776	623 380 706 842	yes yes no no		3 989230 7 832163 8 712269 9 908617 6 684670	0.1 Luxury 1.1 Luxury 9.1 Luxury 7.3 Luxury
99	0770	424	no		0 004070	9.0 Middle
[100	rows	x 18 col	umns]			
		rice2 = rice2.he	properti_price. ead(<mark>100</mark>)	.drop('	category', axis	=1)
	square	meters	numberofrooms h	nasyard	haspool floor	s citycode \
0 1		75523 55712	3 58	no	yes 6 yes 1	
_		86929	100	no yes	yes 1 no 1	
2 3 4		51522	3	no	no 6	
		96470	74	yes	no 2	
95		98868	41	no	yes 6	
96		83110	43	yes	no 7	
97 98		71154 90841	67 48	no yes	yes 5 no 1	
99		68416	87	yes	no 4	
base		rtrange \	numprevowners	made :	isnewbuilt hass	tormprotector
0		` 3	8	2005	old	yes
4313 1		6	8	2021	old	no
_		- 3	J	2021	Jea	110

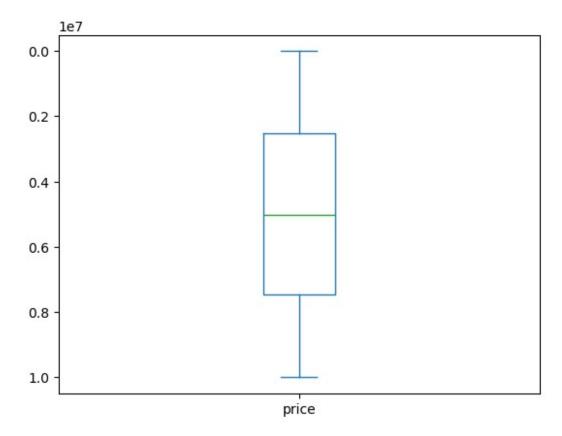
2937 2									
6326 632 4	2937	'							
8			3	4	2003	new		no	
632 4			Ω	3	2012	new		VAS	
4			O	3	2012	Hew		yes	
			4	2	2011	new		yes	
95 7 3 2021 new yes 2146 96 7 10 2001 new no 4108 97 2 6 2021 new yes 8418 98 6 5 2003 old no 3333 99 8 7 2010 old no 1811 attic garage hasstorageroom hasguestroom price 0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1	5414								
95				• • • •					
2146 96			7	3	2021	new		ves	
4108 97	2146							•	
97			7	10	2001	new		no	
8418 98 6 5 2003 old no 3333 99 8 7 2010 old no 1811 attic garage hasstorageroom hasguestroom price 0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1)	2	6	2021	new		ves	
3333 99 8 7 2010 old no 1811 attic garage hasstorageroom hasguestroom price 0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1 95 1077 623 yes 3 9892300.1 96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <box></box> 		3	_	· ·				yes	
99 8 7 2010 old no 1811 attic garage hasstorageroom hasguestroom price 0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1 95 1077 623 yes 3 9892300.1 96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <box></box> cbound method DataFrame.info of hasyard haspool floors citycode 0 75523 3 no yes 19 34457 2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029			6	5	2003	old		no	
attic garage hasstorageroom hasguestroom price 0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1			8	7	2010	ol d		no	
0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1			J	,	2010	ota		110	
0 9005 956 no 7 7559081.5 1 8852 135 yes 9 5574642.1 2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1									
1 8852 135				_	nasguest				
2 4748 654 no 10 8696869.3 3 5792 807 yes 5 5154055.2 4 1172 716 yes 9 9652258.1 95 1077 623 yes 3 9892300.1 96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <br< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></br<>									
4 1172 716 yes 9 9652258.1 95 1077 623 yes 3 9892300.1 96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <box></box> 	2			_					
95 1077 623 yes 3 9892300.1 96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <b< td=""><td></td><td></td><td></td><td>yes</td><td></td><td></td><td></td><td></td><td></td></b<>				yes					
95 1077 623	4	1172		yes		9 96522	258.1		
96 5663 380 yes 7 8321631.1 97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info 0 75523 3 no yes 63 9373 1 55712 58 no yes 19 34457 2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 9995 341 83 no no 8 1960 9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606							300.1		
97 7187 706 no 8 7122699.1 98 149 842 no 9 9086177.3 99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td></td>				_					
99 6776 424 no 6 6846709.0 [100 rows x 17 columns] properti_price2.info <box></box> <box></box> bound method DataFrame.info of hasyard haspool floors citycode of the color of the co									
[100 rows x 17 columns] properti_price2.info <box></box> <box></box> bound method DataFrame.info of hasyard haspool floors citycode \(0 \) 0 75523 3 no yes 63 9373 1 55712 58 no yes 19 34457 2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 9995 341 83 no no 8 1960 9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606									
properti_price2.info <body> <body> </body></body>	99	6//6	424	no		6 6846	709.0		
<pre> <</pre>	[100	rows	x 17 colum	ns]					
<pre> <</pre>	nron	orti n	ricol info						
hasyard haspool floors citycode \ 0 75523	prop	erti_p	ricez.inio						
0 75523 3 no yes 63 9373 1 55712 58 no yes 19 34457 2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 9995 341 83 no no 8 1960 9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606									
1 55712 58 no yes 19 34457 2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 <td>_</td> <td>ard ha</td> <td></td> <td>_</td> <td>•</td> <td>V05</td> <td>62</td> <td>0272</td> <td></td>	_	ard ha		_	•	V05	62	0272	
2 86929 100 yes no 11 98155 3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td>						_			
3 51522 3 no no 61 9047 4 96470 74 yes no 21 92029 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
9995 341 83 no no 8 1960 9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606	3				_				
9995 341 83 no no 8 1960 9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606	4		96470	74	yes	no	21	92029	
9996 21514 5 no yes 11 91373 9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606									
9997 1726 89 no yes 5 73133 9998 44403 29 yes yes 12 34606									
9998 44403 29 yes yes 12 34606						=			
9999 1440 84 no no 49 18412	9998	}				_			
	9999		1440	84	no	no	49	18412	

	citypartra	nge	numprevow	ners	made	isne	wbuilt	hasstor	mprotector
0		3		8	2005		old		yes
1		6		8	2021		old		no
2		3		4	2003		new		no
3		8		3	2012		new		yes
4		4		2	2011		new		yes
9995		4		4	1993		new		yes
9996		1		1	1999		old		no
9997		7		6	2009		old		yes
9998		9		4	1990		old		yes
9999		6		10	1994		new		no
	hacament	a++ia	~~ ~~ ~~	h+	0 20 20 1		bossus	c+ room	nni co
0		attic 9005	garage 956	nasst	oragei		hasgue	7	price
0	4313 2937		135			no		9	7559081.5 5574642.1
2	6326	8852 4748	654			yes		10	8696869.3
						no			5154055.2
3	632	5792	807			yes		5	
4	5414	1172	716			yes		9	9652258.1
0005	2266	4016	220						25271 2
9995	2366	4016	229			yes		5	35371.3
9996	2584	5266	787			no		3	2153602.9
9997	9311	1698	218			no		4	176425.9
9998	9061	1742	230			no		0	4448474.0
9999	8485	2024	278			yes		6	146708.4
[1000	9 rows x 17	colu	mns]>						

properti_pric	e2.desc	ribe()		
	meters	numberofrooms	floors	citycode
citypartrange count 10000 10000.000000	.00000	10000.000000	10000.000000	10000.000000
	.13120	50.358400	50.276300	50225.486100
std 28774	.37535	28.816696	28.889171	29006.675799
	.00000	1.000000	1.000000	3.000000
	5.50000	25.000000	25.000000	24693.750000
	5.50000	50.000000	50.000000	50693.000000
	.75000	75.000000	76.000000	75683.250000
8.000000 max 99999 10.000000	.00000	100.000000	100.000000	99953.000000
	vowners	made	basement	attic
	.000000	10000.00000	10000.000000	10000.00000
	.521700	2005.48850	5033.103900	5028.01060
	.856667	9.30809	2876.729545	2894.33221
	.000000	1990.00000	0.000000	1.00000
-	.000000	1997.00000	2559.750000	2512.00000
	.000000	2005.50000	5092.500000	5045.00000
	.000000	2014.00000	7511.250000	7540.50000
	.000000	2021.00000	10000.000000	10000.00000
1000.00000				
count 10000 mean 4 std 3 min 6 25% 50% 55% 8	stroom 0.00000 1.99460 3.17641 0.00000 2.00000 6.00000 0.00000	price 1.000000e+04 4.993448e+06 2.877424e+06 1.031350e+04 2.516402e+06 5.016180e+06 7.469092e+06 1.000677e+07		

```
print(properti price2['price'].value counts())
price
              1
7559081.5
2600292.1
              1
              1
3804577.4
3658559.7
              1
2316639.4
              1
5555606.6
             1
5501007.5
             1
9986201.2
              1
              1
9104801.8
146708.4
              1
Name: count, Length: 10000, dtype: int64
print("data null \n", properti_price2.isnull().sum())
print("data kosong \n", properti_price2.empty)
print("data nan \n", properti_price2.isna().sum())
data null
                       0
 squaremeters
numberofrooms
                      0
                      0
hasyard
                      0
haspool
floors
                      0
                      0
citycode
                      0
citypartrange
numprevowners
                      0
made
                      0
isnewbuilt
                      0
                      0
hasstormprotector
                      0
basement
                      0
attic
garage
                      0
                      0
hasstorageroom
                      0
hasguestroom
                      0
price
dtype: int64
data kosong
False
data nan
                       0
 squaremeters
numberofrooms
                      0
                      0
hasyard
                      0
haspool
floors
                      0
citycode
                      0
                      0
citypartrange
                      0
numprevowners
```

```
made
                      0
isnewbuilt
                      0
                      0
hasstormprotector
                      0
basement
                      0
attic
                      0
garage
                      0
hasstorageroom
hasquestroom
                      0
price
                      0
dtype: int64
properti_price2.price.plot(kind='box')
plt.gca().invert_yaxis()
plt.show()
```



```
def remove_outlier(df_in):
    for col_name in list(df_in):
        if is_numeric_dtype(df_in[col_name]):
            q1 = df_in[col_name].quantile(0.25)
            q3 = df_in[col_name].quantile(0.75)

        iqr = q3-q1
        batas_atas = q3+(iqr*1.5)
        batas_bawah = q1-(iqr*1.5)
```

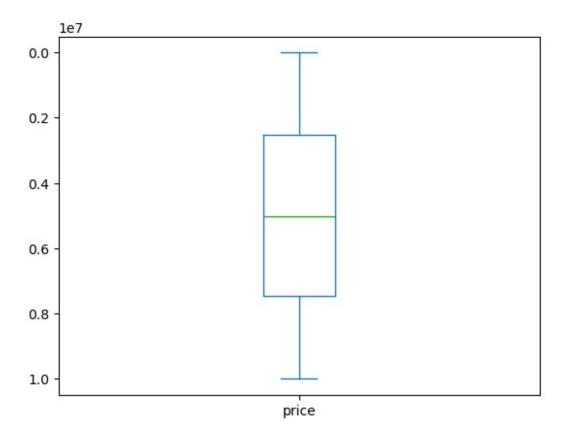
```
df_out = df_in.loc[(df_in[col_name]>=batas_bawah) &
(df_in[col_name]<=batas_atas)]

return df_out

properti_price_clean = remove_outlier(properti_price2)
print("Jumlah baris DataFrame sebelum di
outlier",properti_price2.shape[0])
print("Jumlah baris DataFrame sesudah di
outlier",properti_price_clean.shape[0])
properti_price_clean.price.plot(kind='box', vert=True)

plt.gca().invert_yaxis()
plt.show()

Jumlah baris DataFrame sebelum di outlier 10000
Jumlah baris DataFrame sesudah di outlier 10000</pre>
```



```
print("data null \n", properti_price_clean.isnull().sum())
print("data kosong \n", properti_price_clean.empty)
print("data nan \n", properti_price_clean.isna().sum())
```

```
data null
                       0
 squaremeters
numberofrooms
                      0
hasyard
                      0
                      0
haspool
floors
                      0
                      0
citycode
citypartrange
                      0
                      0
numprevowners
                      0
made
                      0
isnewbuilt
                      0
hasstormprotector
basement
                      0
                      0
attic
garage
                      0
                      0
hasstorageroom
                      0
hasguestroom
                      0
price
dtype: int64
data kosong
False
data nan
                       0
 squaremeters
numberofrooms
                      0
                      0
hasyard
                      0
haspool
floors
                      0
                      0
citycode
                      0
citypartrange
                      0
numprevowners
                      0
made
isnewbuilt
                      0
                      0
hasstormprotector
                      0
basement
attic
                      0
                      0
garage
hasstorageroom
                      0
                      0
hasguestroom
                      0
price
dtype: int64
X regress=properti price clean.drop('price',axis=1)
y_regress=properti_price_clean.price
X_train_price, X_test_price, y_train_price, y_test_price =
train test split(X regress, y regress, test size=0.20,
random_state=84)
X_regress=properti_price_clean.drop('price',axis=1)
y regress=properti price clean.price
```

```
X_train_ins, X_test_ins, y_train_ins, y_test_ins =
train test split(X regress, y regress, test size=0.20,
random state=84)
cat cols =
X train ins.select dtypes(include=['object']).columns.tolist()
print("Kolom kategorik:",cat_cols)
transformer = make column transformer(
    (OneHotEncoder(), cat cols),
    remainder = 'passthrough'
)
X train enc = transformer.fit transform(X train ins)
X test enc = transformer.transform(X test ins)
df train enc = pd.DataFrame (X train enc,
columns=transformer.get_feature_names_out())
df test enc = pd.DataFrame (X test enc,
columns=transformer.get feature names out())
df train enc.head(10)
df test enc.head(10)
Kolom kategorik: ['hasyard', 'haspool', 'isnewbuilt',
'hasstormprotector', 'hasstorageroom']
   onehotencoder hasyard no onehotencoder hasyard yes \
0
                          0.0
                                                       1.0
1
                          0.0
                                                       1.0
2
                          0.0
                                                       1.0
3
                          1.0
                                                       0.0
4
                          0.0
                                                       1.0
5
                          1.0
                                                       0.0
6
                          0.0
                                                       1.0
7
                          1.0
                                                       0.0
8
                          1.0
                                                       0.0
9
                          0.0
                                                       1.0
   onehotencoder__haspool_no
                               onehotencoder__haspool_yes \
0
                          0.0
1
                          0.0
                                                       1.0
2
                          0.0
                                                       1.0
3
                          0.0
                                                       1.0
4
                          0.0
                                                       1.0
5
                          0.0
                                                       1.0
6
                          0.0
                                                       1.0
7
                         1.0
                                                       0.0
8
                         1.0
                                                       0.0
9
                          0.0
                                                       1.0
```

```
onehotencoder isnewbuilt new
                                    onehotencoder isnewbuilt old \
0
                               0.0
                                                                 1.0
1
2
3
4
                                1.0
                                                                 0.0
                                1.0
                                                                 0.0
                                1.0
                                                                 0.0
                                1.0
                                                                 0.0
5
                                1.0
                                                                 0.0
6
                                1.0
                                                                 0.0
7
                               1.0
                                                                 0.0
8
                               1.0
                                                                 0.0
9
                                                                 0.0
                               1.0
   onehotencoder__hasstormprotector_no
onehotencoder_hasstormprotector_yes \
                                      0.0
1.0
                                      1.0
1
0.0
2
                                      1.0
0.0
                                      1.0
3
0.0
                                      0.0
4
1.0
                                      0.0
1.0
                                      1.0
6
0.0
                                      0.0
7
1.0
                                      1.0
8
0.0
9
                                      1.0
0.0
   onehotencoder_hasstorageroom_no onehotencoder_hasstorageroom_yes
. . .
                                                                         0.0
0
                                   1.0
. . .
                                                                         0.0
                                   1.0
1
. . .
                                                                         1.0
2
                                   0.0
3
                                   1.0
                                                                         0.0
. . .
                                   1.0
                                                                         0.0
4
                                   0.0
                                                                         1.0
5
```

6		0.0		1.0
7		1.0		0.0
8		0.0		1.0
9		0.0		1.0
0 1 2 3	remaindernumberofrooms 97.0 76.0 72.0 46.0	remainderf	45.0 54.0 26.0 51.0	rcitycode \ 62899.0 82737.0 7812.0 91317.0
4 5 6 7 8	4.0 47.0 54.0 42.0 97.0		30.0 14.0 15.0 50.0 3.0	8424.0 50927.0 61691.0 50833.0 68804.0
9	18.0		26.0	67302.0
	remaindercitypartrange	remaindern	umprevowners r	emainder <u></u> made
0	1.0		9.0	1990.0
1	7.0		3.0	1998.0
2	6.0		3.0	1995.0
3	5.0		3.0	2020.0
4	4.0		10.0	2003.0
5	9.0		6.0	1993.0
6	2.0		2.0	2002.0
7	3.0		8.0	2009.0
8	10.0		5.0	1991.0
9	6.0		2.0	2005.0
0 1 2 3 4	remainderbasement rema 4110.0 4010.0 6972.0 3337.0 5655.0	inderattic 1675.0 8343.0 3804.0 7250.0 1684.0	26/ 82/ 33	age \ 9.0 9.0 9.0 8.0 7.0 3.0

```
5
                4078.0
                                                        767.0
                                    315.0
6
                                                        342.0
                5925.0
                                   9705.0
7
                9320.0
                                   5752.0
                                                        936.0
8
                5804.0
                                   2070.0
                                                        846.0
9
                6111.0
                                    771.0
                                                        500.0
   remainder__hasguestroom
0
                       4.0
1
                       10.0
2
                       8.0
3
                        1.0
4
                       8.0
5
                       10.0
6
                       8.0
7
                       3.0
8
                       9.0
9
                       10.0
[10 rows x 21 columns]
from sklearn.linear model import Ridge
from sklearn.model selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import MinMaxScaler
from sklearn.feature selection import SelectKBest, f regression
from sklearn.metrics import mean absolute error, mean squared error
pipe Ridge = Pipeline(steps=[
    ('scale', MinMaxScaler()),
    ('feature selection', SelectKBest(score func=f regression)),
    ('reg', Ridge())
    1)
param grid Ridge = {
    'reg alpha': [0.01,0.1,1,10,100],
    'feature selection k': np.arange(2,11)
}
GSCV RR = GridSearchCV(pipe Ridge, param grid Ridge, cv=5,
                       scoring='neg mean squared error',
error score='raise')
GSCV RR.fit(X train enc, y train price)
print("Best model:{}".format(GSCV RR.best estimator ))
print("Ridge best parameters:{}".format(GSCV RR.best params ))
print("Koefisien/bobot:
{}".format(GSCV_RR.best_estimator_.named_steps['reg'].coef_))
print("Intercept/bias:
{}".format(GSCV RR.best estimator .named steps['reg'].intercept ))
```

```
Ridge predict = GSCV RR.predict(X test enc)
mse_Ridge = mean_squared_error(y_test_price, Ridge_predict)
mae Ridge = mean absolute error(y test price, Ridge predict)
print("Ridge Mean Squard Error (MSE): {}".format(mse Ridge))
print("Ridge Mean Absolute Error (MAE): {}".format(mae_Ridge))
print("Ridge Root Mean Squared Error: {}".format(np.sqrt(mse Ridge)))
Best model:Pipeline(steps=[('scale', MinMaxScaler()),
                ('feature selection',
                 SelectKBest(score func=<function f regression at
0x0000020133634CC0>)),
                ('reg', Ridge(alpha=0.01))])
Ridge best parameters:{'feature selection k': 10, 'reg alpha': 0.01}
Koefisien/bobot:[-1.53069804e+03 1.53069804e+03 8.37049891e+01 -
8.37049878e+01
 -5.36117068e+01
                 5.36117075e+01 9.99077325e+06 4.76218243e+02
 -3.30900310e+01 -4.68782145e+011
Intercept/bias:15269.991580400616
Ridge Mean Squard Error (MSE): 8244727.333072739
Ridge Mean Absolute Error (MAE): 2337.7145753501745
Ridge Root Mean Squared Error: 2871.3633230701994
df results['Ridge Prediction'] = Ridge predict
df results = pd.DataFrame(y test price)
df results['Ridge Prediction'] = Ridge predict
df results['Selisih price RR'] = df results['Ridge Prediction'] -
df results['price']
df results.head()
          price
                 Ridge Prediction Selisih price RR
2457
      6033313.0
                     6.034185e+06
                                         872.342258
4865
     5290006.8
                     5.283703e+06
                                       -6304.221330
5288
     9235289.5
                     9.234346e+06
                                        -943.386054
1063
                     7.617647e+06
     7616002.0
                                        1644.933213
5197 9390420.3
                     9.391224e+06
                                         804.087296
df results.describe()
              price
                     Ridge Prediction
                                       Selisih price RR
       2.000000e+03
                         2.000000e+03
                                            2000.000000
count
      4.931727e+06
                         4.931782e+06
                                              55.352778
mean
       2.848679e+06
                         2.848562e+06
                                            2871.547718
std
       2.381840e+04
                         2.787007e+04
                                          -10833.184798
min
25%
      2.494605e+06
                         2.495427e+06
                                           -1843.724940
50%
      5.014176e+06
                         5.017360e+06
                                             297.079502
```

```
75%
       7.338401e+06
                         7.339645e+06
                                             2355.146005
       9.994474e+06
                         9.998520e+06
                                             5919.050249
max
from sklearn.svm import SVR
from sklearn.model selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectKBest, f regression
from sklearn.metrics import mean absolute error, mean squared error
pipe SVR = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature selection', SelectKBest(score func=f regression)),
    ('reg', SVR(kernel='linear'))
    1)
param grid SVR = {
    'reg \overline{C}': [0.01, 0.1, 1, 10],
    'reg epsilon': [0.1, 0.2, 0.5, 1],
    'feature selection k': np.arange(2,11)
}
GSCV SVR = GridSearchCV(pipe SVR, param grid SVR, cv=5,
scoring='neg mean squared error')
GSCV SVR.fit(X train enc, y train price)
print("Best model:{}".format(GSCV SVR.best estimator ))
print("Ridge best parameters:{}".format(GSCV SVR.best params ))
print("Koefisien/bobot:
{}".format(GSCV SVR.best estimator .named steps['reg'].coef ))
print("Intercept/bias:
{}".format(GSCV SVR.best estimator .named steps['reg'].intercept ))
SVR predict = GSCV SVR.predict(X test enc)
mse SVR = mean squared error(y test price, SVR predict)
mae_SVR = mean_absolute_error(y_test_price, SVR_predict)
print("SVR Mean Squard Error (MSE): {}".format(mse SVR))
print("SVR Mean Absolute Error (MAE): {}".format(mae SVR))
print("SVR Root Mean Squared Error: {}".format(np.sqrt(mse SVR)))
Best model:Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectKBest(k=2,
                             score func=<function f regression at
0 \times 00000020133634CC0 > )),
                ('reg', SVR(C=10, kernel='linear'))])
Ridge best parameters: { 'feature selection k': 2, 'reg C': 10,
```

```
'reg epsilon': 0.1}
Koefisien/bobot:[[69203.83142266 1771.44667832]]
Intercept/bias:[5017389.52551094]
SVR Mean Squard Error (MSE): 7733494955101.608
SVR Mean Absolute Error (MAE): 2392029.6675750944
SVR Root Mean Squared Error: 2780916.2078533773
df results['SVR Prediction'] =SVR predict
df results = pd.DataFrame(y test price)
df results['SVR Prediction'] =SVR predict
df results['Selisih price SVR'] = df results['SVR Prediction'] -
df results['price']
df results.head()
          price SVR Prediction Selisih price SVR
2457 6033313.0
                   5.044114e+06
                                      -9.891985e+05
4865 5290006.8
                   5.022385e+06
                                      -2.676220e+05
5288 9235289.5 5.117175e+06
                                      -4.118115e+06
1063 7616002.0 5.078386e+06 -2.537616e+06
5197 9390420.3 5.125272e+06 -4.265149e+06
df results.describe()
              price SVR Prediction Selisih price SVR
count 2.000000e+03
                       2.000000e+03
                                           2.000000e+03
mean
       4.931727e+06
                       5.015550e+06
                                           8.382343e+04
       2.848679e+06
                       6.835477e+04
std
                                           2.780348e+06
min
      2.381840e+04 4.896081e+06
                                          -4.858343e+06
25%
      2.494605e+06
5.014176e+06
                       4.957087e+06
                                          -2.266067e+06
50%
                       5.018407e+06
                                           2.438072e+03
75% 7.338401e+06 5.072981e+06 max 9.994474e+06 5.138576e+06
                                          2.461521e+06
                                       4.874318e+06
from sklearn.svm import SVR
from sklearn.model selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectPercentile, f regression
from sklearn.metrics import mean absolute error, mean squared error
import numpy as np
# Membuat pipeline dengan SelectPercentile
pipe SVR percentile = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature selection', SelectPercentile(score func=f regression)),
    ('reg', SVR(kernel='linear'))
])
# Parameter grid untuk GridSearchCV
param grid SVR percentile = {
```

```
'reg C': [0.01,0.1,1,10],
    'reg epsilon': [0.1, 0.2, 0.5, 1],
    'feature_selection__percentile': [10, 20, 30, 40, 50, 60, 70, 80,
90] # Menggunakan percentile
}
# Membuat objek GridSearchCV
GSCV SVR = GridSearchCV(pipe SVR percentile,
param grid SVR percentile, cv=5, scoring='neg mean squared error')
# Fitting model
GSCV SVR.fit(X train enc, y train price)
# Output hasil terbaik
print("Best model: {}".format(GSCV SVR.best estimator ))
print("SVR best parameters: {}".format(GSCV SVR.best params ))
# Menghitung koefisien dan intercept
try:
    print("Koefisien/bobot:
{}".format(GSCV SVR.best estimator .named steps['reg'].coef ))
    print("Intercept/bias:
{}".format(GSCV SVR.best estimator .named steps['reg'].intercept ))
except AttributeError:
    print("SVR tidak memiliki koefisien yang dapat diakses secara
langsung.")
# Melakukan prediksi
SVR predict = GSCV SVR.predict(X test enc)
# Menghitung MSE dan MAE
mse SVR = mean squared error(y test price, SVR predict)
mae SVR = mean absolute error(y test price, SVR predict)
# Menampilkan hasil
print("SVR Mean Squared Error (MSE): {}".format(mse SVR))
print("SVR Mean Absolute Error (MAE): {}".format(mae SVR))
print("SVR Root Mean Squared Error: {}".format(np.sqrt(mse_SVR)))
Best model: Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectPercentile(score func=<function f regression at
0x0000020133634CC0>)),
                ('reg', SVR(C=10, kernel='linear'))])
SVR best parameters: {'feature selection percentile': 10, 'reg C':
10, 'reg epsilon': 0.1}
Koefisien/bobot: [[69203.83142266 1771.44667832]]
Intercept/bias: [5017389.52551094]
SVR Mean Squared Error (MSE): 7733494955101.608
```

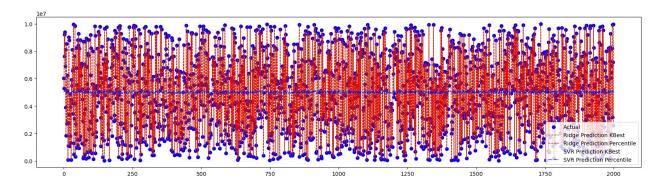
```
SVR Mean Absolute Error (MAE): 2392029.6675750944
SVR Root Mean Squared Error: 2780916.2078533773
df results['SVR Percentile Prediction'] =SVR predict
df results = pd.DataFrame(y test price)
df results['SVR Percentile Prediction'] =SVR predict
df results['Selisih price SVR percentile'] = df results['SVR
Percentile Prediction'] - df results['price']
df results.head()
          price SVR Percentile Prediction
Selisih price SVR percentile
2457 6033313.0
                              5.044114e+06
9.891985e+05
4865 5290006.8
                              5.022385e+06
2.676220e+05
5288 9235289.5
                              5.117175e+06
4.118115e+06
1063 7616002.0
                              5.078386e+06
2.537616e+06
5197 9390420.3
                              5.125272e+06
4.265149e+06
df results.describe()
              price SVR Percentile Prediction
Selisih price SVR percentile
count 2.000000e+03
                                  2.000000e+03
2.000000e+03
       4.931727e+06
                                  5.015550e+06
mean
8.382343e+04
std
       2.848679e+06
                                  6.835477e+04
2.780348e+06
       2.381840e+04
                                  4.896081e+06
min
4.858343e+06
25%
       2.494605e+06
                                  4.957087e+06
2.266067e+06
50%
       5.014176e+06
                                  5.018407e+06
2.438072e+03
75%
      7.338401e+06
                                  5.072981e+06
2.461521e+06
       9.994474e+06
                                  5.138576e+06
max
4.874318e+06
from sklearn.linear model import Ridge
from sklearn.model selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
from sklearn.feature selection import SelectPercentile, f regression
```

```
from sklearn.metrics import mean absolute error, mean squared error
pipe Ridge percentile = Pipeline(steps=[
    ('scale', StandardScaler()),
    ('feature selection', SelectPercentile(score func=f regression)),
    ('reg', Ridge())
])
param_grid_Ridge_percentile = {
    'reg__alpha': [0.01, 0.1, 1, 10, 100],
    'feature_selection__percentile': [10, 20, 30, 40, 50, 60, 70, 80,
90] # Mengganti 'k' dengan 'percentile'
GSCV RR = GridSearchCV(pipe Ridge percentile,
param grid Ridge percentile, cv=5,
                       scoring='neg mean squared error',
error score='raise')
GSCV_RR.fit(X_train_enc, y_train_price)
print("Best model: {}".format(GSCV RR.best estimator ))
print("Ridge best parameters: {}".format(GSCV RR.best params ))
print("Koefisien/bobot:
{}".format(GSCV RR.best estimator .named steps['reg'].coef ))
print("Intercept/bias:
{}".format(GSCV RR.best estimator .named steps['reg'].intercept ))
Ridge predict = GSCV RR.predict(X test enc)
mse Ridge = mean squared error(y test price, Ridge predict)
mae Ridge = mean absolute error(y test price, Ridge predict)
print("Ridge Mean Squared Error (MSE): {}".format(mse Ridge))
print("Ridge Mean Absolute Error (MAE): {}".format(mae Ridge))
print("Ridge Root Mean Squared Error: {}".format(np.sqrt(mse Ridge)))
Best model: Pipeline(steps=[('scale', StandardScaler()),
                ('feature selection',
                 SelectPercentile(percentile=90,
                                  score func=<function f regression at
0x0000020133634CC0>)),
                ('reg', Ridge(alpha=0.01))])
Ridge best parameters: {'feature selection percentile': 90,
'reg alpha': 0.01}
Koefisien/bobot: [ 1.49636141e+03 -7.55922006e+02 7.55922004e+02
4.14416376e+01
 -4.14416377e+01 -3.87150865e+01 3.87150862e+01 -6.77404283e+00
  6.77404323e+00 2.88436798e+06 -4.56405366e-02 1.59112848e+03
```

```
1.48200813e+02 - 1.43371744e+01 - 1.86279947e+01 - 1.15977886e+01
  3.17189986e+01 -8.23109475e+001
Intercept/bias: 5008877.6749249995
Ridge Mean Squared Error (MSE): 3540144.7107716934
Ridge Mean Absolute Error (MAE): 1463.0366330413735
Ridge Root Mean Squared Error: 1881.527228283368
df results['Ridge Percentile Prediction'] = Ridge predict
df results = pd.DataFrame(y test price)
df results['Ridge Percentile Prediction'] = Ridge predict
df results['Selisih price RR percentile'] = df results['Ridge
Percentile Prediction'] - df results['price']
df results.head()
          price Ridge Percentile Prediction
Selisih price RR percentile
2457 6033313.0
                                6.034185e+06
872.342258
4865 5290006.8
                                5.283703e+06
6304.221330
5288 9235289.5
                                9.234346e+06
943.386054
                                7.617647e+06
1063 7616002.0
1644.933213
5197 9390420.3
                                9.391224e+06
804.087296
df results.describe()
              price Ridge Percentile Prediction
Selisih price RR percentile
count 2.000000e+03
                                    2.000000e+03
2000,000000
      4.931727e+06
                                    4.931782e+06
mean
55.352778
std
       2.848679e+06
                                    2.848562e+06
2871.547718
       2.381840e+04
                                    2.787007e+04
min
10833.184798
                                    2.495427e+06
25%
       2.494605e+06
1843.724940
50%
       5.014176e+06
                                    5.017360e+06
297.079502
75%
      7.338401e+06
                                    7.339645e+06
2355.146005
       9.994474e+06
                                    9.998520e+06
max
5919.050249
```

```
import pandas as pd
import matplotlib.pyplot as plt
# Misalkan Ridge predict dan SVR predict sudah didefinisikan
sebelumnya
# Ridge predict = model ridge.predict(X test)
# SVR predict = model svr.predict(X test)
# Mengonversi y test price menjadi DataFrame
df results = pd.DataFrame(y test price)
# Menambahkan kolom prediksi
df results['Ridge Prediction'] = Ridge predict
df results['SVR Prediction'] = SVR predict # Pastikan ini ada
# Jika ada kolom lain yang perlu ditambahkan
df results['Ridge Percentile Prediction'] = Ridge predict
df results['SVR Percentile Prediction'] = SVR predict # Pastikan kamu
sudah menambahkan ini juga
# Menghitung selisih
df results['Selisih price RR'] = df results['Ridge Prediction'] -
df results['price']
df results['Selisih price SVR'] = df results['SVR Prediction'] -
df results['price']
df results['Selisih price RR percentile'] = df results['Ridge
Percentile Prediction'] - df results['price']
df_results['Selisih_price_SVR_percentile'] = df_results['SVR
Percentile Prediction'] - df results['price']
# Menampilkan beberapa data teratas
print(df results.head())
# Membuat plot
plt.figure(figsize=(20, 5))
data len = range(len(y test price))
plt.scatter(data len, df results['price'], label="Actual",
color="blue")
plt.plot(data len, df results['Ridge Prediction'], label="Ridge
Prediction KBest", color="green", linewidth=1, linestyle="dashed")
plt.plot(data len, df results['Ridge Percentile Prediction'],
label="Ridge Prediction Percentile", color="red", linewidth=1,
linestyle="dashed")
plt.plot(data_len, df_results['SVR Prediction'], label="SVR Prediction")
KBest", color="yellow", linewidth=1, linestyle="-.")
plt.plot(data len, df results['SVR Percentile Prediction'], label="SVR
Prediction Percentile", color="blue", linewidth=1, linestyle="-.")
# Menambahkan legenda dan menampilkan plot
```

```
plt.legend()
plt.show()
                 Ridge Prediction
                                    SVR Prediction \
          price
2457
      6033313.0
                      6.034185e+06
                                      5.044114e+06
4865
      5290006.8
                      5.283703e+06
                                      5.022385e+06
5288
      9235289.5
                      9.234346e+06
                                      5.117175e+06
1063
      7616002.0
                      7.617647e+06
                                      5.078386e+06
5197
      9390420.3
                      9.391224e+06
                                     5.125272e+06
      Ridge Percentile Prediction
                                    SVR Percentile Prediction \
2457
                                                  5.044114e+06
                      6.034185e+06
4865
                      5.283703e+06
                                                  5.022385e+06
5288
                      9.234346e+06
                                                  5.117175e+06
1063
                      7.617647e+06
                                                  5.078386e+06
5197
                      9.391224e+06
                                                  5.125272e+06
      Selisih_price_RR Selisih_price_SVR Selisih_price_RR_percentile
2457
            872.342258
                             -9.891985e+05
                                                               872.342258
4865
          -6304.221330
                             -2.676220e+05
                                                             -6304.221330
5288
           -943.386054
                             -4.118115e+06
                                                              -943.386054
1063
           1644.933213
                             -2.537616e+06
                                                              1644.933213
5197
            804.087296
                             -4.265149e+06
                                                               804.087296
      Selisih_price_SVR_percentile
2457
                      -9.891985e+05
4865
                      -2.676220e+05
5288
                      -4.118115e+06
1063
                      -2.537616e+06
5197
                      -4.265149e+06
```



```
import streamlit as st
import pandas as pd
import pickle
import os
from streamlit option menu import option menu
import numpy as np
# Navigasi sidebar
with st.sidebar:
   selected = option menu('Prediksi Harga Properti',
                           ['Klasifikasi', 'Regresi'],
                           default_index=0)
# Fungsi untuk memuat model
def load model():
   with open('gscv SVM percentile model.pkl', 'rb') as file:
       model = pickle.load(file)
   return model
gscv SVM percentile model = load model()
def load model1():
   with open('GSCV RF_model.pkl', 'rb') as file:
        model1 = pickle.load(file)
   return model1
GSCV RF model = load model1()
# Muat model
# Halaman Klasifikasi
if selected == 'Klasifikasi':
   st.title('Klasifikasi')
    # Inputan file dataset CSV
   file = st.file uploader("Masukkan File", type=["csv", "txt"])
    # Input data properti
   squaremeters = st.number input("Masukkan luas tanah dalam meter persegi", min value=0)
   numberofrooms = st.number input("Masukkan jumlah kamar", min value=0)
    # Input untuk kategori yang terpisah
   hasyard yes = st.selectbox("Memiliki halaman (Ya)", [1, 0])
   hasyard_no = 1 - hasyard_yes
   haspool yes = st.selectbox("Memiliki kolam renang (Ya)", [1, 0])
   haspool\ no = 1 - haspool\ yes
   floors = st.number input("Masukkan jumlah lantai", min value=0)
   citycode = st.number_input("Masukkan kode lokasi", min_value=0)
   citypartrange = st.number input("Masukkan eksklusivitas kawasan", min value=0)
   numprevowners = st.number_input("Masukkan jumlah pemilik sebelumnya", min_value=0)
   made = st.number input("Masukkan tahun pembuatan", min value=0)
   isnewbuilt new = st.selectbox("Bangunan baru (Ya)", [1, 0])
   isnewbuilt old = 1 - isnewbuilt new
   hasstormprotector yes = st.selectbox("Memiliki pelindung badai (Ya)", [1, 0])
   has storm protector no = 1 - has storm protector yes
   basement = st.number input("Masukkan luas basement", min value=0)
   attic = st.number input("Masukkan luas loteng", min value=0)
   garage = st.number input("Masukkan luas garase", min value=0)
   hasstorageroom yes = st.selectbox("Memiliki gudang (Ya)", [1, 0])
```

```
hasstorageroom no = 1 - hasstorageroom yes+1 # Inversi dari hasstorageroom yes
   hasguestroom = st.number input("Masukkan jumlah ruang tamu", min value=0)
    # Siapkan data input
   input data = np.array([[
       squaremeters,
       numberofrooms,
       hasyard yes,
       hasyard no,
       haspool_yes,
       haspool_no,
       floors,
       citycode,
       citypartrange,
       numprevowners,
       made,
       isnewbuilt new,
       isnewbuilt old,
       hasstormprotector_yes,
       hasstormprotector no,
       basement,
       attic,
        garage,
       hasstorageroom yes,
       hasstorageroom no,
       hasquestroom
   11)
    # Tombol untuk prediksi
   hitung = st.button("Prediksi")
   if hitung:
        # Debug info sebelum prediksi
        st.write("Data yang akan diprediksi:", input data)
        # Gunakan model untuk prediksi
        rf model prediction = gscv SVM percentile model.predict(input data)
        # Tampilkan hasil dengan format yang lebih baik
        kategori = rf_model_prediction[0]
        st.write("predik:", kategori)
        # Tampilkan hasil dengan warna dan format yang lebih baik
        if kategori == "Basic":
            st.success(f" Properti termasuk kategori Basic")
        elif kategori == "Middle":
            st.warning(f" Properti termasuk kategori Middle")
        else:
            st.error(f" Properti termasuk kategori Luxury")
if selected == 'Regresi':
   st.title('Regresi')
    # Inputan file dataset CSV
   file = st.file uploader("Masukkan File", type=["csv", "txt"])
    # Input data properti
   squaremeters = st.number input("Masukkan luas tanah dalam meter perseqi", min value=0)
   numberofrooms = st.number input("Masukkan jumlah kamar", min_value=0)
    # Perbaikan untuk variabel kategorikal
   hasyard_yes = st.selectbox("Memiliki halaman", [0, 1])
```

```
hasyard no = 1 - hasyard yes
haspool yes = st.selectbox("Memiliki kolam renang", [0, 1])
haspool\ no = 1 - haspool\ yes
floors = st.number input("Masukkan jumlah lantai", min value=0)
citycode = st.number input("Masukkan kode lokasi", min value=0)
citypartrange = st.number_input("Masukkan eksklusivitas kawasan", min_value=0)
numprevowners = st.number input("Masukkan jumlah pemilik sebelumnya", min value=0)
made = st.number input("Masukkan tahun pembuatan", min value=0)
isnewbuilt new = st.selectbox("Bangunan baru", [0, 1])
isnewbuilt_old = 1 - isnewbuilt_new
hasstormprotector yes = st.selectbox("Memiliki pelindung badai", [0, 1])
has storm protector no = 1 - has storm protector yes
basement = st.number input("Masukkan luas basement", min value=0)
attic = st.number input("Masukkan luas loteng", min value=0)
garage = st.number_input("Masukkan luas garase", min_value=0)
hasstorageroom yes = st.selectbox("Memiliki gudang", [0, 1])
hasstorageroom no = 1 - hasstorageroom yes
hasguestroom = st.number input("Masukkan jumlah ruang tamu", min value=0)
# Siapkan data input
input data = np.array([[
    squaremeters,
    numberofrooms,
   hasyard yes,
   hasyard no,
   haspool_yes,
   haspool no,
   floors,
   citycode,
    citypartrange,
   numprevowners,
   made,
   isnewbuilt new,
   isnewbuilt old,
    hasstormprotector_yes,
    hasstormprotector_no,
   basement,
    attic,
    garage,
    hasstorageroom yes,
    hasstorageroom no,
    hasquestroom
11)
# Tombol untuk prediksi
hitung = st.button("Prediksi")
if hitung:
    try:
        # Gunakan model untuk prediksi
        rf model prediction = GSCV RF model.predict(input data)
        # Format hasil prediksi dengan 1 angka di belakang koma
        formatted prediction = "{:,.1f}".format(rf model prediction[0])
        st.success(f"Harga properti yang diprediksi: Rp {formatted prediction}")
    except Exception as e:
        st.error(f"Terjadi kesalahan dalam prediksi: {str(e)}")
```