modeval

November 19, 2021

1 Classification Model Template

[ ]:
```
import joblib
df = joblib.load('finaldf.pkl')
df.head()
```

[ ]:

	id	cons_12m	cons_gas_12m	cons_last_month	has_gas	nb_prod_act	num_years_antig	pow_max	active_dur	price_p1_var	price_p2_var	price_p3_var	price_p1_fix	price_p2_fix	price_p3_fix	churn
0	48ada52261e7cf58715202705a0451c9	309275	0	10025	0	1	3	180.000	1460.0	0.151367	0.0	0.0	44.266931	0.0	0.0	0
1	24011ae4ebbe3035111d65fa7c15bc57	0	54946	0	1	2	3	43.648	1096.0	0.151367	0.0	0.0	44.266931	0.0	0.0	1
2	d29c2c54acc38ff3c0614d0a653813dd	4660	0	0	0	1	6	13.800	2566.0	0.151367	0.0	0.0	44.266931	0.0	0.0	0
3	764c75f661154dac3a6c254cd082ea7d	544	0	0	0	1	6	13.856	2192.0	0.149626	0.0	0.0	44.266931	0.0	0.0	0
4	bba03439a292a1e166f80264c16191cb	1584	0	0	0	1	6	13.200	2192.0	0.149626	0.0	0.0	44.266931	0.0	0.0	0

[ ]:
```
df.drop(['id'], axis = 1, inplace = True)
df.head()
```

[ ]:

	cons_12m	cons_gas_12m	cons_last_month	has_gas	nb_prod_act	num_years_antig	pow_max	active_dur	price_p1_var	price_p2_var	price_p3_var	price_p1_fix	price_p2_fix	price_p3_fix	churn
0	309275	0	10025	0	1	3	180.000	1460.0	0.151367	0.0	0.0	44.266931	0.0	0.0	0
1	0	54946	0	1	2	3	43.648	1096.0	0.151367	0.0	0.0	44.266931	0.0	0.0	1
2	4660	0	0	0	1	6	13.800	2566.0	0.151367	0.0	0.0	44.266931	0.0	0.0	0
3	544	0	0	0	1	6	13.856	2192.0	0.149626	0.0	0.0	44.266931	0.0	0.0	0
4	1584	0	0	0	1	6	13.200	2192.0	0.149626	0.0	0.0	44.266931	0.0	0.0	0

```
   num_years_antig  pow_max  active_dur  price_p1_var  price_p2_var  \
0                3  180.000      1460.0      0.151367           0.0
1                3   43.648      1096.0      0.151367           0.0
2                6   13.800      2566.0      0.151367           0.0
3                6   13.856      2192.0      0.149626           0.0
4                6   13.200      2192.0      0.149626           0.0

   price_p3_var  price_p1_fix  price_p2_fix  price_p3_fix  churn
0           0.0     44.266931           0.0           0.0      0
1           0.0     44.266931           0.0           0.0      1
2           0.0     44.266931           0.0           0.0      0
3           0.0     44.266931           0.0           0.0      0
4           0.0     44.266931           0.0           0.0      0
```

[ ]:
```python
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import cross_val_score
from sklearn.naive_bayes import GaussianNB
from sklearn.naive_bayes import MultinomialNB
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import GridSearchCV
import pandas as pd
```

[ ]:
```python
model_params = {
    'LogisticRegression': {
        'model': LogisticRegression(solver='liblinear', multi_class='auto'),
        'params': {
            'C': [1, 5, 10]
        }
    },
    'DecisionTree': {
        'model': DecisionTreeClassifier(),
        'params': {
            'criterion': ['gini', 'entropy']
        }
    },
    'RandomForest': {
        'model': RandomForestClassifier(),
        'params': {
            'n_estimators': [1, 5, 10]
        }
    },
    'GaussianNB': {
        'model': GaussianNB(),
        'params': {
```

```
        }
    },

    'KNN': {
        'model': KNeighborsClassifier(),
        'params': {
            'n_neighbors': [2, 3]
        }
    }
}
X = df.drop(['churn'], axis=1)
y = df.churn

scores = []
for model_name, mp in model_params.items():
    clf = GridSearchCV(mp['model'], mp['params'],
                       cv=5, return_train_score=False)
    clf.fit(X, y)
    scores.append({
        'model': model_name,
        'best_score': (clf.best_score_).round(2),
        'best_params': (clf.best_params_),
    })
result = pd.DataFrame(scores, columns=['model', 'best_score', 'best_params'])
result
```

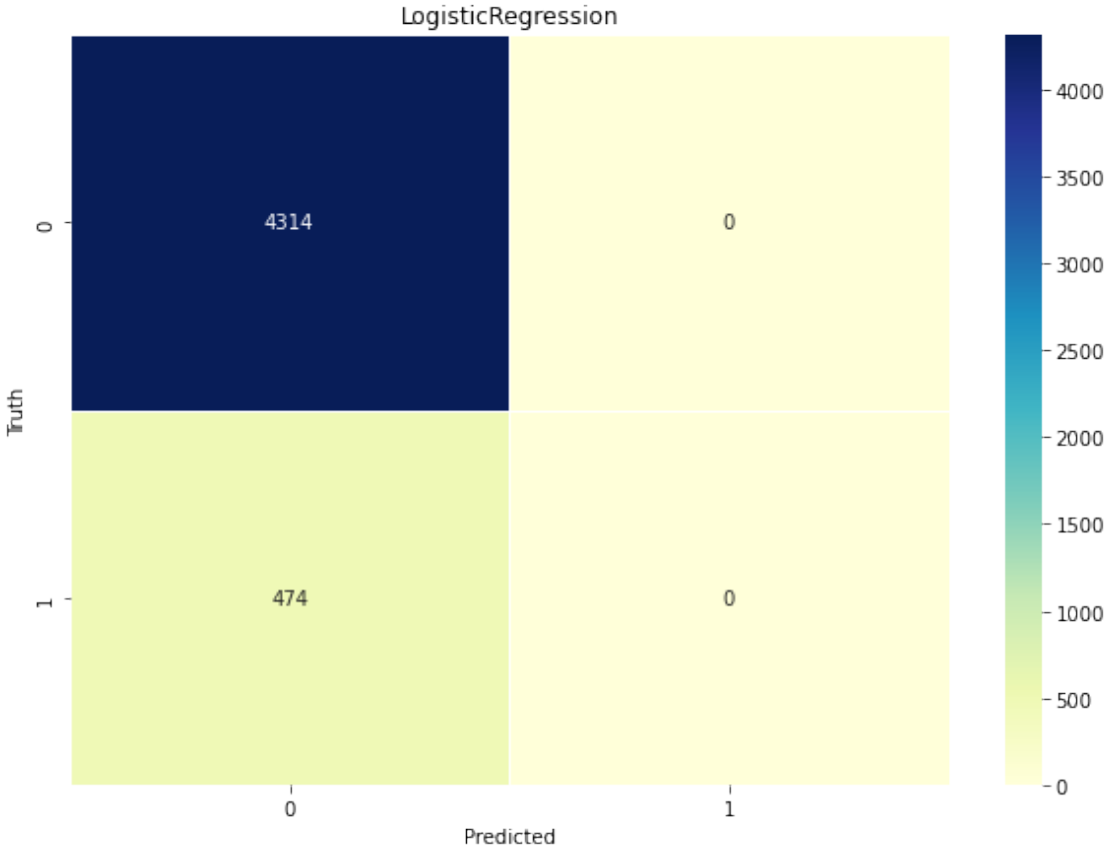
[ ]:

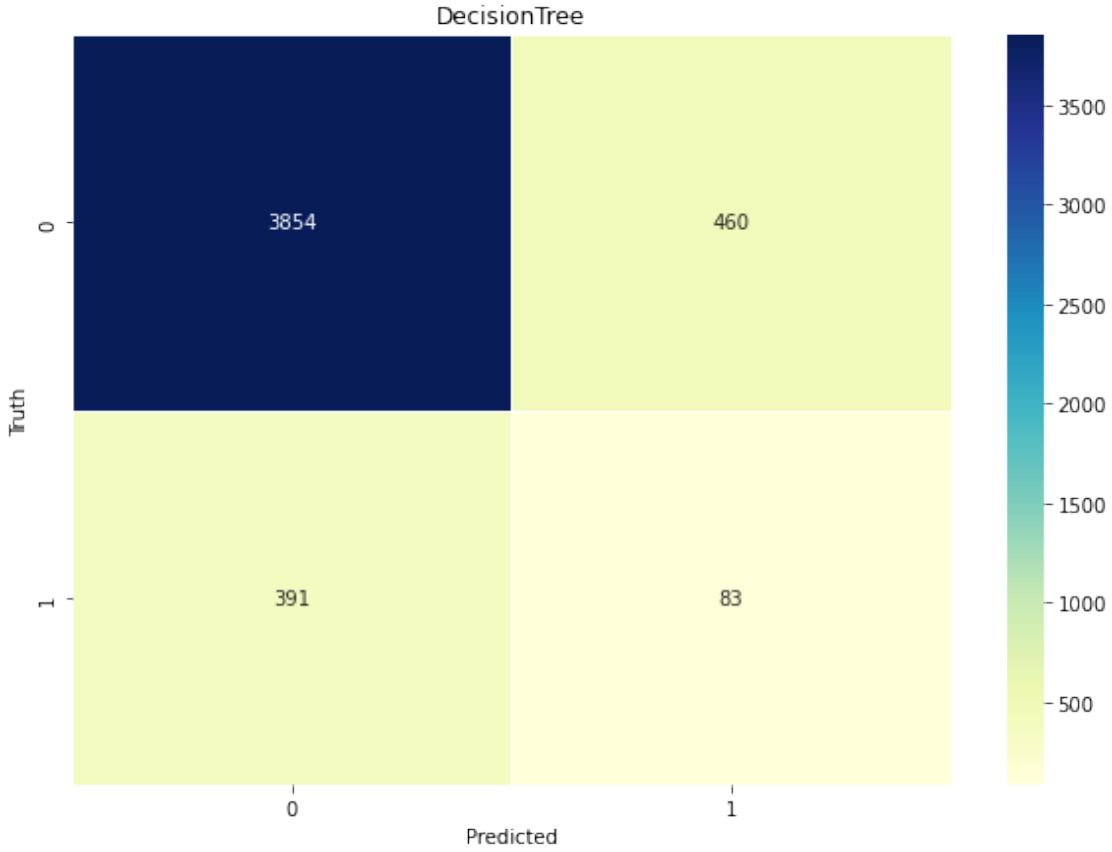
	model	best_score	best_params
0	LogisticRegression	0.90	{'C': 1}
1	DecisionTree	0.83	{'criterion': 'gini'}
2	RandomForest	0.90	{'n_estimators': 10}
3	GaussianNB	0.23	{}
4	KNN	0.90	{'n_neighbors': 2}

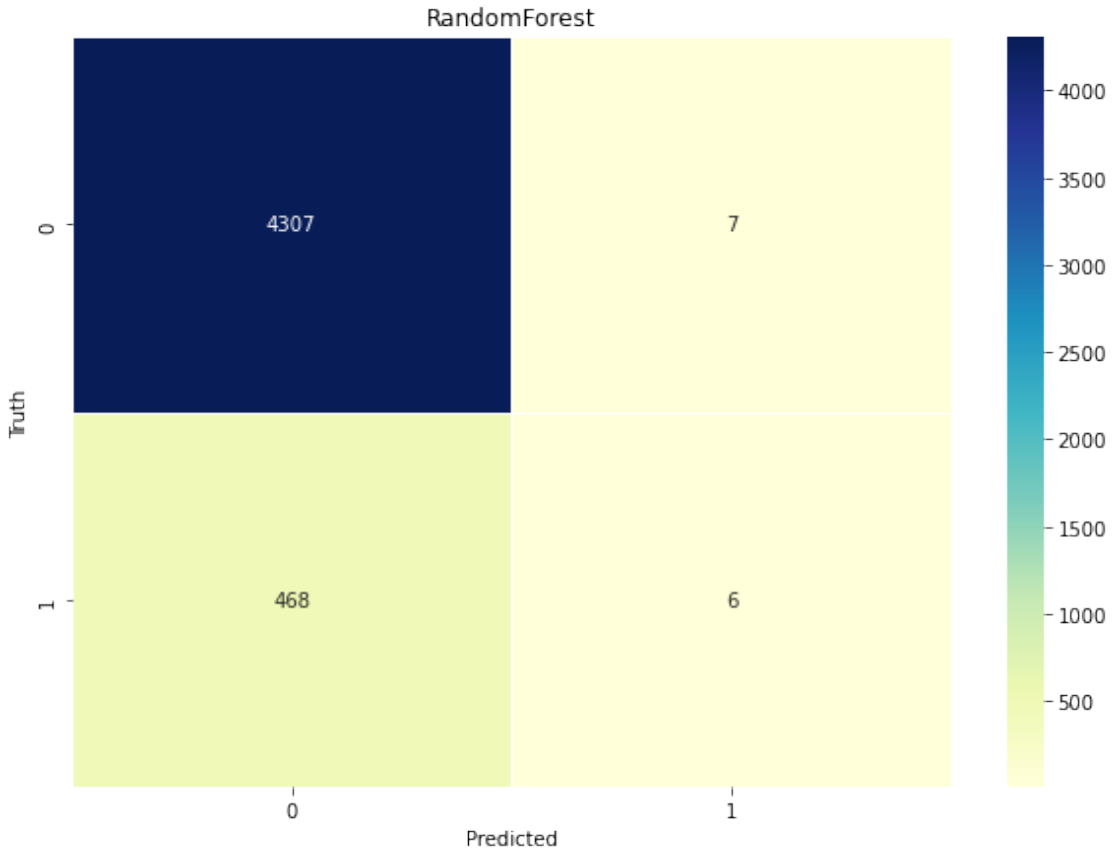
[ ]:
```
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, classification_report,␣
 ↪accuracy_score, precision_score, recall_score
from matplotlib import pyplot as plt
import seaborn as sns
sc =[]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,␣
 ↪random_state=3)

model_sel = {
    'LogisticRegression': {
        'model': LogisticRegression(solver='liblinear', multi_class='auto')
    },
```

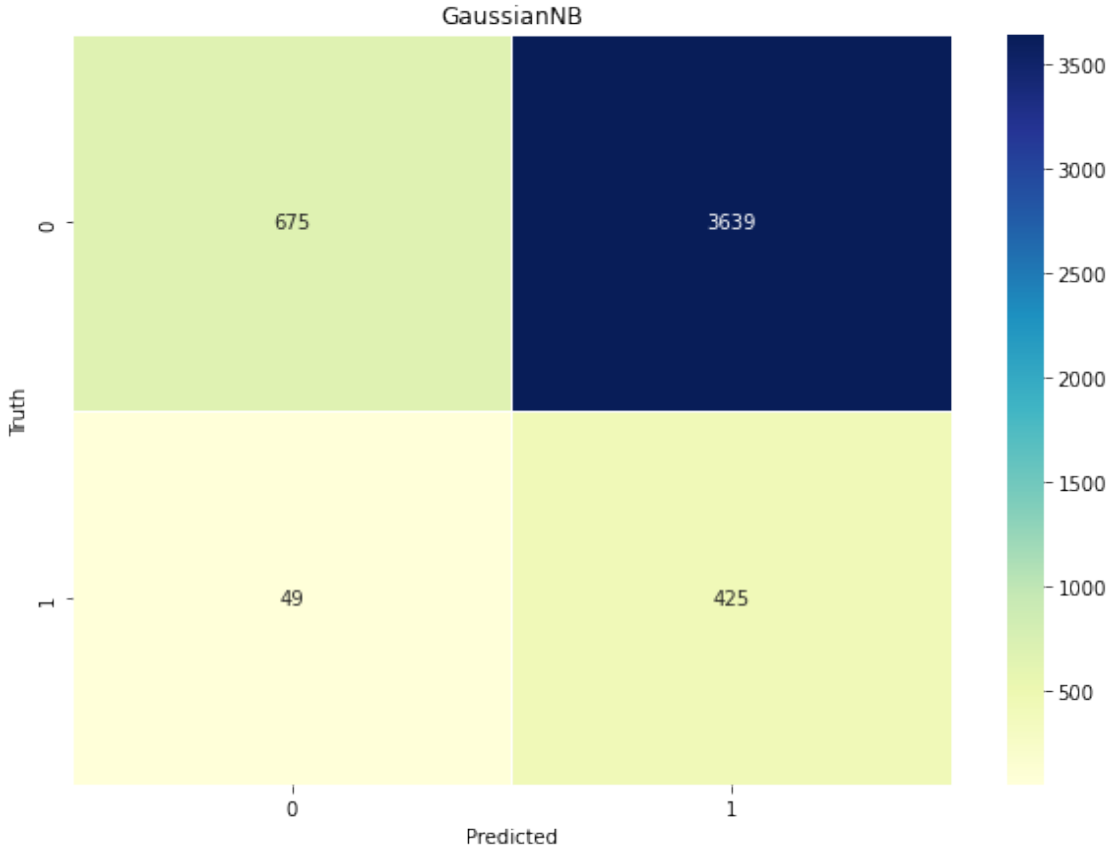
```
    'DecisionTree': {
        'model': DecisionTreeClassifier()
    },
    'RandomForest': {
        'model': RandomForestClassifier()
    },
    'GaussianNB': {
        'model': GaussianNB()
    },

    'KNN': {
        'model': KNeighborsClassifier()
    }
}
scor = []
for model_name, mp in model_sel.items():
    clf = mp['model']
    clf.fit(X_train, y_train)
    scor.append({
        'model': model_name,
        'accuracy': accuracy_score(y_test, clf.predict(X_test)).round(2),
        'precision': precision_score(y_test, clf.predict(X_test)).round(2),
        'recall': recall_score(y_test, clf.predict(X_test)).round(2),
    })
    cm = confusion_matrix(y_test, clf.predict(X_test)).round(2)
    plt.figure(figsize=(10, 7))
    sns.heatmap(cm, annot=True, fmt='d', cmap='YlGnBu', linewidths = .5)
    plt.xlabel('Predicted')
    plt.ylabel('Truth')
    plt.title(model_name)
    plt.show()
reslt = pd.DataFrame(scor, columns=['model','accuracy', 'precision', 'recall'])
reslt
```

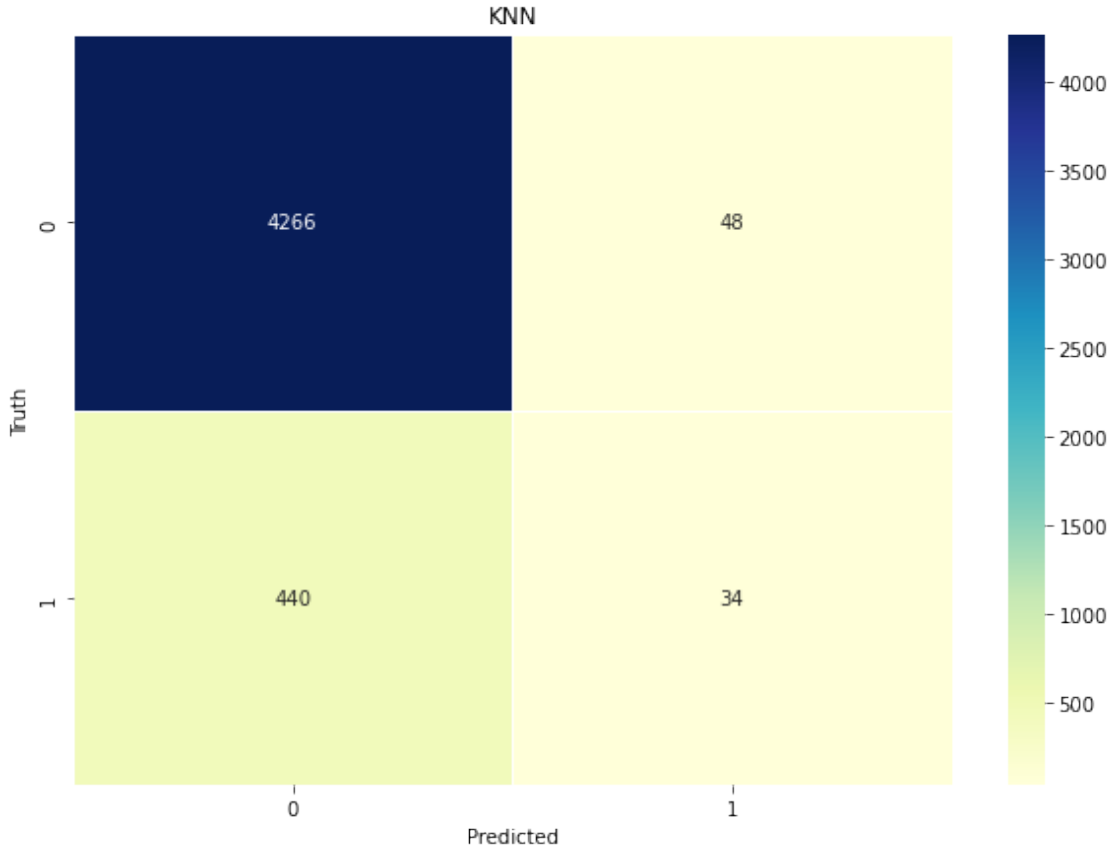
```
/Users/jatindersinghmalhi/opt/anaconda3/envs/tensorflow/lib/python3.8/site-
packages/sklearn/metrics/_classification.py:1248: UndefinedMetricWarning:
Precision is ill-defined and being set to 0.0 due to no predicted samples. Use
`zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
```


LogisticRegression
4314
0
474
0
Truth
0
1
0
1
Predicted
4000
3500
3000
2500
2000
1500
1000
500
0


DecisionTree
3854
460
391
83
0
1
Truth
0
1
Predicted
3500
3000
2500
2000
1500
1000
500


RandomForest
4307
7
468
6
0
1
Truth
0
1
Predicted
4000
3500
3000
2500
2000
1500
1000
500


GaussianNB
675
3639
49
425
Truth
0
1
Predicted
0
1
3500
3000
2500
2000
1500
1000
500



[ ]:

	model	accuracy	precision	recall
0	LogisticRegression	0.90	0.00	0.00
1	DecisionTree	0.82	0.15	0.18
2	RandomForest	0.90	0.46	0.01
3	GaussianNB	0.23	0.10	0.90
4	KNN	0.90	0.41	0.07