3647SHDS-attached python

December 8, 2022

[44]:
```
import numpy as np
import pandas as pd
from sklearn.model_selection import StratifiedKFold
from sklearn.metrics import confusion_matrix, accuracy_score,␣
 ↪classification_report
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import RandomForestClassifier
from xgboost import XGBClassifier
from xgboost import plot_importance
import seaborn as sns
from matplotlib import pyplot
from collections import Counter
from imblearn.over_sampling import RandomOverSampler
```

[47]:
```
df = pd.read_csv("../Documents/PHS/Statistics for HDS/module assessment/part2/
 ↪child_cleaned.csv")
df = df.drop("Unnamed: 0",axis=1)
df
```

[47]:

	social	motherIQ	alcohol	smoke	birthorder	birthwt	childage	score	\
0	2	1	1	1	1	3.78	5.00	110	
1	2	1	1	1	2	3.03	5.17	91	
2	1	1	3	2	2	2.71	5.08	91	
3	2	2	1	1	1	2.92	4.92	96	
4	1	1	2	2	2	3.62	4.92	93	
…	…	…	…	…	…	…	…	…	
1842	3	2	2	2	2	3.07	5.00	96	
1843	1	2	2	1	2	3.87	4.92	90	
1844	2	2	1	1	3	3.99	5.00	96	
1845	3	2	1	1	1	4.27	5.00	90	
1846	2	3	1	1	1	3.45	5.00	132	

	disease
0	0
1	0

```
2           0
3           0
4           1
…       …
1842        0
1843        0
1844        0
1845        0
1846        0

[1847 rows x 9 columns]
```

[63]:
```python
def get_dataset(return_X=True, over_sampling = True):
    X = df.to_numpy()[:,:-2]
    y = df["disease"]

    if over_sampling:
        ros = RandomOverSampler(random_state=0)
        X_resampled, y_resampled = ros.fit_resample(X, y)
        return X_resampled, np.array(y_resampled, dtype=int)

    return X, np.array(y, dtype=int)
len(get_dataset()[1])
```

[63]:
```
3272
```

[51]:
```python
def data_split():
    X, y = get_dataset()
    split_indices = []
    skf = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)

    for train_index, test_index in skf.split(X, y):
        split_indices.append((train_index, test_index))

    return split_indices
```

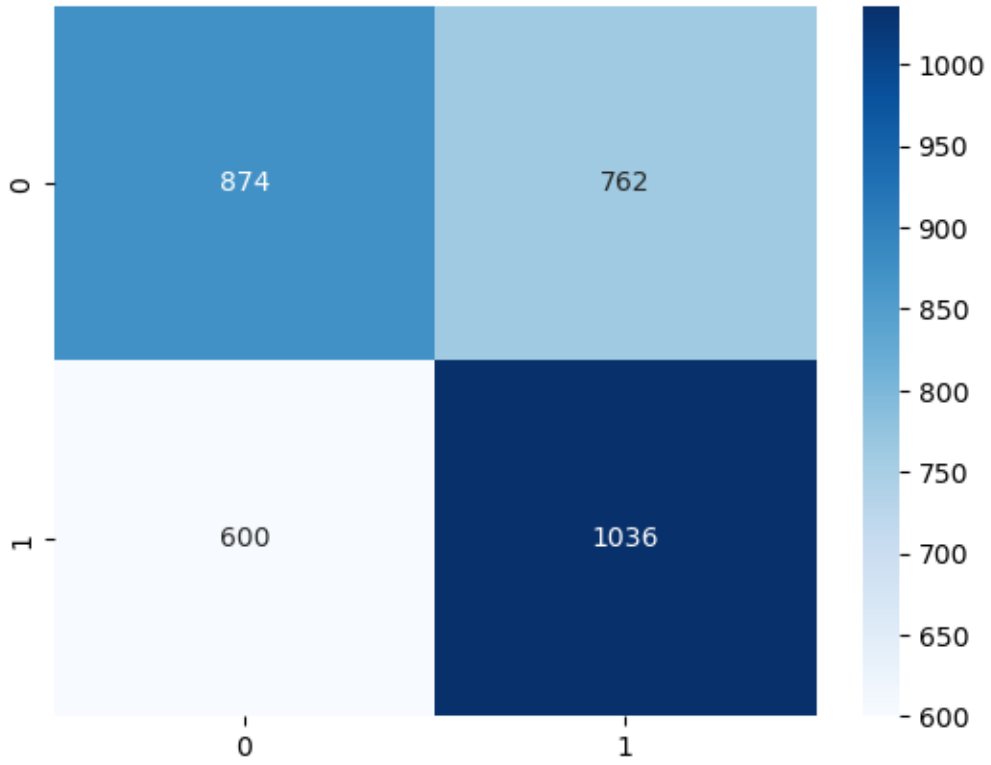
[56]:
```python
def train_and_test(model_name, svm_kernel='rbf'):
    X, y = get_dataset()
    split_indices = data_split()
    y_pre, y_tru = np.array([]), np.array([])

    for train_indices, test_indices in split_indices:
        X_train, X_test = X[train_indices], X[test_indices]
        y_train, y_test = y[train_indices], y[test_indices]

        if model_name=='LR':
            model = LogisticRegression(solver='lbfgs', max_iter=10000)
```

```
        elif model_name=='KNN':
            model = KNeighborsClassifier()
        elif model_name=='SVM':
            model = SVC(kernel=svm_kernel)
        elif model_name=='XGBoost':
            model = XGBClassifier(use_label_encoder=False,␣
↪eval_metric='mlogloss')
        else:
            print('No matched classifiers')
            return

        model.fit(X_train, y_train)

        y_test_pre = model.predict(X_test)
        y_pre = np.concatenate((y_pre, y_test_pre))
        y_tru = np.concatenate((y_tru, y_test))

    return {'pre': y_pre, 'tru': y_tru}
```

[38]:
```
def plot_heatmap(res, model_name):
    print('Model:', model_name)
    classes = [0,1]
    y_pred, y_test = res['pre'].astype(int), res['tru'].astype(int)

    vis = confusion_matrix(y_test, y_pred)
    accu = accuracy_score(y_test, y_pred)

    #print(classification_report(y_test, y_pred))
    print('Accuracy: %.2f%%' % (accu*100))

    pd_vis = pd.DataFrame(vis, columns=classes, index=classes)
    ax = sns.heatmap(pd_vis, cmap="Blues", annot=True, fmt='d')
```

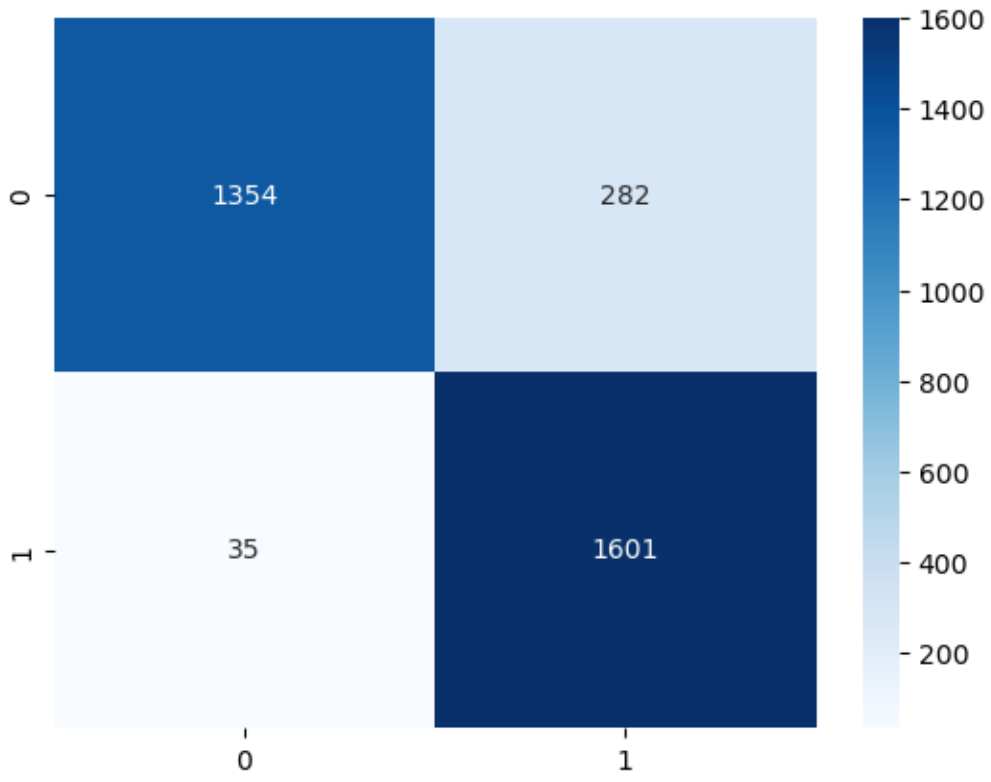
[64]:
```
res_lr = train_and_test('LR')
plot_heatmap(res_lr, 'Multinominal Logistic Regression')
```

```
Model: Multinominal Logistic Regression
Accuracy: 58.37%
```



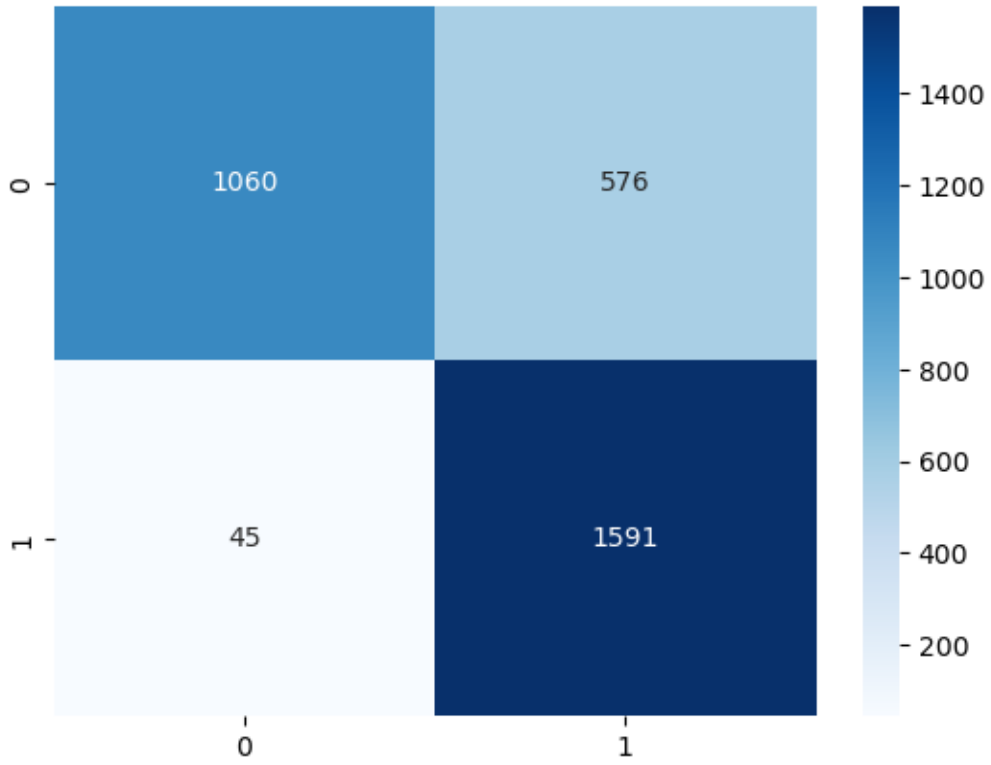
[58]:
```
res_xgboost = train_and_test('XGBoost')
plot_heatmap(res_xgboost, 'XGBoost')
```

```
Model: XGBoost
Accuracy: 90.31%
```



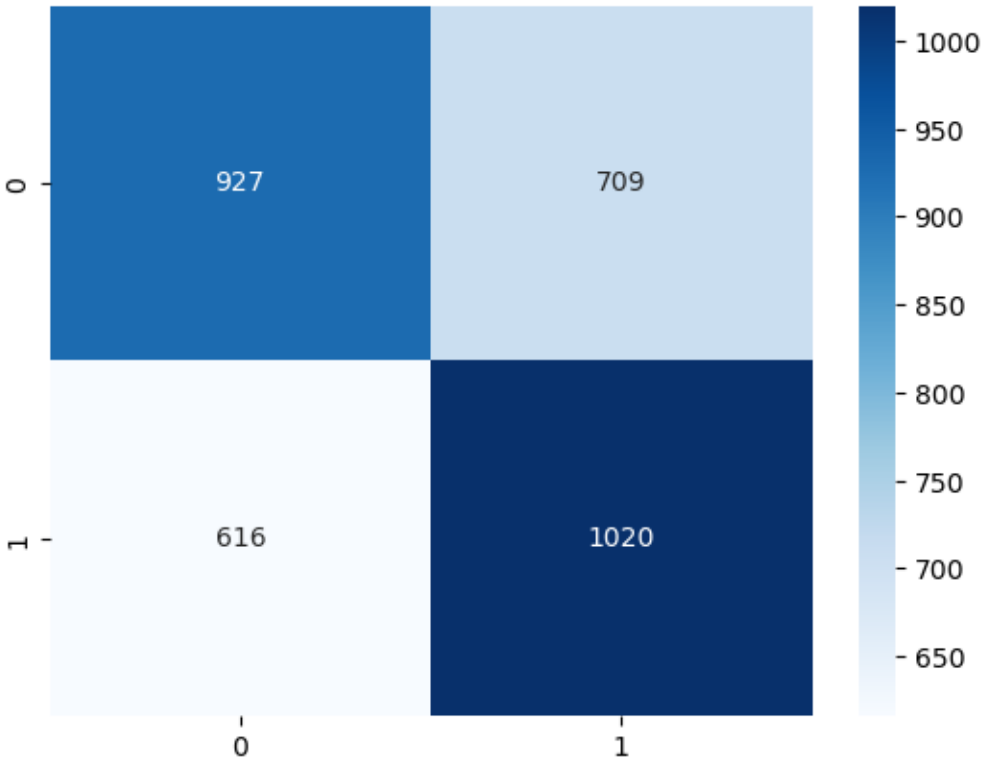
[59]:
```
res_knn = train_and_test('KNN')
plot_heatmap(res_knn, 'KNN')
```

```
Model: KNN
Accuracy: 81.02%
```



[60]:
```
res_svm_rbf = train_and_test('SVM', 'rbf')
plot_heatmap(res_svm_rbf, 'SVM, kernel: rbf')
```

```
Model: SVM, kernel: rbf
Accuracy: 59.50%
```


927
709
616
1020
0
1
0
1
1000
950
900
850
800
750
700
650