notebook 210607

June 7, 2021

[1]:

```
import numpy as np

random_state = None
```

[2]:

```
# accuracy = number of correctly classified instances / total instances
# errors = index list representing instances that were misclassified

from sklearn.model_selection import StratifiedKFold

def evaluate(X, y, model):
    skf = StratifiedKFold(n_splits=5, shuffle=True, random_state=random_state)
    errors = []
    for train, test in skf.split(X, y):
        model.fit(X[train], y[train])
        y_pred = model.predict(X[test])
        errors.append(test[y_pred != y[test]])

    errors = np.concatenate(errors)
    accuracy = 1 - (len(errors) / len(y))
    return accuracy, errors
```

[3]:

```
# Resamples with replacement but with double the probability for error␣
 ↪classifications
def resample(X, y, errors):
    n_samples = len(y)
    weights = np.array([1 / n_samples] * n_samples)
    weights[errors] *= 1.1
    weights /= np.sum(weights)
    selection = np.random.choice(n_samples, size=n_samples, p=weights)
    selection = np.unique(selection)
    return X[selection], y[selection]
```

[4]:

```
import matplotlib.pyplot as plt

def plot(X, y):
    fig, ax = plt.subplots()
    colours = ('red', 'blue')
    for label in range(n_classes):
        ax.scatter(x=X[y==label, label],
                y=X[y==label, label],
                c=colours[label],
                s=20,
                label=label)

    ax.set(xlabel='X',
        ylabel='y',
        title='Sample data')
    ax.legend(loc='upper right')

    plt.show()
```

[9]:

```
from sklearn.datasets import make_blobs
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neural_network import MLPClassifier

X, y = make_blobs(n_samples=10000, centers=2, cluster_std=10,␣
 ↪random_state=random_state)

knn = KNeighborsClassifier(n_neighbors=3)
tree = DecisionTreeClassifier()
nn = MLPClassifier(hidden_layer_sizes=(5, 5))

models = {
    '3-NN': knn,
    'Decision Tree': tree,
    'Neural Net': nn
}

for name, model in models.items():
    acc = []
    for i in range(5):
        # plot(X, y)
        accuracy, errors = evaluate(X, y, model)
        acc.append(accuracy)
        X, y = resample(X, y, errors)
    plt.plot(acc, label=name)

plt.xlabel('Resampling iteration')
plt.ylabel('Accuracy')
plt.legend()
plt.show()
```

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packages\sklearn\neural_network\_multilayer_perceptron.py:614:
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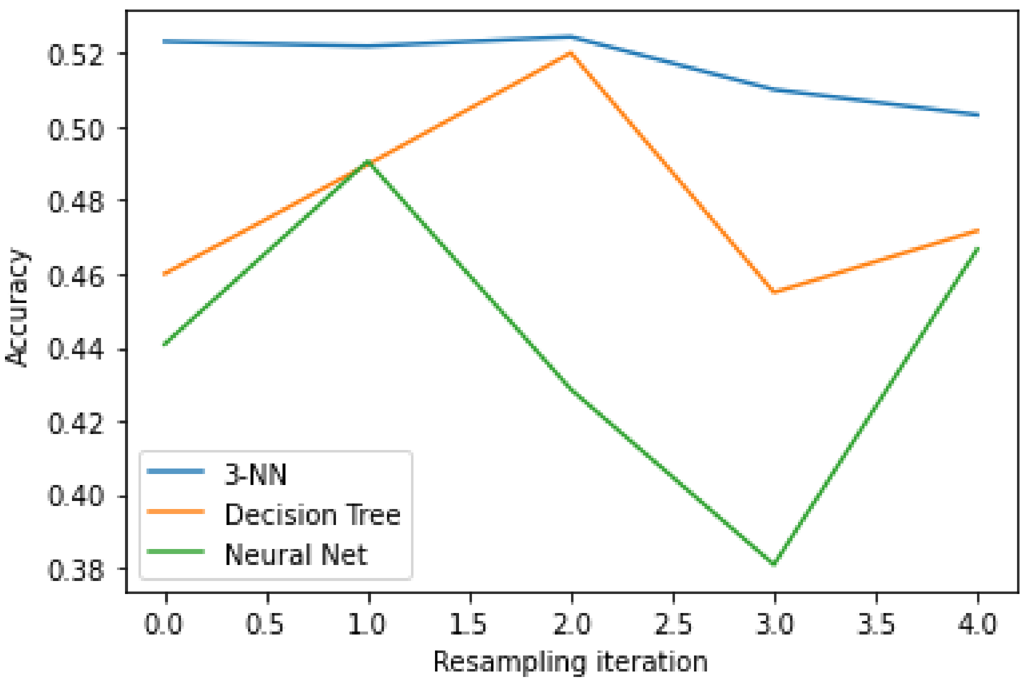
0.52
0.50
0.48
0.46
0.44
0.42
0.40
0.38
Accuracy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Resampling iteration
3-NN
Decision Tree
Neural Net

```
[ ]:
```