In [41]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
import numpy as np
from sklearn.datasets import load_digits
import matplotlib.pyplot as plt
digits=load_digits()
```

In [42]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(digits.data,digits.target,tes
```

In [43]:
```
x_train
```

Out[43]:
```
array([[ 0.,  2., 13., ...,  0.,  0.,  0.],
       [ 0.,  0.,  6., ..., 11.,  2.,  0.],
       [ 0.,  0.,  4., ..., 16.,  1.,  0.],
       ...,
       [ 0.,  0.,  8., ...,  3.,  0.,  0.],
       [ 0.,  0.,  0., ...,  0.,  0.,  0.],
       [ 0.,  1.,  8., ...,  3.,  0.,  0.]])
```

In [44]:
```
y_train
```

Out[44]:
```
array([5, 1, 8, ..., 3, 4, 9])
```

In [45]:
```
lr=LogisticRegression(solver='liblinear',multi_class='ovr')
lr.fit(x_train,y_train)
lr.score(x_test,y_test)
```

Out[45]:
```
0.9518518518518518
```

In [46]:
```
lr=SVC()
lr.fit(x_train,y_train)
lr.score(x_test,y_test)
```

Out[46]:
```
0.9796296296296296
```

In [47]:
```
lr=RandomForestClassifier(n_estimators=40)
lr.fit(x_train,y_train)
lr.score(x_test,y_test)
```

Out[47]:
```
0.9666666666666667
```

In [48]:
```
from sklearn.model_selection import KFold
kf=KFold(n_splits=3)
kf
```

Out[48]:
```
KFold(n_splits=3, random_state=None, shuffle=False)
```

In [49]:
```
kf.split([1,2,3,4,5,6,7,8,9])
```

Out[49]:
```
<generator object _BaseKFold.split at 0x0000021029565660>
```

In [50]:
```
for train_index,test_index in kf.split([1,2,3,4,5,6,7,8,9]):
    print(train_index,test_index)
```

```
[3 4 5 6 7 8] [0 1 2]
[0 1 2 6 7 8] [3 4 5]
[0 1 2 3 4 5] [6 7 8]
```

In [52]:
```
def get_score(model,x_train,x_test,y_train,y_test):
    model.fit(x_train,y_train)
    return model.score(x_test,y_test)
```

In [54]:
```
get_score(SVC(),x_train,x_test,y_train,y_test)
```

Out[54]:
```
0.9796296296296296
```

In [55]:
```
get_score(RandomForestClassifier(n_estimators=40)
,x_train,x_test,y_train,y_test)
```

Out[55]:
```
0.9555555555555556
```

In [57]:
```
get_score(LogisticRegression(),x_train,x_test,y_train,y_test)
```

```
C:\Users\Dell\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:
814: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
```

Out[57]:
```
0.9481481481481482
```

In [61]:
```
from sklearn.model_selection import StratifiedKFold
```

In [71]:
```
folds= StratifiedKFold(n_splits=3)
score_logistic=[]
score_SVM=[]
score_rf=[]

for train_index,test_index in kf.split(digits.data,digits.target):
    x_train,x_test,y_train,y_test=digits.data[train_index],digits.data[test_
    digits.target[train_index],digits.target[test_index]

    score_logistic.append(get_score(LogisticRegression(),x_train,x_test,y_tr
    score_SVM.append(get_score(SVC(),x_train,x_test,y_train,y_test))
    score_rf.append(get_score(RandomForestClassifier(n_estimators=40),x_trai
```

```
C:\Users\Dell\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:
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ssion
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C:\Users\Dell\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:
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Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
```

In [72]:

```
score_logistic
```

Out[72]:

```
[0.9232053422370617, 0.9415692821368948, 0.9148580968280468]
```

In [74]:

```
score_SVM
```

Out[74]:

```
[0.9666110183639399, 0.9816360601001669, 0.9549248747913188]
```

In [75]:

```
score_rf
```

Out[75]:

```
[0.9315525876460768, 0.9398998330550918, 0.9215358931552587]
```

In [76]:

```
from sklearn.model_selection import cross_val_score
```

In [83]:

```
cross_val_score(LogisticRegression(),digits.data,digits.target,cv=5)
```

```
C:\Users\Dell\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:
814: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
C:\Users\Dell\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:
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Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
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Increase the number of iterations (max_iter) or scale the data as shown in:
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Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
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Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion
  n_iter_i = _check_optimize_result(
```

Out[83]:
```
array([0.92222222, 0.86944444, 0.94150418, 0.93871866, 0.89693593])
```

In [84]:
```
cross_val_score(RandomForestClassifier(),digits.data,digits.target,cv=5)
```

Out[84]:
```
array([0.93333333, 0.90833333, 0.95543175, 0.95264624, 0.91922006])
```

In [86]:
```
scores1=cross_val_score(RandomForestClassifier(n_estimators=5),digits.data,d
np.average(scores1)
```

Out[86]:
```
0.8736778398510243
```

In [89]:
```
scores1=cross_val_score(RandomForestClassifier(n_estimators=20),digits.data,
np.average(scores1)
```

Out[89]:
```
0.9531710362047441
```

In [90]:
```
scores1=cross_val_score(RandomForestClassifier(n_estimators=40),digits.data,
np.average(scores1)
```

Out[90]:
```
0.9688135593220337
```