Support Vector Machine dengan data Visit-Nominal.csv

1. Inisialisasikan library yang diperlukan untuk dataset ini.

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import statistics

from sklearn import svm
from sklearn.datasets import load_digits
from sklearn.model_selection import validation_curve
from sklearn.model_selection import cross_val_score
```

2. Masukan dataset Visit-Nominal.csv kedalam dataframe

In [2]:
```
df = pd.read_csv("\\Users\\aftermath\\Documents\\Machine Learning\\Visit-Nominal.csv",header=None,
skipinitialspace=True)
attrs = []
for attr in range(7):
    attrs.append(df.at[0,attr])

dfnew = pd.read_csv("\\Users\\aftermath\\Documents\\Machine Learning\\Visit-Nominal.csv",header=No
ne, skipinitialspace=True, skiprows = 1)
dfnew.columns = attrs

dfnew.head()
```

Out[2]:

	Home	Browsed	Searched	Prod_A	Prod_B	Prod_C	Visit_Again
0	yes	no	no	no	no	no	no
1	yes	yes	yes	no	no	no	no
2	yes	no	no	no	no	no	no
3	yes	yes	yes	yes	no	no	yes
4	yes	no	yes	yes	yes	no	yes

In [3]:
```
print(dfnew.describe())
```

```
        Home Browsed Searched Prod_A Prod_B Prod_C Visit_Again
count    100     100      100    100    100    100         100
unique     2       2        2      2      2      2           2
top      yes     yes       no    yes    yes     no          no
freq      60      72       57     53     55     55          61
```

3. Representasikan data 'yes' dan 'no' kedalam bentuk biner '1' dan '0'

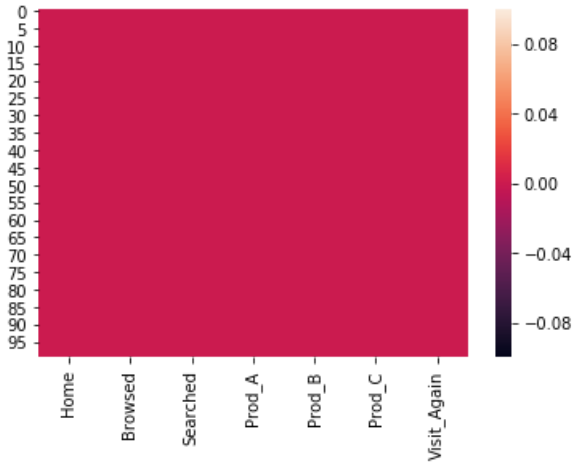
In [4]:
```
toBinary = lambda x: 1 if x=="yes" else 0
dfnew = dfnew.applymap(toBinary)
```

4. Cek apakah terdapat value fitur yang kosong

In [5]:
```
missing_values = dfnew.isnull()
missing_values

sns.heatmap(data = missing_values)
```

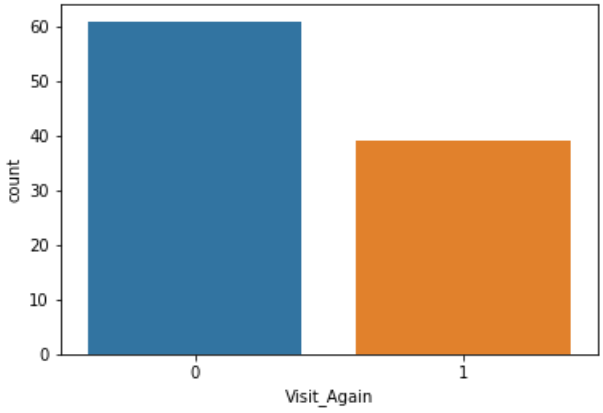
Out[5]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x263e84d4588>
```



5. Lihat perbandingan jumlah class 0 dan 1

In [6]:
```
sns.countplot(x='Visit_Again', data=dfnew)
dfnew.Visit_Again.value_counts()
```

Out[6]:
```
0    61
1    39
Name: Visit_Again, dtype: int64
```



6. Siapkan data untuk training secara biasa dan training dengan cross validation

In [7]:
```
feature = attrs
feature.pop()
feature
```

Out[7]:
```
['Home', 'Browsed', 'Searched', 'Prod_A', 'Prod_B', 'Prod_C']
```

In [8]:
```
features = dfnew[feature]
label = dfnew['Visit_Again']
```

7. Inisialisasi 12 model

In [9]:
```
#RBF C = 0.01
rbfmodel1 = svm.SVC(gamma='scale', C=0.01, kernel='rbf')
#RBF C = 0.1
rbfmodel2 = svm.SVC(gamma='scale', C=0.1, kernel='rbf')
#RBF C = 1
rbfmodel3 = svm.SVC(gamma='scale', C=1, kernel='rbf')
#RBF C = 10
rbfmodel4 = svm.SVC(gamma='scale', C=10, kernel='rbf')

#SIGMOID C = 0.01
sigmoidmodel1 = svm.SVC(gamma='scale', C=0.01, kernel='sigmoid')
#SIGMOID C = 0.1
sigmoidmodel2 = svm.SVC(gamma='scale', C=0.1, kernel='sigmoid')
#SIGMOID C = 1
sigmoidmodel3 = svm.SVC(gamma='scale', C=1, kernel='sigmoid')
#SIGMOID C = 10
sigmoidmodel4 = svm.SVC(gamma='scale', C=10, kernel='sigmoid')

#LINEAR C = 0.01
linearmodel1 = svm.SVC(gamma='scale', C=0.01, kernel='linear')
#LINEAR C = 0.1
linearmodel2 = svm.SVC(gamma='scale', C=0.1, kernel='linear')
#LINEAR C = 1
linearmodel3 = svm.SVC(gamma='scale', C=1, kernel='linear')
#LINEAR C = 10
linearmodel4 = svm.SVC(gamma='scale', C=10, kernel='linear')
```

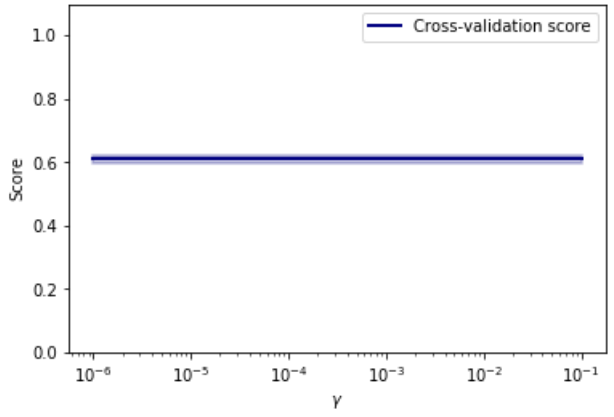
7.1 RBF Model

In [10]:
```
RBFscore1 =  cross_val_score(rbfmodel1, features, label, cv=5)
print("CROSS VALIDATION SCORE RBF C=0.01 : ",statistics.mean(RBFscore1))

param_range = np.logspace(-6, -1, 5)
train_scores, test_scores = validation_curve(
    rbfmodel1, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE RBF C=0.01 :  0.610125313283208
```

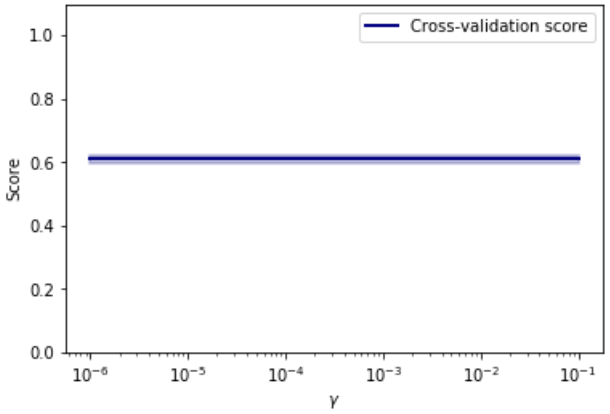


In [11]:
```
RBFscore2 =  cross_val_score(rbfmodel2, features, label, cv=5)
print("CROSS VALIDATION SCORE RBF C=0.1 : ",statistics.mean(RBFscore2))

train_scores, test_scores = validation_curve(
    rbfmodel2, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE RBF C=0.1 :  0.610125313283208
```

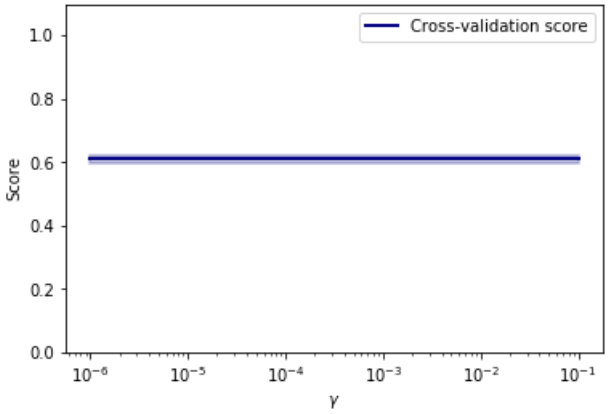


In [12]:
```
RBFscore3 =  cross_val_score(rbfmodel3, features, label, cv=5)
print("CROSS VALIDATION SCORE RBF C=1 : ",statistics.mean(RBFscore3))

train_scores, test_scores = validation_curve(
    rbfmodel3, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE RBF C=1 :  0.5095989974937344
```

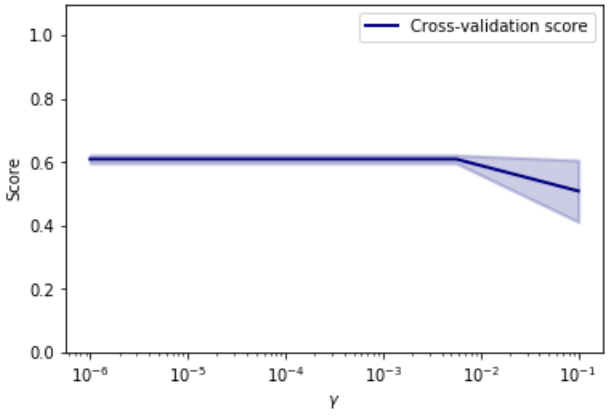


In [13]:
```
RBFscore4 =  cross_val_score(rbfmodel2, features, label, cv=5)
print("CROSS VALIDATION SCORE RBF C=10 : ",statistics.mean(RBFscore4))

train_scores, test_scores = validation_curve(
    rbfmodel4, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE RBF C=10 :  0.610125313283208
```



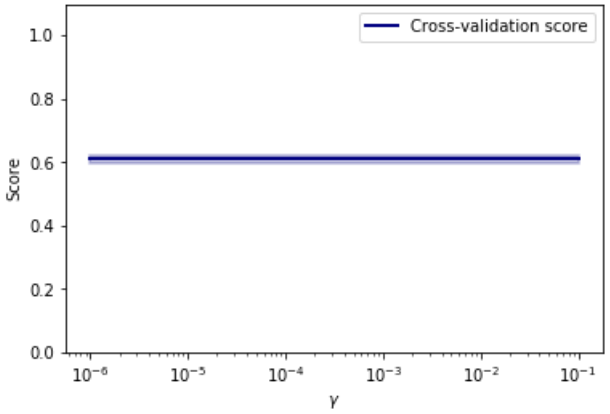
7.2 SIGMOID Model

In [14]:
```
sigmoidscore1 =  cross_val_score(sigmoidmodel1, features, label, cv=5)
print("CROSS VALIDATION SCORE SIGMOID C=0.01 : ",statistics.mean(sigmoidscore1))

train_scores, test_scores = validation_curve(
    sigmoidmodel1, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE SIGMOID C=0.01 :  0.610125313283208
```

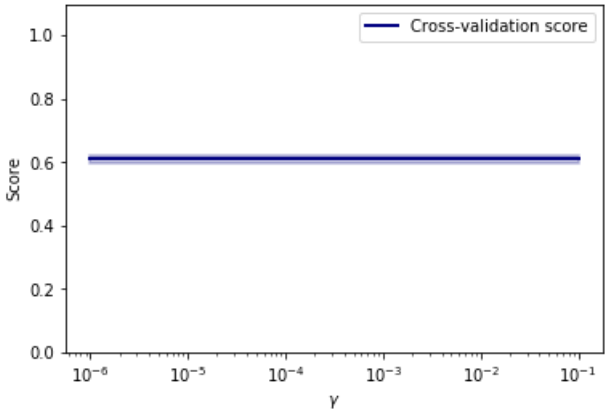


In [15]:
```
sigmoidscore2 =  cross_val_score(sigmoidmodel2, features, label, cv=5)
print("CROSS VALIDATION SCORE SIGMOID C=0.1 : ",statistics.mean(sigmoidscore2))

train_scores, test_scores = validation_curve(
    sigmoidmodel2, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE SIGMOID C=0.1 :  0.610125313283208
```

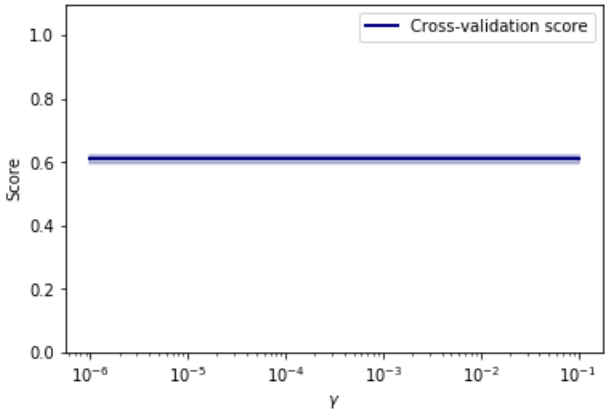


In [16]:
```
sigmoidscore3 =  cross_val_score(sigmoidmodel3, features, label, cv=5)
print("CROSS VALIDATION SCORE SIGMOID C=1 : ",statistics.mean(sigmoidscore3))

train_scores, test_scores = validation_curve(
    sigmoidmodel3, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE SIGMOID C=1 :  0.640125313283208
```

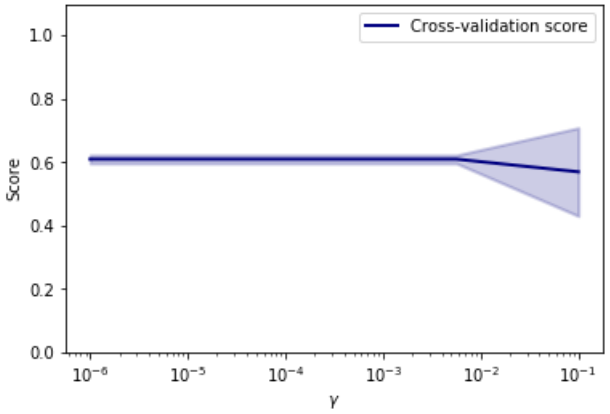


In [17]:
```
sigmoidscore4 =  cross_val_score(sigmoidmodel4, features, label, cv=5)
print("CROSS VALIDATION SCORE SIGMOID C=10 : ",statistics.mean(sigmoidscore4))

train_scores, test_scores = validation_curve(
    sigmoidmodel4, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE SIGMOID C=10 :  0.46849624060150374
```



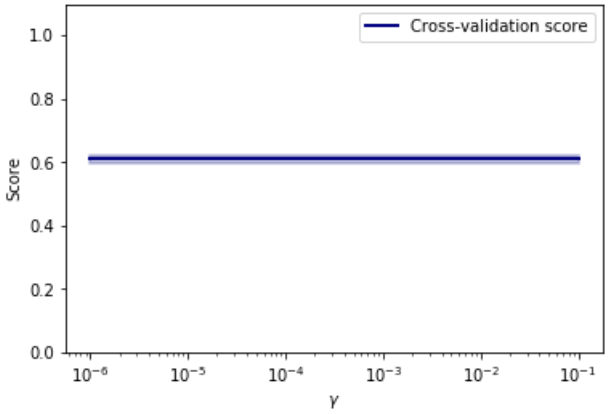
7.3 LINEAR Model

In [18]:
```
linearscore1 =  cross_val_score(sigmoidmodel1, features, label, cv=5)
print("CROSS VALIDATION SCORE LINEAR C=0.01 : ",statistics.mean(linearscore1))


train_scores, test_scores = validation_curve(
    linearmodel1, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE LINEAR C=0.01 :  0.610125313283208
```

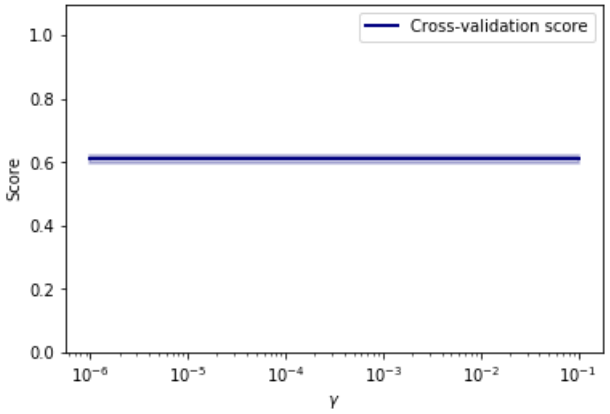


In [19]:
```
linearscore2 =  cross_val_score(sigmoidmodel2, features, label, cv=5)
print("CROSS VALIDATION SCORE LINEAR C=0.1 : ",statistics.mean(linearscore2))

train_scores, test_scores = validation_curve(
    linearmodel2, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE LINEAR C=0.1 :  0.610125313283208
```

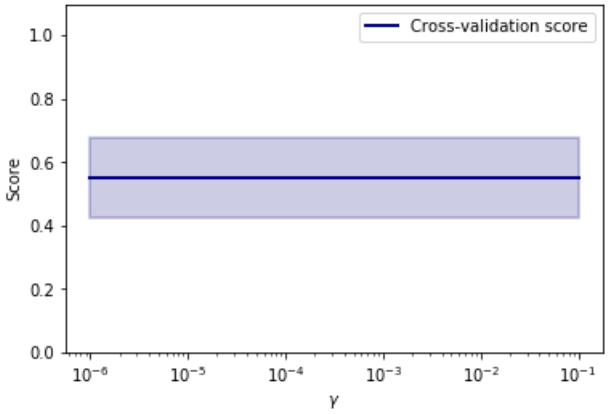


In [20]:
```
linearscore3 =  cross_val_score(sigmoidmodel1, features, label, cv=5)
print("CROSS VALIDATION SCORE LINEAR C=1 : ",statistics.mean(linearscore3))

train_scores, test_scores = validation_curve(
    linearmodel3, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE LINEAR C=1 :  0.610125313283208
```



In [21]:
```
linearscore4 =  cross_val_score(sigmoidmodel4, features, label, cv=5)
print("CROSS VALIDATION SCORE LINEAR C=10 : ",statistics.mean(linearscore4))

train_scores, test_scores = validation_curve(
    linearmodel4, features, label, param_name="gamma", param_range=param_range,
    cv=5, scoring="accuracy", n_jobs=1)
train_scores_mean = np.mean(train_scores, axis=1)
train_scores_std = np.std(train_scores, axis=1)
test_scores_mean = np.mean(test_scores, axis=1)
test_scores_std = np.std(test_scores, axis=1)

plt.xlabel(r"$\gamma$")
plt.ylabel("Score")
plt.ylim(0.0, 1.1)
lw = 2
plt.semilogx(param_range, test_scores_mean, label="Cross-validation score",
             color="navy", lw=lw)
plt.fill_between(param_range, test_scores_mean - test_scores_std,
                 test_scores_mean + test_scores_std, alpha=0.2,
                 color="navy", lw=lw)
plt.legend(loc="best")
plt.show()
```

```
CROSS VALIDATION SCORE LINEAR C=10 :  0.46849624060150374
```