# KNN Classification of Glass Dataset

In [1]:
```
# KNN Classification
from pandas import read_csv
import numpy as np
from sklearn.model_selection import KFold
from sklearn.model_selection import cross_val_score
from sklearn.neighbors import KNeighborsClassifier
import os
os.chdir("/home/prathikm/Desktop/assignments/knn/")
```

In [2]:
```
df=read_csv("glass.csv")
```

In [3]:
```
df.head()
```

| | RI | Na | Mg | Al | Si | K | Ca | Ba | Fe | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1.52101 | 13.64 | 4.49 | 1.10 | 71.78 | 0.06 | 8.75 | 0.0 | 0.0 | 1 |
| **1** | 1.51761 | 13.89 | 3.60 | 1.36 | 72.73 | 0.48 | 7.83 | 0.0 | 0.0 | 1 |
| **2** | 1.51618 | 13.53 | 3.55 | 1.54 | 72.99 | 0.39 | 7.78 | 0.0 | 0.0 | 1 |
| **3** | 1.51766 | 13.21 | 3.69 | 1.29 | 72.61 | 0.57 | 8.22 | 0.0 | 0.0 | 1 |
| **4** | 1.51742 | 13.27 | 3.62 | 1.24 | 73.08 | 0.55 | 8.07 | 0.0 | 0.0 | 1 |

In [4]:
```
array = df.values
X = array[:, 0:9]
Y = array[:, 9]
```

In [5]:
```
X
```

```
array([[ 1.52101, 13.64   ,  4.49   , ...,  8.75   ,  0.     ,  0.     ],
       [ 1.51761, 13.89   ,  3.6    , ...,  7.83   ,  0.     ,  0.     ],
       [ 1.51618, 13.53   ,  3.55   , ...,  7.78   ,  0.     ,  0.     ],
       ...,
       [ 1.52065, 14.36   ,  0.     , ...,  8.44   ,  1.64   ,  0.     ],
       [ 1.51651, 14.38   ,  0.     , ...,  8.48   ,  1.57   ,  0.     ],
       [ 1.51711, 14.23   ,  0.     , ...,  8.62   ,  1.67   ,  0.     ]])
```

In [6]:
```
Y
```

```
array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1.,
       1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1.,
       1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1.,
       1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1.,
       1., 1., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2.,
       2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2.,
       2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2.,
       2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 2.,
       2., 2., 2., 2., 2., 2., 2., 2., 2., 2., 3., 3., 3., 3., 3., 3.,
       3., 3., 3., 3., 3., 3., 3., 3., 3., 3., 5., 5., 5., 5., 5., 5.,
       5., 5., 5., 5., 5., 5., 6., 6., 6., 6., 6., 6., 6., 6., 6., 7.,
       7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7., 7.,
       7., 7., 7., 7., 7., 7., 7., 7., 7., 7.])
```

In [7]:
```
model = KNeighborsClassifier(n_neighbors=1)
results = cross_val_score(model, X, Y)
```

In [8]:
```
print(results.mean())
```

```
0.640531561461794
```

## Grid Search for Algorithm Tuning to find best n_neighbours

In [9]:
```
# Grid Search for Algorithm Tuning
import numpy
from pandas import read_csv
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import GridSearchCV
```

In [10]:
```
array = df.values
X = array[:, 0:9]
Y = array[:, 9]
```

In [11]:
```
n_neighbors = numpy.array(range(1,30))
param_grid = dict(n_neighbors=n_neighbors)
```

In [12]:
```
model = KNeighborsClassifier()
grid = GridSearchCV(estimator=model, param_grid=param_grid)
grid.fit(X, Y)
```

```
GridSearchCV(estimator=KNeighborsClassifier(),
             param_grid={'n_neighbors': array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12
       18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29])})
```

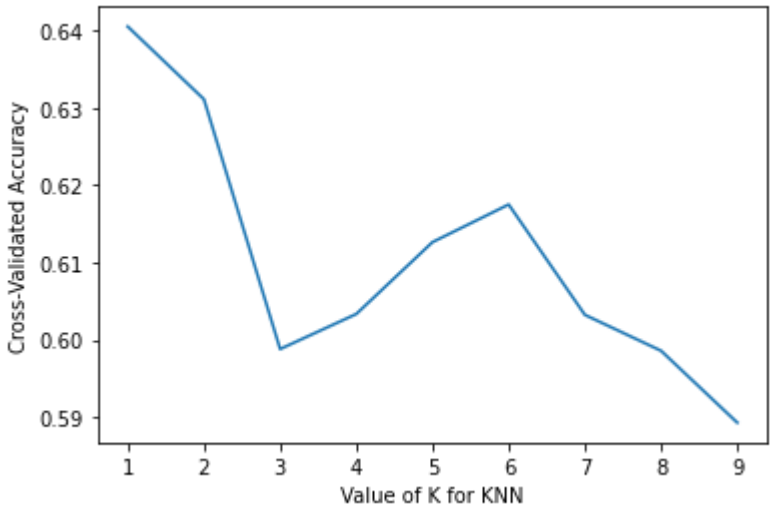
In [13]:
```
print(grid.best_score_)
print(grid.best_params_)
```

```
0.640531561461794
{'n_neighbors': 1}
```

## Visualizing the CV results

In [14]:

```
import matplotlib.pyplot as plt
%matplotlib inline
# choose k between 1 to 41
k_range = range(1, 10)
k_scores = []
# use iteration to caclulator different k in models, then return the aver
for k in k_range:
    knn = KNeighborsClassifier(n_neighbors=k)
    scores = cross_val_score(knn, X, Y, cv=5)
    k_scores.append(scores.mean())
# plot to see clearly
plt.plot(k_range, k_scores)
plt.xlabel('Value of K for KNN')
plt.ylabel('Cross-Validated Accuracy')
plt.show()
```




In [15]:

```
k_scores
```

```
[0.640531561461794,
 0.6311184939091916,
 0.598781838316722,
 0.6033222591362126,
 0.612624584717608,
 0.6174972314507199,
 0.6032115171650055,
 0.5985603543743079,
 0.5892580287929124]
```