In [1]:

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from matplotlib import pyplot as plt
```

Data Process ¶

In [2]:

```
df = pd.read_csv('data-discretized-normalized.csv', ',')
df.drop('id', axis=1, inplace=True)
df.drop('ALUNO', axis=1, inplace=True)
df.drop('Unnamed: 0', axis=1, inplace=True)
y = df['EVASAO']
y = pd.get_dummies(y)
X = df.drop('EVASAO', axis=1)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=4
2)
```

LBFGS

In [3]:

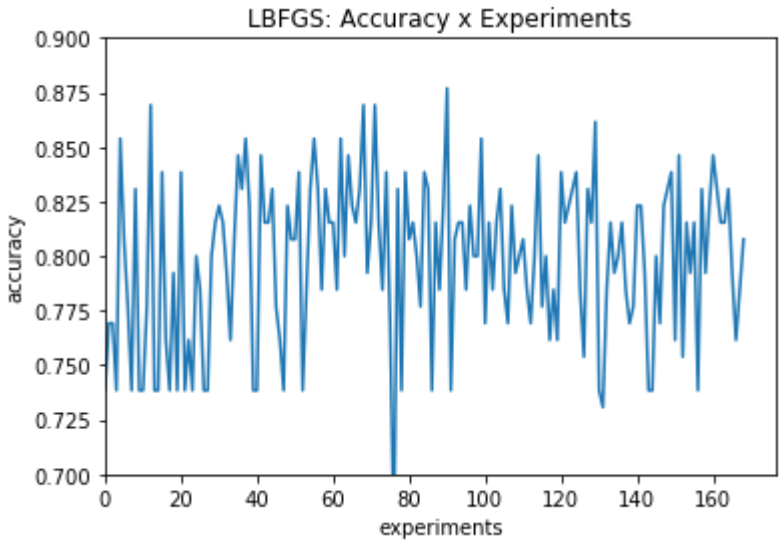
```
# train model
from sklearn.neural_network import MLPClassifier
df_lbfgs = pd.DataFrame(columns=['Layers', 'Accuracy'])
count = 0
for i in range(1,27,2):
    for j in range(1,27,2):
        lbfgs_clf = MLPClassifier(solver='lbfgs', alpha=1e-5, hidden_layer_sizes=(i, j
), random_state=42, max_iter=5000).fit(X_train, y_train)
        df_lbfgs.loc[count] = ([str(i)+'x'+str(j)], lbfgs_clf.score(X_test, y_test))
        count = count+1
```

```
d:\dev6\python\python37\lib\site-packages\sklearn\neural_network\_multilay
er_perceptron.py:470: ConvergenceWarning: lbfgs failed to converge (status
=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown i
n:
    https://scikit-learn.org/stable/modules/preprocessing.html.
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

In [4]:

```
plt.plot(range(0,169), df_lbfgs.Accuracy)
plt.title('LBFGS: Accuracy x Experiments')
plt.ylabel('accuracy')
plt.xlabel('experiments')
plt.ylim(0.7,0.9)
plt.xlim(0,)
plt.show
plt.savefig('lbfgs.png', dpi=100)
```



In [5]:

```
df_lbfgs.sort_values('Accuracy', axis=0, ascending=False, inplace=False).head()
```

Out[5]:

	Layers	Accuracy
90	[13x25]	0.876923
71	[11x13]	0.869231
68	[11x7]	0.869231
12	[1x25]	0.869231
129	[19x25]	0.861538

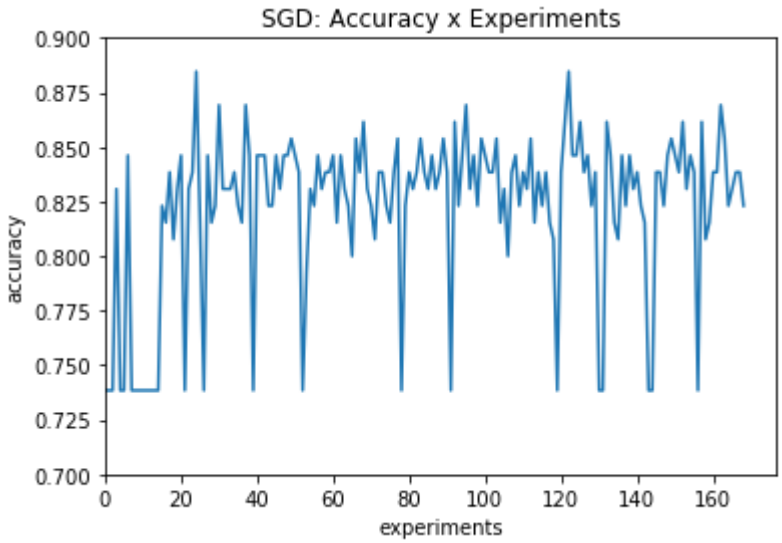
SGD

In [6]:

```
# train model
from sklearn.neural_network import MLPClassifier
df_sgd = pd.DataFrame(columns=['Layers', 'Accuracy'])
count = 0
for i in range(1,27,2):
    for j in range(1,27,2):
        sgd_clf = MLPClassifier(solver='sgd', alpha=1e-5, hidden_layer_sizes=(i, j), ra
ndom_state=42, max_iter=5000).fit(X_train, y_train)
        df_sgd.loc[count] = ([str(i)+'x'+str(j)], sgd_clf.score(X_test, y_test))
        count = count+1
```

In [7]:

```
plt.plot(range(0,169), df_sgd.Accuracy)
plt.title('SGD: Accuracy x Experiments')
plt.ylabel('accuracy')
plt.xlabel('experiments')
plt.ylim(0.7,0.9)
plt.xlim(0,)
plt.show
plt.savefig('sgd.png', dpi=100)
```



In [8]:

```
df_sgd.sort_values('Accuracy', axis=0, ascending=False, inplace=False).head()
```

Out[8]:

	Layers	Accuracy
24	[3x23]	0.884615
122	[19x11]	0.884615
37	[5x23]	0.869231
162	[25x13]	0.869231
30	[5x9]	0.869231

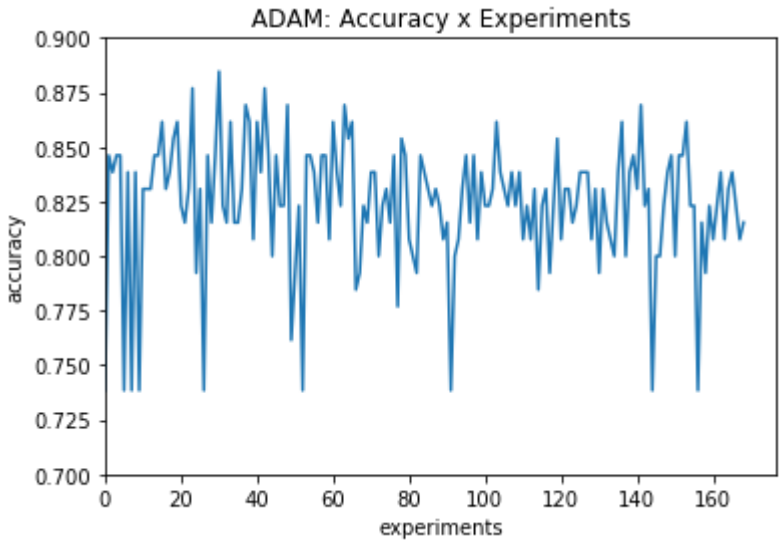
ADAM

In [9]:

```
# train model
from sklearn.neural_network import MLPClassifier
df_adam = pd.DataFrame(columns=['Layers', 'Accuracy'])
count = 0
for i in range(1,27,2):
    for j in range(1,27,2):
        adam_clf = MLPClassifier(solver='adam', alpha=1e-5, hidden_layer_sizes=(i, j),
random_state=42, max_iter=5000).fit(X_train, y_train)
        df_adam.loc[count] = ([str(i)+'x'+str(j)], adam_clf.score(X_test, y_test))
        count = count+1
```

In [10]:

```
plt.plot(range(0,169), df_adam.Accuracy)
plt.title('ADAM: Accuracy x Experiments')
plt.ylabel('accuracy')
plt.xlabel('experiments')
plt.ylim(0.7,0.9)
plt.xlim(0,)
plt.show
plt.savefig('adam.png', dpi=100)
```



In [11]:

```
df_adam.sort_values('Accuracy', axis=0, ascending=False, inplace=False).head()
```

Out[11]:

	Layers	Accuracy
30	[5x9]	0.884615
42	[7x7]	0.876923
23	[3x21]	0.876923
63	[9x23]	0.869231
37	[5x23]	0.869231

Build model with the best parameters of tests and with full data

In [12]:

```
dnn = MLPClassifier(solver='adam', alpha=1e-5, hidden_layer_sizes=(5, 9), random_state=
42, max_iter=5000)
dnn = dnn.fit(X_train, y_train)
```

In [13]:

```
print('Accuracy: ', dnn.score(X_test, y_test))
```

```
Accuracy:  0.8846153846153846
```

Save best model

In [14]:

```
# save model
import joblib
filename = 'dnn.sav'
joblib.dump(dnn, filename)
print('saved')
```

```
saved
```