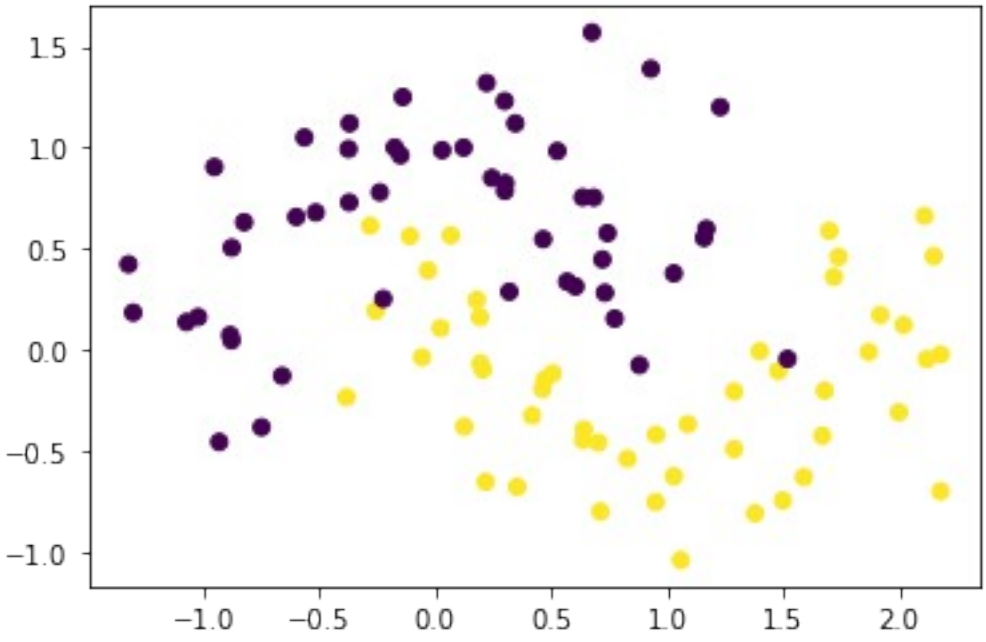
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

df = pd.read_csv('ushape.csv')

df.head()
```

	X	Y	class
0	0.0316	0.9870	0.0
1	2.1200	-0.0462	1.0
2	0.8820	-0.0758	0.0
3	-0.0551	-0.0373	1.0
4	0.8300	-0.5390	1.0

```
X = df.iloc[:,0:2].values
y = df.iloc[:,-1].values

plt.scatter(X[:,0],X[:,1],c=y)
```

```
<matplotlib.collections.PathCollection at 0x19c0b506ee0>
```

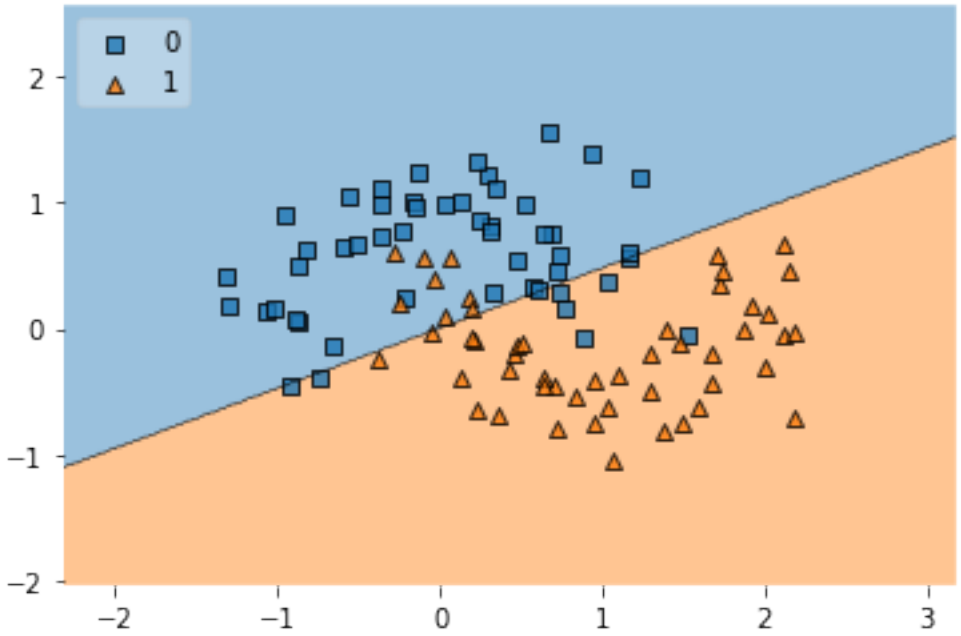



```
from sklearn.linear_model import LogisticRegression
clf = LogisticRegression()

clf.fit(X,y)
```

```
LogisticRegression()
```

```
from mlxtend.plotting import plot_decision_regions

plot_decision_regions(X, y.astype('int'), clf, legend=2)
```

```
<AxesSubplot:>
```




```
from sklearn.model_selection import cross_val_score
np.mean(cross_val_score(clf,X,y,scoring='accuracy',cv=10))
```

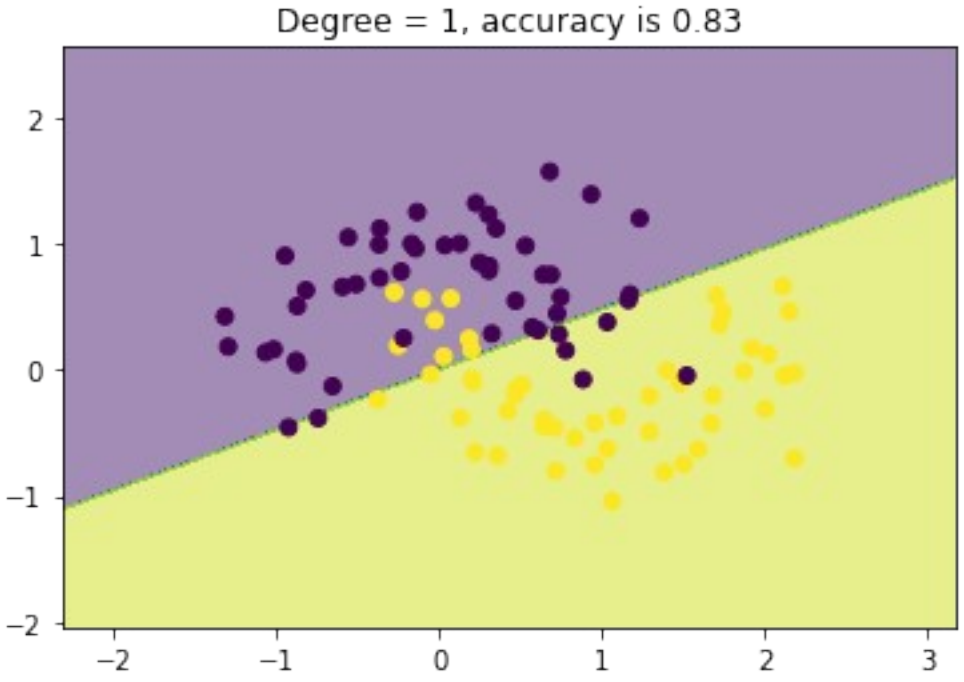
```
0.8300000000000001
```

```
from sklearn.preprocessing import PolynomialFeatures
poly = PolynomialFeatures(degree=3,include_bias=False)
X_trf = poly.fit_transform(X)

clf1 = LogisticRegression()
np.mean(cross_val_score(clf1,X_trf,y,scoring='accuracy',cv=10))
```

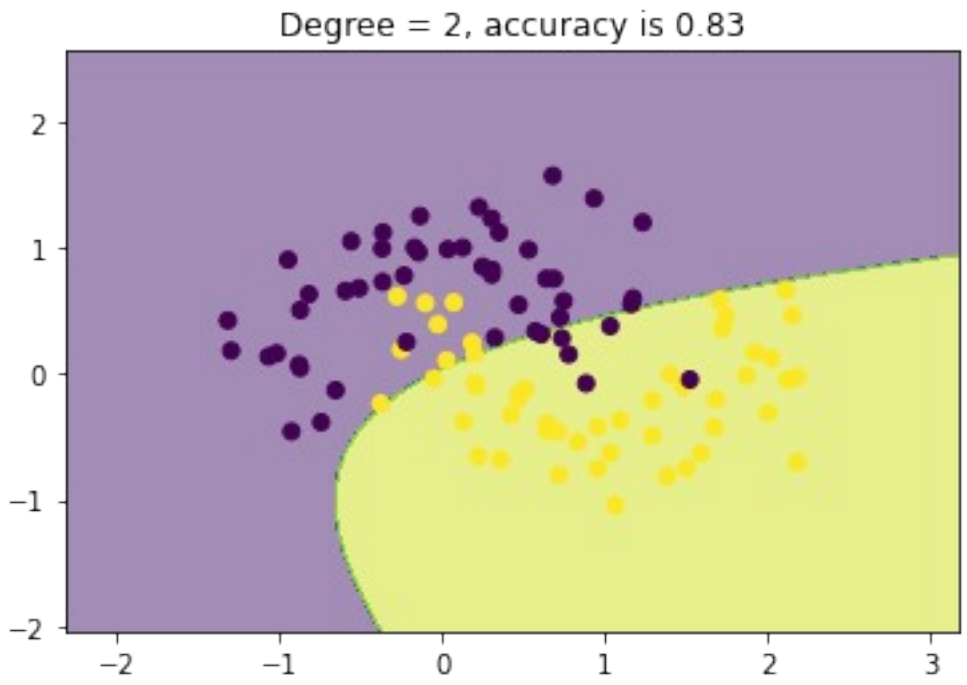
```
0.9
```

```
def plot_decision_boundary(X,y,degree=1):

    poly = PolynomialFeatures(degree=degree)
    X_trf = poly.fit_transform(X)

    clf = LogisticRegression()
    clf.fit(X_trf,y)

    accuracy =
np.mean(cross_val_score(clf,X_trf,y,scoring='accuracy',cv=10))
```

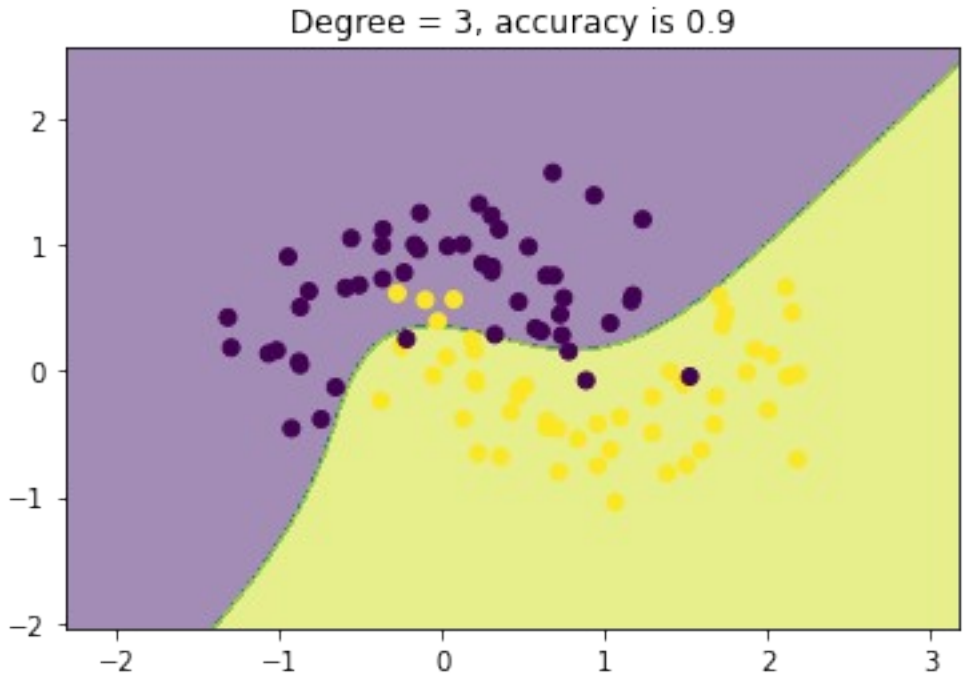
```
    a=np.arange(start=X[:,0].min()-1, stop=X[:,0].max()+1, step=0.01)
    b=np.arange(start=X[:,1].min()-1, stop=X[:,1].max()+1, step=0.01)


    XX,YY=np.meshgrid(a,b)

    input_array=np.array([XX.ravel(),YY.ravel()]).T

    labels=clf.predict(poly.transform(input_array))

    plt.contourf(XX,YY,labels.reshape(XX.shape),alpha=0.5)
    plt.scatter(X[:,0],X[:,1], c=y)
    plt.title('Degree = {}, accuracy is
{}'.format(degree,np.round(accuracy,4)))

plot_decision_boundary(X,y)
```



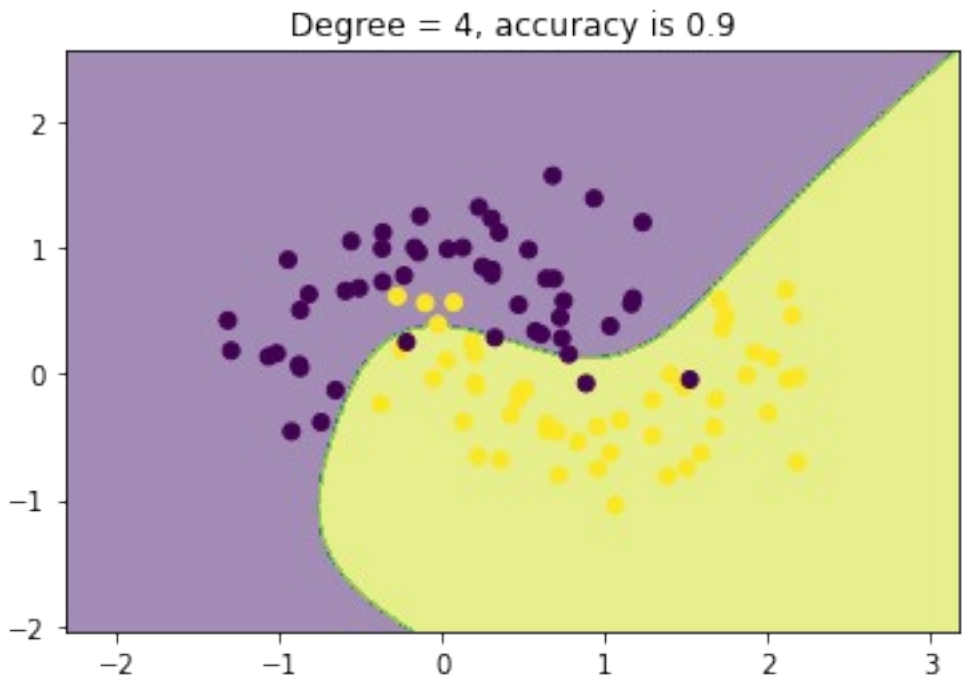

```
plot_decision_boundary(X,y,degree=2)
```



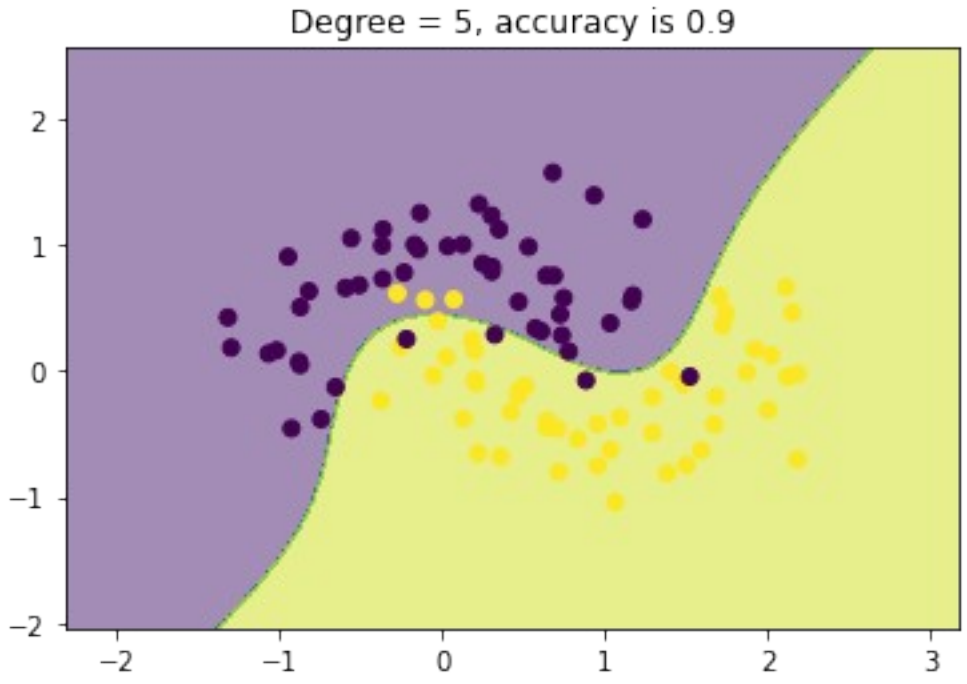

```
plot_decision_boundary(X,y,degree=3)
```



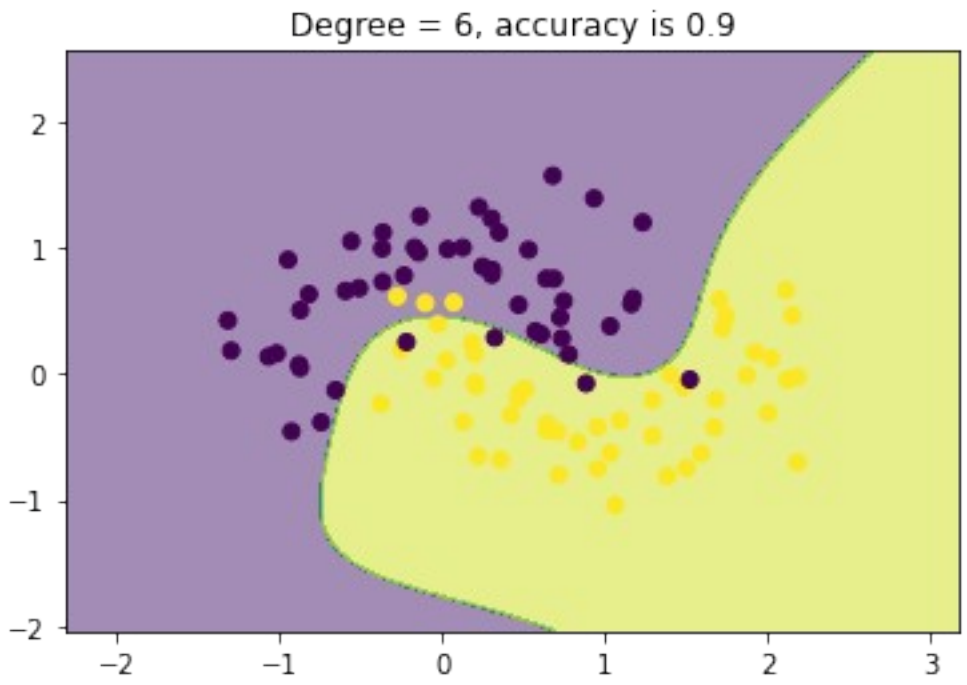

```
plot_decision_boundary(X,y,degree=4)
```



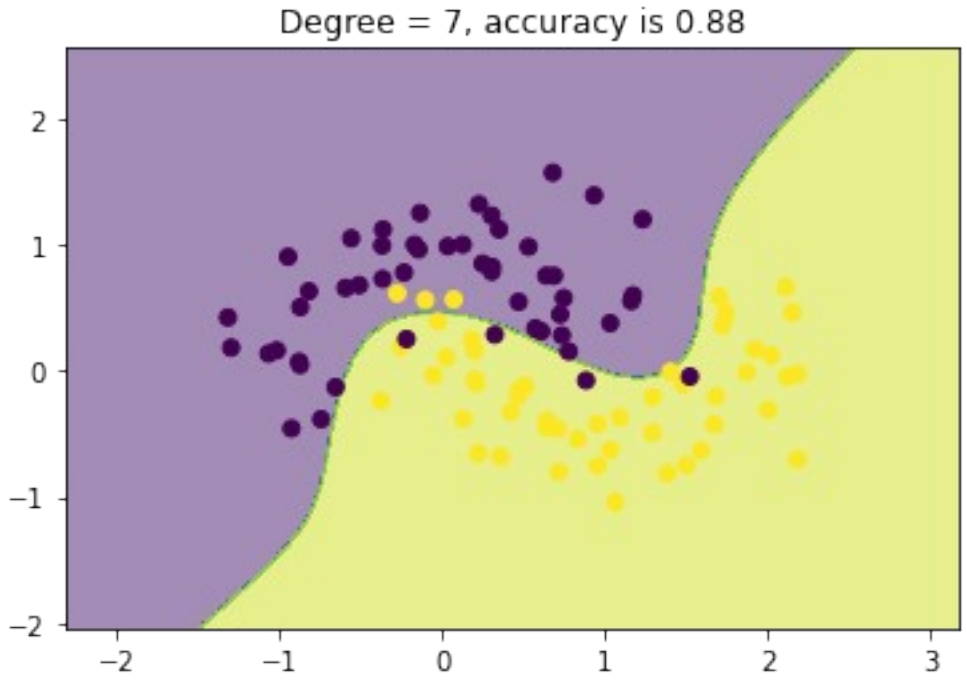

```
plot_decision_boundary(X,y,degree=5)
```




```
plot_decision_boundary(X,y,degree=6)
```




```
plot_decision_boundary(X,y,degree=7)
```




```
plot_decision_boundary(X,y,degree=25)
```

```
C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
_logistic.py:763: 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-
regression
  n_iter_i = _check_optimize_result(
C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
_logistic.py:763: ConvergenceWarning: lbfgs failed to converge
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C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
_logistic.py:763: ConvergenceWarning: lbfgs failed to converge
(status=1):
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regression
  n_iter_i = _check_optimize_result(
```

```
C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
_logistic.py:763: ConvergenceWarning: lbfgs failed to converge
(status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

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-
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  n_iter_i = _check_optimize_result(
C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
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Please also refer to the documentation for alternative solver options:

https://scikit-learn.org/stable/modules/linear_model.html#logistic-
```

```
regression
  n_iter_i = _check_optimize_result(
C:\Users\91842\anaconda3\lib\site-packages\sklearn\linear_model\
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```