

8C

March 11, 2022

```
[1]: import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")
import numpy as np
from sklearn.linear_model import SGDRegressor
```

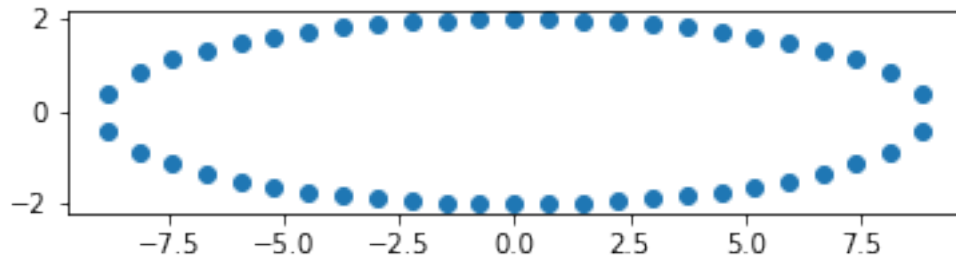
```
[2]: import numpy as np
import scipy as sp
import scipy.optimize

def angles_in_ellipse(num,a,b):
    assert(num > 0)
    assert(a < b)
    angles = 2 * np.pi * np.arange(num) / num
    if a != b:
        e = (1.0 - a ** 2.0 / b ** 2.0) ** 0.5
        tot_size = sp.special.ellipeinc(2.0 * np.pi, e)
        arc_size = tot_size / num
        arcs = np.arange(num) * arc_size
        res = sp.optimize.root(
            lambda x: (sp.special.ellipeinc(x, e) - arcs), angles)
        angles = res.x
    return angles
```

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[3]: a = 2
b = 9
n = 50

phi = angles_in_ellipse(n, a, b)
e = (1.0 - a ** 2.0 / b ** 2.0) ** 0.5
arcs = sp.special.ellipeinc(phi, e)

fig = plt.figure()
ax = fig.gca()
ax.axes.set_aspect('equal')
ax.scatter(b * np.sin(phi), a * np.cos(phi))
plt.show()
```



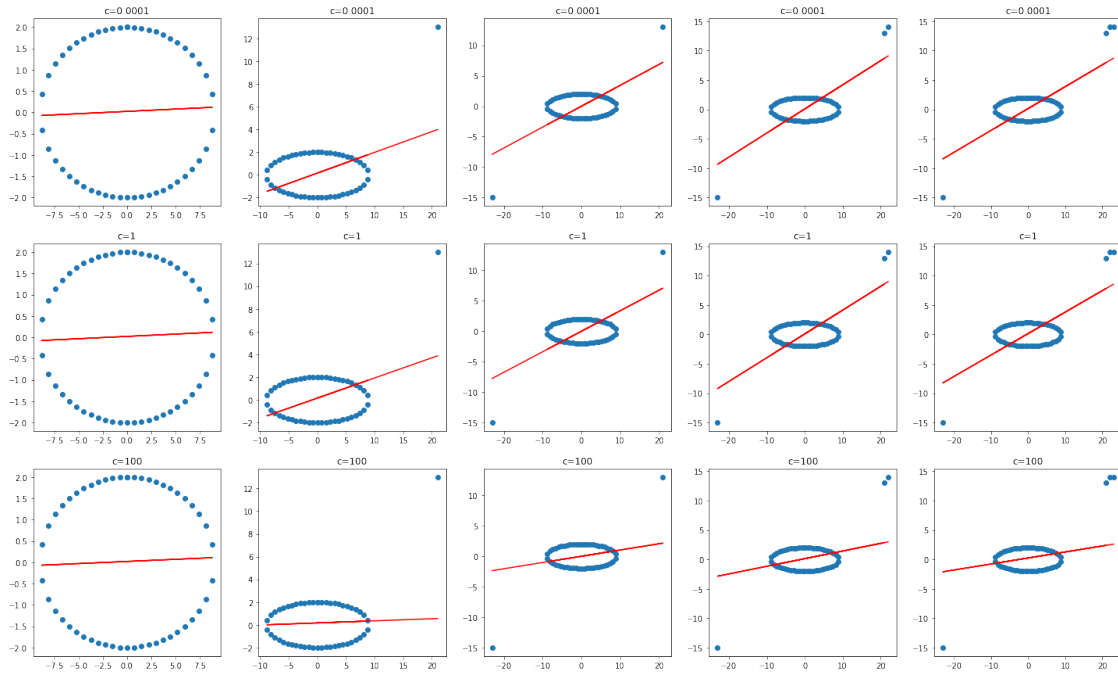
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[4]: X= b * np.sin(phi)
Y= a * np.cos(phi)
print(X.shape,Y.shape)

x=X.reshape(-1,1)
```

(50,) (50,)

```
[5]: s=0
outlier= [[0,2],[21,13],[-23,-15],[22,14],[23,14]]
aplha =[0.0001,1,100]
plt.figure(figsize=(25,15))

for k in aplha:
    x_new=x
    y_new=Y
    for j,i in enumerate(outlier):
        s+=1
        x_new=np.append(x_new,i[0]).reshape(-1,1)
        y_new=np.append(y_new,i[1]).reshape(-1,1)
        clf= SGDRegressor(alpha=k,eta0=0.001,
→learning_rate="constant",random_state=10)
        clf.fit(x_new,y_new)
        predict=clf.predict(x_new)
        plt.subplot(3,5,s)
        plt.title("c="+str(k))
        plt.scatter(x_new,y_new)
        plt.plot(x_new,predict,color="red")
```



0.0.1 1.As increase in regularization the effect of outlier decreases.

0.0.2 2.Here we can see that regularization term increases by increase in hyperparameter $\alpha = "C"$ and therefore there is reduction in overfitting and increase in bias (generalisation).

0.0.3 3.hyperparameter α is directly proportional to bias and inversely to variance.

[]: