In [3]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures
```

In [4]:
```
data = {'level':[1,2,3,4,5,6,7,8,9,10],
        'salary':[45000,50000,60000,80000,110000,150000,200000,300000,500000,1000000]}
data
```

Out[4]:
```
{'level': [1, 2, 3, 4, 5, 6, 7, 8, 9, 10],
 'salary': [45000,
  50000,
  60000,
  80000,
  110000,
  150000,
  200000,
  300000,
  500000,
  1000000]}
```

In [5]:
```
df = pd.DataFrame(data)
df
```

Out[5]:

	level	salary
0	1	45000
1	2	50000
2	3	60000
3	4	80000
4	5	110000
5	6	150000
6	7	200000
7	8	300000
8	9	500000
9	10	1000000

In [6]:
```
x=df[['level']]
x
```

Out[6]:

	level
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10

In [7]:
```
y=df['salary']
y
```

Out[7]:
```
0      45000
1      50000
2      60000
3      80000
4     110000
5     150000
6     200000
7     300000
8     500000
9    1000000
Name: salary, dtype: int64
```

In [8]:
```
lr = LinearRegression()
lr.fit(x,y)
y_pred = lr.predict(x).round(2)
y_pred
```

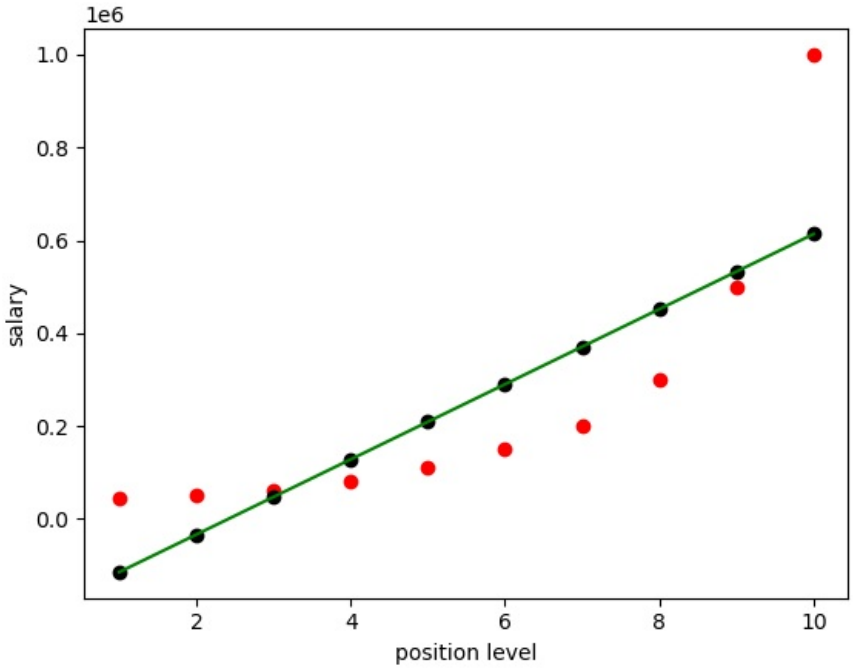
Out[8]:
```
array([-114454.55,  -33575.76,   47303.03,  128181.82,  209060.61,
        289939.39,  370818.18,  451696.97,  532575.76,  613454.55])
```

In [9]:
```
from sklearn.metrics import r2_score,mean_squared_error
```

In [10]:
```
print(r2_score(y,y_pred))
```

```
0.6690412358828437
```

In [11]:
```
plt.scatter(x,y,color='red',label='actual salary data')
plt.plot(x,y_pred,color='green',label='Linear Regression')
plt.scatter(x,y_pred,color='Black',label='Linear Regression')
plt.xlabel('position level')
plt.ylabel('salary')
plt.show()
```



In [12]:
```
poly = PolynomialFeatures(degree=3)
x_poly = poly.fit_transform(x)
x_poly
```

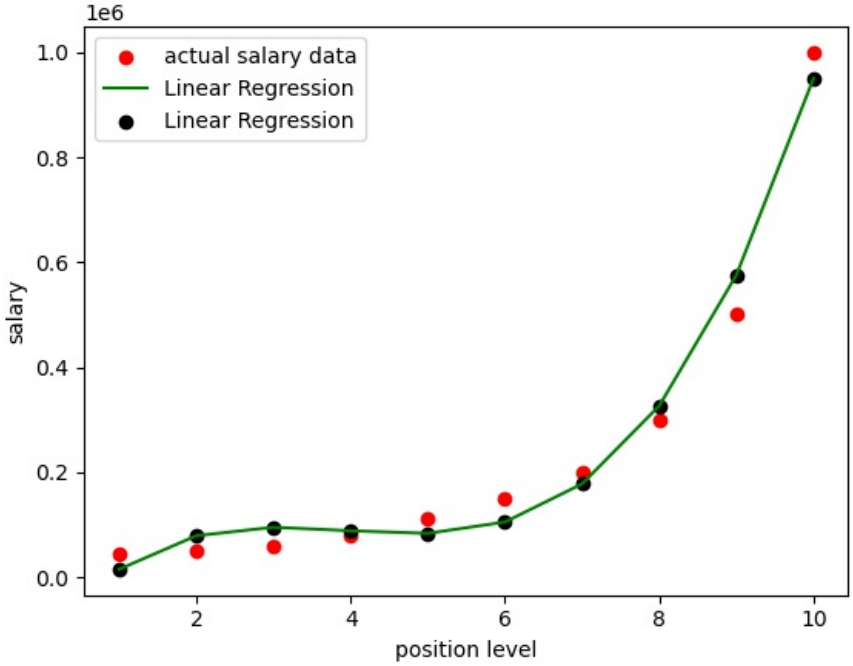
Out[12]:
```
array([[   1.,    1.,    1.,    1.],
       [   1.,    2.,    4.,    8.],
       [   1.,    3.,    9.,   27.],
       [   1.,    4.,   16.,   64.],
       [   1.,    5.,   25.,  125.],
       [   1.,    6.,   36.,  216.],
       [   1.,    7.,   49.,  343.],
       [   1.,    8.,   64.,  512.],
       [   1.,    9.,   81.,  729.],
       [   1.,   10.,  100., 1000.]])
```

In [13]:
```
poly_reg = LinearRegression()
poly_reg.fit(x_poly,y)
poly_y = poly_reg.predict(x_poly)
```

In [14]:
```
print(r2_score(y,poly_y))
```

```
0.9812097727913367
```

In [15]:
```
plt.scatter(x,y,color='red',label='actual salary data')
plt.plot(x,poly_y,color='green',label='Linear Regression')
plt.scatter(x,poly_y,color='black',label='Linear Regression')
plt.xlabel('position level')
plt.ylabel('salary')
plt.legend()
plt.show()
```



In [16]:
```
from sklearn.linear_model import Ridge,Lasso
```

In [17]:
```
rm = Ridge()
rm.fit(x,y)
y_rd = rm.predict(x).round(2)
y_rd
```

Out[17]:
```
array([-110095.81,  -30185.63,   49724.55,  129634.73,  209544.91,
        289455.09,  369365.27,  449275.45,  529185.63,  609095.81])
```

In [18]:
```
r2_score(y,y_rd)
```

Out[18]:
```
0.6689452755413183
```

In [19]:
```
lr = Lasso(alpha=1,max_iter=200)
lr.fit(x,y)
y_pred=lr.predict(x).round()
r2_score(y,y_pred)
```

Out[19]:
```
0.6690412271043766
```