assignment07

November 15, 2018

This script demonstrates Line of best fit, using line fitting algorithm

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github link : https://github.com/Jisu-Lee/HII

import packages for plotting graphs and manipulating data

```
In [65]: import numpy as np
         from numpy.linalg import inv
         from numpy import linalg as la
         import matplotlib.pyplot as plt
         from scipy.spatial import distance
```

setting variables

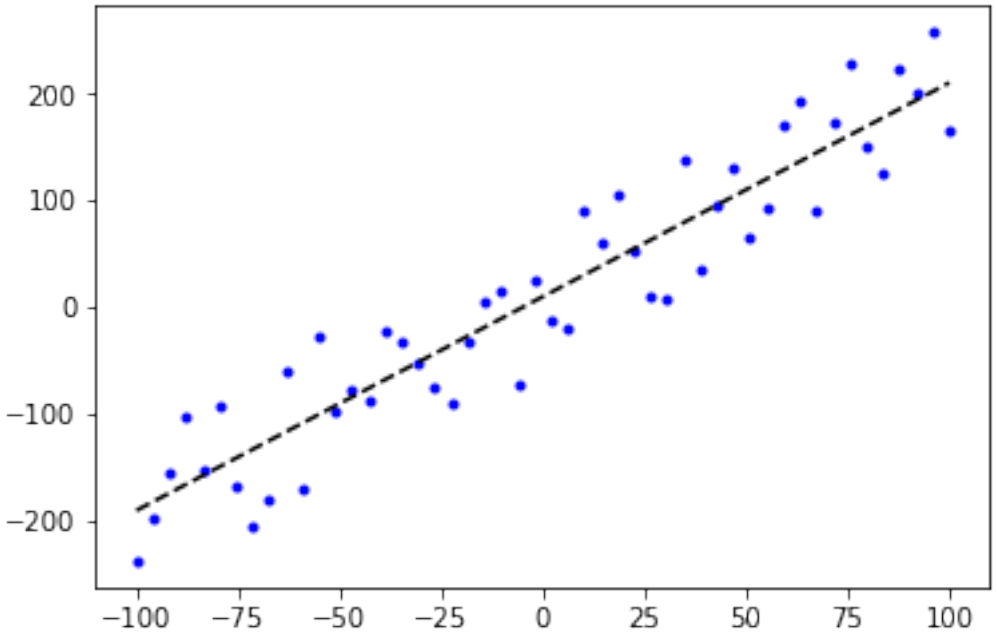
```
In [67]: num     = 50
         std     = 150
         a       = 2
         b       = 10

         # x  : x-coordinate data
         # y1 : (noisy) y-coordinate data
         # y2 : (clean) y-coordinate data
         # y = f(x) = a * x + b
         n       = np.random.rand(num)
         nn      = n - np.mean(n)
         x       = np.linspace(-100,100,num)
         y1      = a * x + nn * std + b
         y2      = a * x + b
```

show noisy data and clean data

- blue dot : noisy data
- black line : clean data

```
In [68]: plt.plot(x, y1, 'b.', x, y2, 'k--')
         plt.show()
```



1 define function to get matrix A

```
In [70]: def generateMatrixA(data, p):
             A = []
             n = len(data)
             for i in range (n):
                 A.append([])
                 for j in range (p+1):
                     A[i].append(np.power(data[i], j))

             return A
```

2 define function to calculate model parameters

```
In [72]: def generateParam(A, b):
             A0 = np.array(A)
             AT = A0.transpose()
             AR = AT @ A0
             AR = inv(AR) @ AT
             param = AR @ b
             return param
```

3 define function to generate new result

```
In [74]: def generateB(A, param):
             p = len(A[0])
             B = np.dot(A,param)
             return B
```

4 define function to compute error

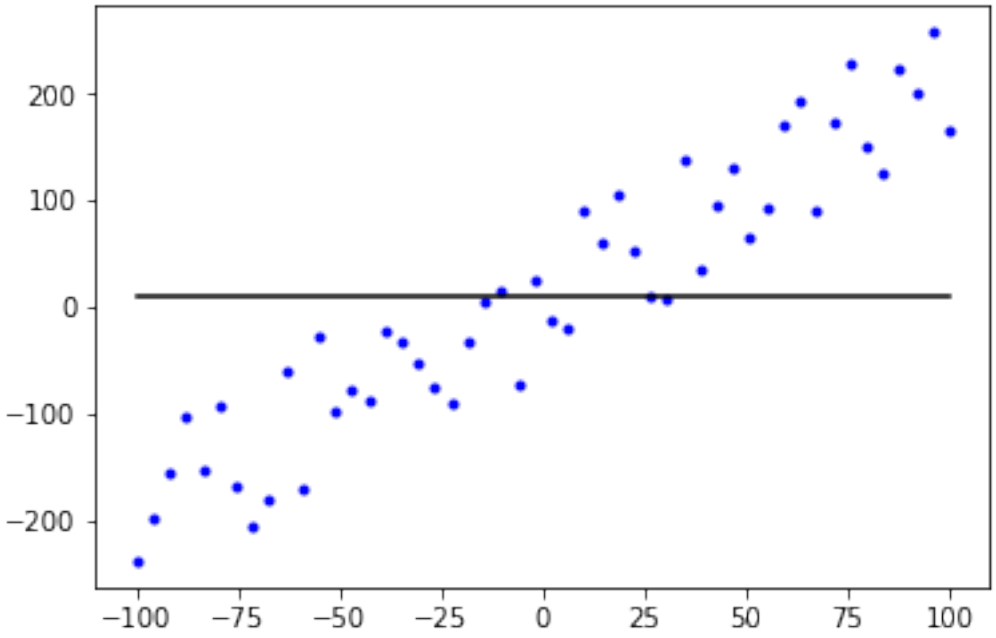
```
In [76]: def computeError(y, yt):
             dst = np.square(distance.euclidean(y, yt))
             return dst
```

5 let's see the result

```
In [81]: # e = list to contain error
         e = []

         for i in range(10):
             p = i
             print("P : ", p)
             A = generateMatrixA(x, p)
             theta = generateParam(A, y1)
             yr = generateB(A, theta)
             plt.plot(x, y1, 'b.', x, yr, 'k')
             plt.show()
             e.append(computeError(y1, yr))
```

```
P :  0
```


200
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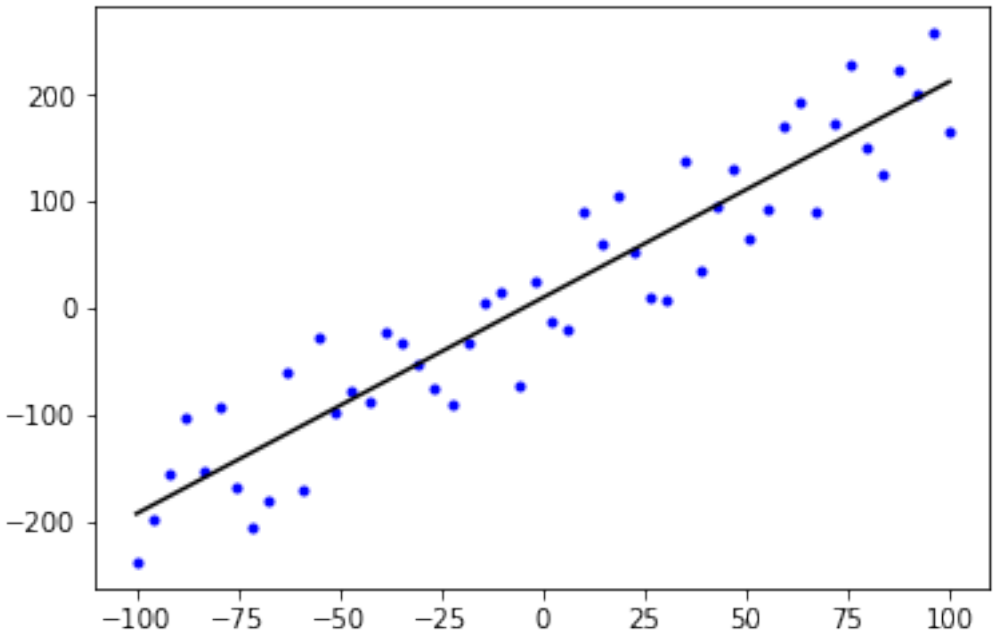
50
75
100

P : 1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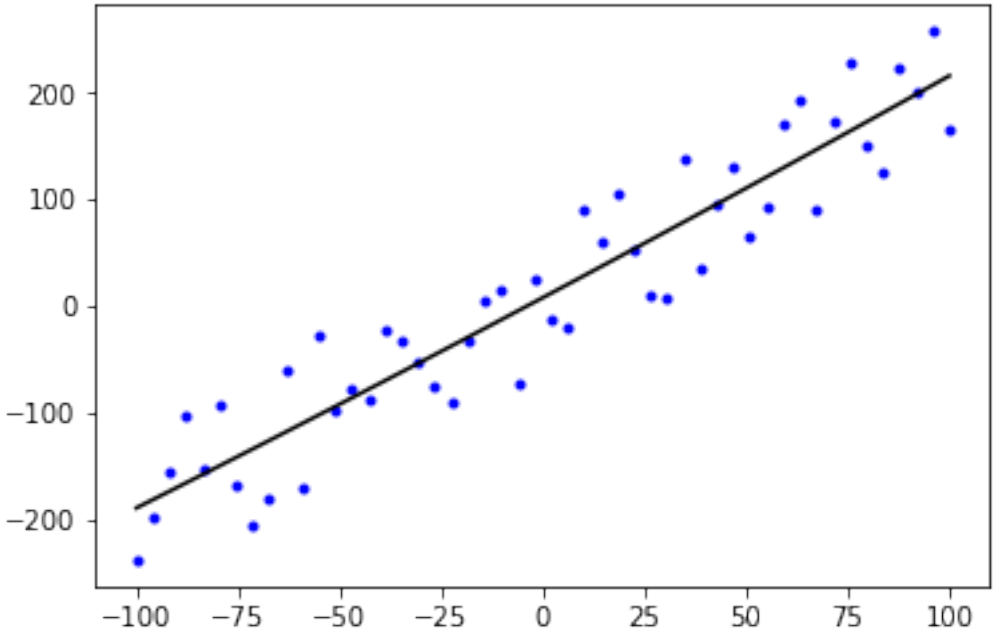
P : 2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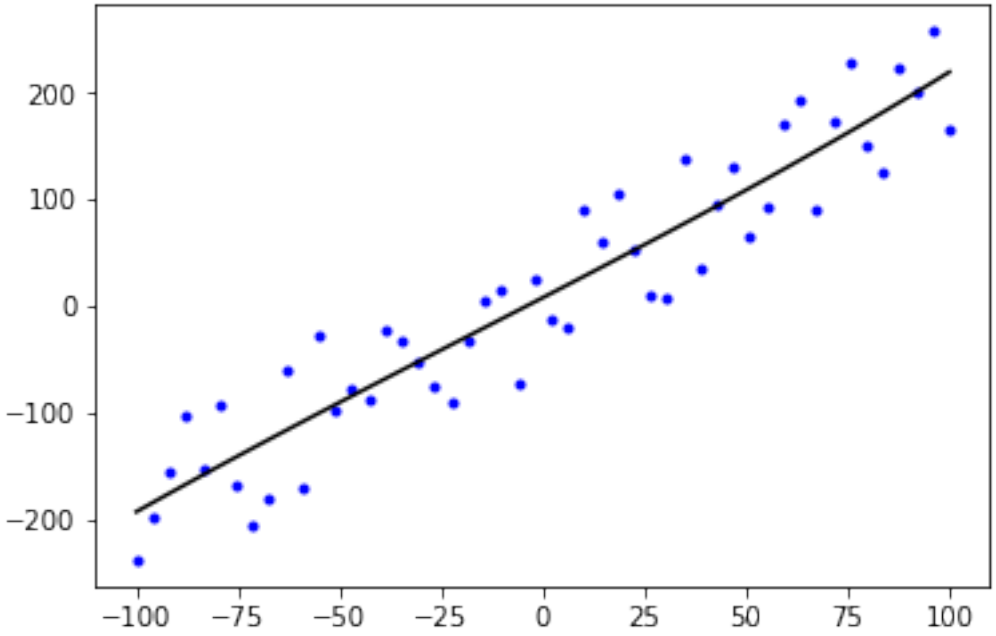
P : 3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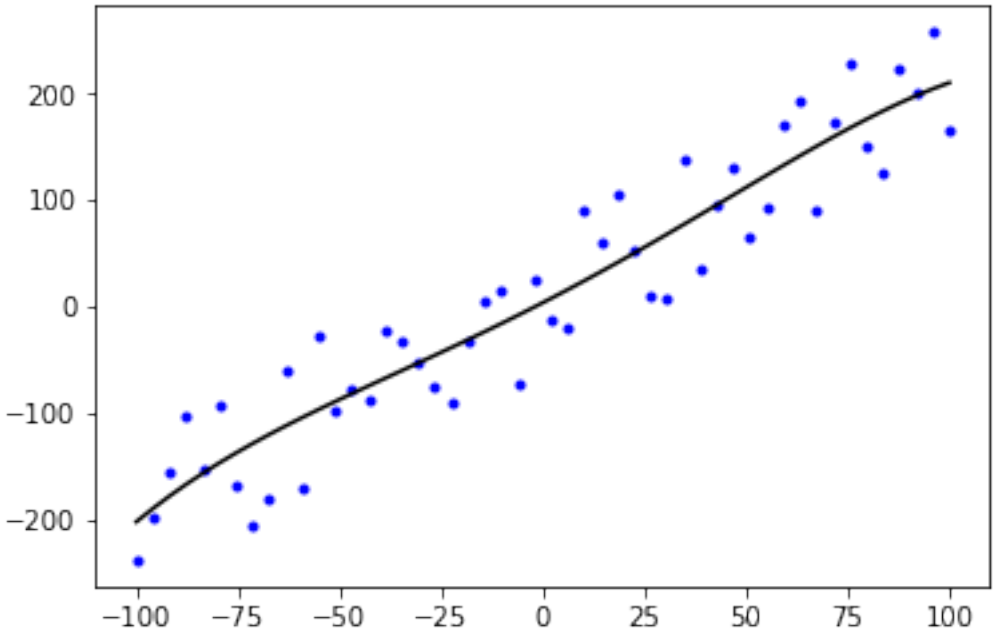
P : 4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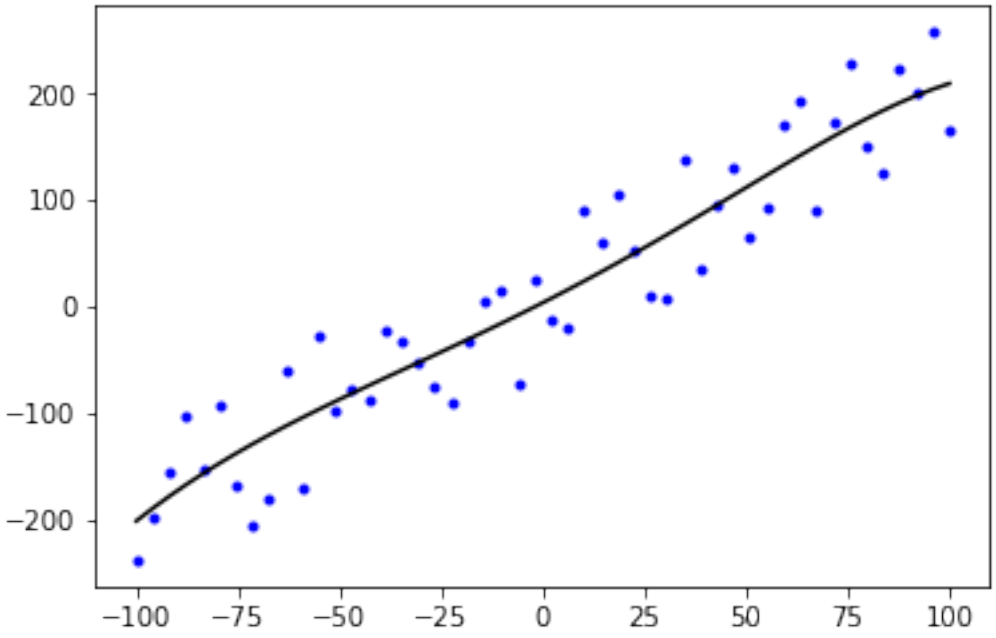
P : 5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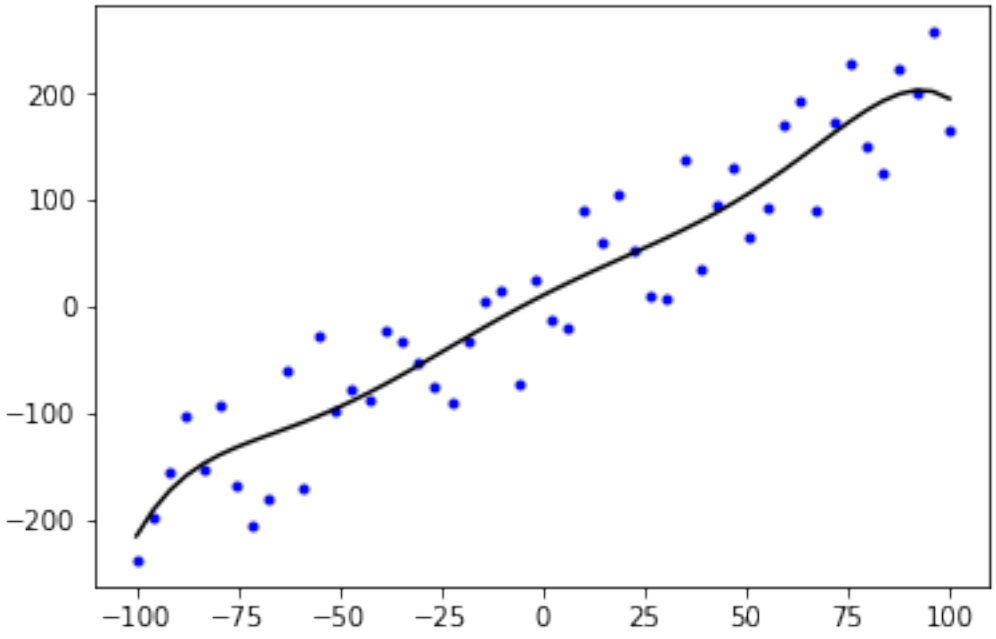
P : 6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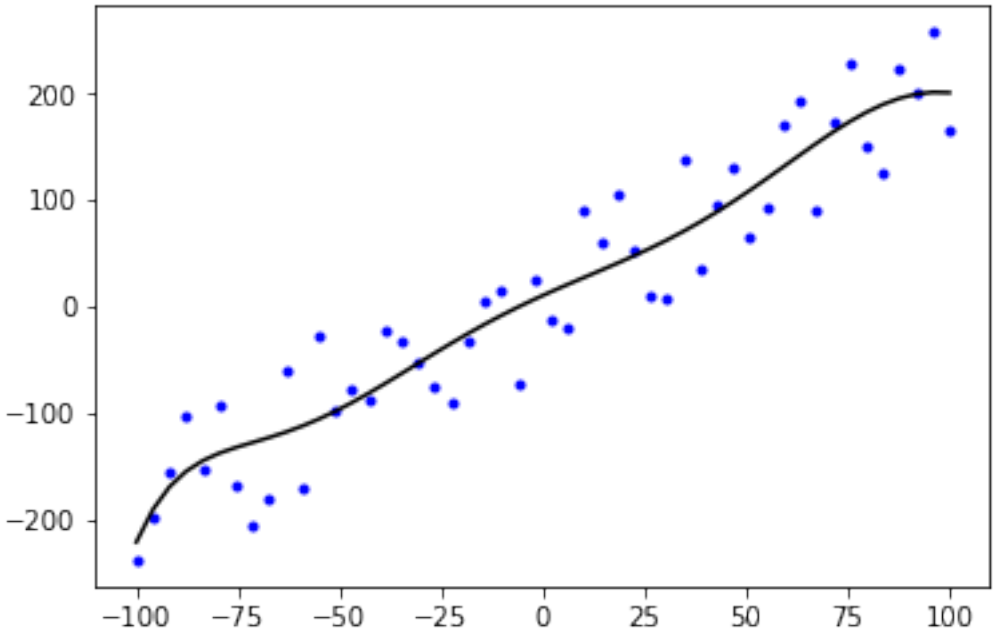
P : 7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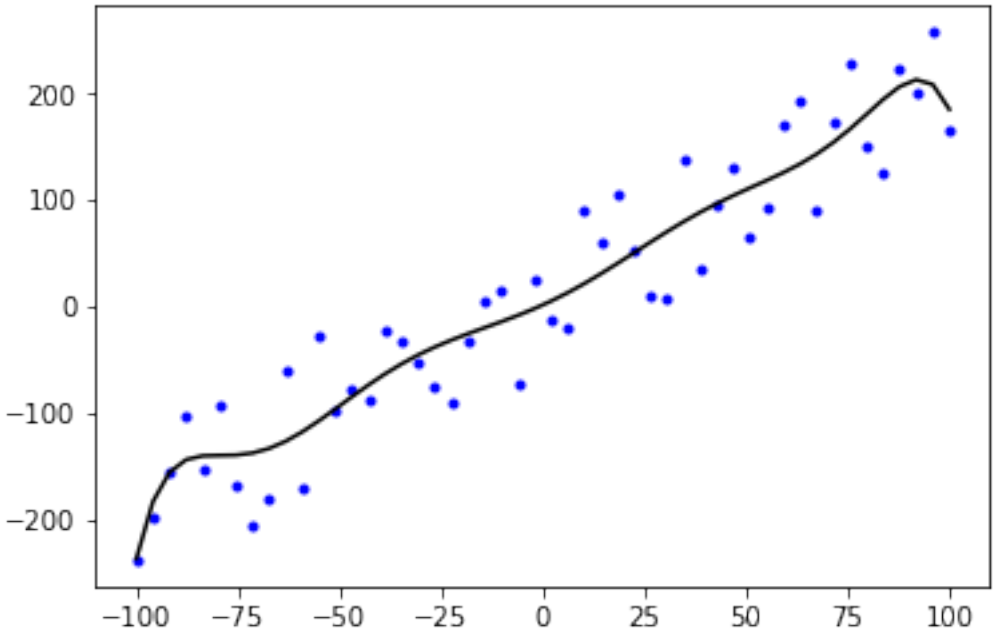
P : 8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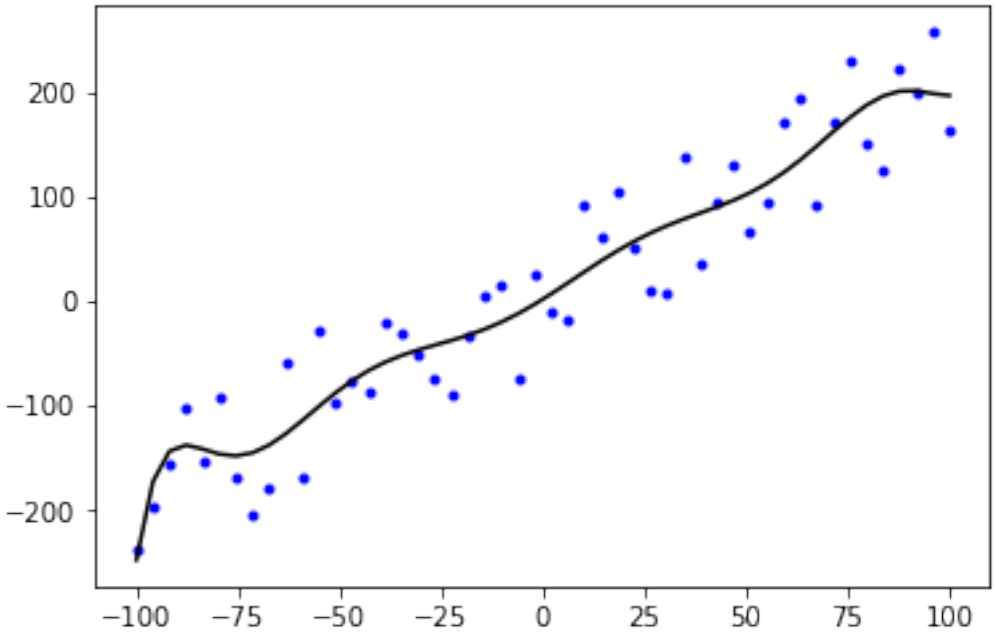
P : 9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6 error graph

```
In [80]: w = np.arange(0,10)
         plt.plot(w,e)
         plt.xlabel('value of p')
         plt.ylabel('Error')
         plt.show()
```