assignment06

November 8, 2018

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1.1 Mathematical Foundations for Computer Vision and Machine Learning

1.1.1 Assignment 06

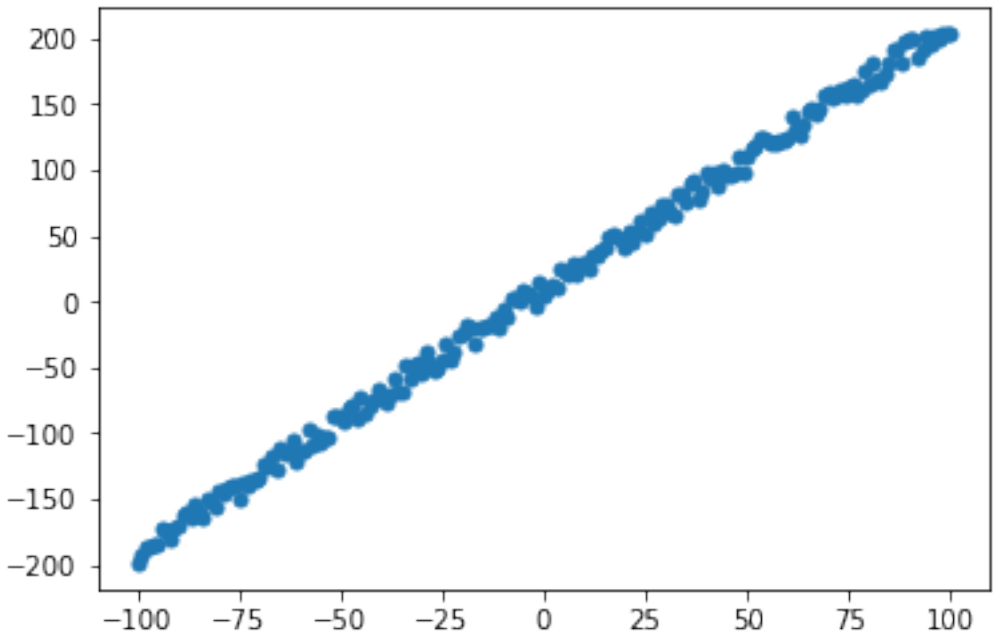
In [2]:
```
import numpy as np
import matplotlib.pyplot as plt

num     = 201
std     = 20
a       = 2
b       = 10

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
```

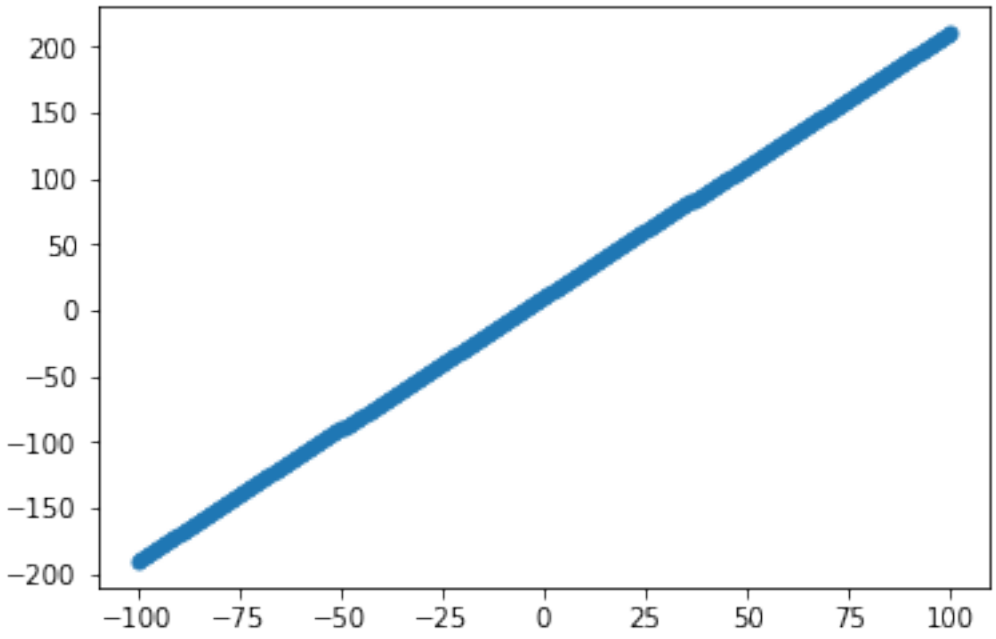
In [7]:
```
plt.plot(x, y1, 'o', label='Original data of y1', markersize=5)
```

Out[7]:
```
[<matplotlib.lines.Line2D at 0x29c6c24d470>]
```



In [8]:
```
plt.plot(x, y2, 'o', label='Original data of y2', markersize=5)
```

Out[8]: [<matplotlib.lines.Line2D at 0x29c6c2b5c50>]



The above graphs are about x, y1 and x, y2.
The second graph is much more clear than the first one.

```
In [9]: A=np.vstack([x, np.ones(len(x))]).T

In [10]: A

Out[10]: array([[-100.,    1.],
                [ -99.,    1.],
                [ -98.,    1.],
                [ -97.,    1.],
                [ -96.,    1.],
                [ -95.,    1.],
                [ -94.,    1.],
                [ -93.,    1.],
                [ -92.,    1.],
                [ -91.,    1.],
                [ -90.,    1.],
                [ -89.,    1.],
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                [ -87.,    1.],
                [ -86.,    1.],
                [ -85.,    1.],
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                [ -82.,    1.],
                [ -81.,    1.],
                [ -80.,    1.],
                [ -79.,    1.],
                [ -78.,    1.],
                [ -77.,    1.],
                [ -76.,    1.],
                [ -75.,    1.],
                [ -74.,    1.],
                [ -73.,    1.],
                [ -72.,    1.],
                [ -71.,    1.],
                [ -70.,    1.],
                [ -69.,    1.],
                [ -68.,    1.],
                [ -67.,    1.],
                [ -66.,    1.],
                [ -65.,    1.],
                [ -64.,    1.],
                [ -63.,    1.],
                [ -62.,    1.],
                [ -61.,    1.],
                [ -60.,    1.],
```

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[ -59.,    1.],
[ -58.,    1.],
[ -57.,    1.],
[ -56.,    1.],
[ -55.,    1.],
[ -54.,    1.],
[ -53.,    1.],
[ -52.,    1.],
[ -51.,    1.],
[ -50.,    1.],
[ -49.,    1.],
[ -48.,    1.],
[ -47.,    1.],
[ -46.,    1.],
[ -45.,    1.],
[ -44.,    1.],
[ -43.,    1.],
[ -42.,    1.],
[ -41.,    1.],
[ -40.,    1.],
[ -39.,    1.],
[ -38.,    1.],
[ -37.,    1.],
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[ -35.,    1.],
[ -34.,    1.],
[ -33.,    1.],
[ -32.,    1.],
[ -31.,    1.],
[ -30.,    1.],
[ -29.,    1.],
[ -28.,    1.],
[ -27.,    1.],
[ -26.,    1.],
[ -25.,    1.],
[ -24.,    1.],
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[ -22.,    1.],
[ -21.,    1.],
[ -20.,    1.],
[ -19.,    1.],
[ -18.,    1.],
[ -17.,    1.],
[ -16.,    1.],
[ -15.,    1.],
[ -14.,    1.],
[ -13.,    1.],
[ -12.,    1.],
```

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[ -11.,    1.],
[ -10.,    1.],
[  -9.,    1.],
[  -8.,    1.],
[  -7.,    1.],
[  -6.,    1.],
[  -5.,    1.],
[  -4.,    1.],
[  -3.,    1.],
[  -2.,    1.],
[  -1.,    1.],
[   0.,    1.],
[   1.,    1.],
[   2.,    1.],
[   3.,    1.],
[   4.,    1.],
[   5.,    1.],
[   6.,    1.],
[   7.,    1.],
[   8.,    1.],
[   9.,    1.],
[  10.,    1.],
[  11.,    1.],
[  12.,    1.],
[  13.,    1.],
[  14.,    1.],
[  15.,    1.],
[  16.,    1.],
[  17.,    1.],
[  18.,    1.],
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[  30.,    1.],
[  31.,    1.],
[  32.,    1.],
[  33.,    1.],
[  34.,    1.],
[  35.,    1.],
[  36.,    1.],
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[  37.,    1.],
[  38.,    1.],
[  39.,    1.],
[  40.,    1.],
[  41.,    1.],
[  42.,    1.],
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[  44.,    1.],
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[  46.,    1.],
[  47.,    1.],
[  48.,    1.],
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[  58.,    1.],
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[  60.,    1.],
[  61.,    1.],
[  62.,    1.],
[  63.,    1.],
[  64.,    1.],
[  65.,    1.],
[  66.,    1.],
[  67.,    1.],
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[  71.,    1.],
[  72.,    1.],
[  73.,    1.],
[  74.,    1.],
[  75.,    1.],
[  76.,    1.],
[  77.,    1.],
[  78.,    1.],
[  79.,    1.],
[  80.,    1.],
[  81.,    1.],
[  82.,    1.],
[  83.,    1.],
[  84.,    1.],
```

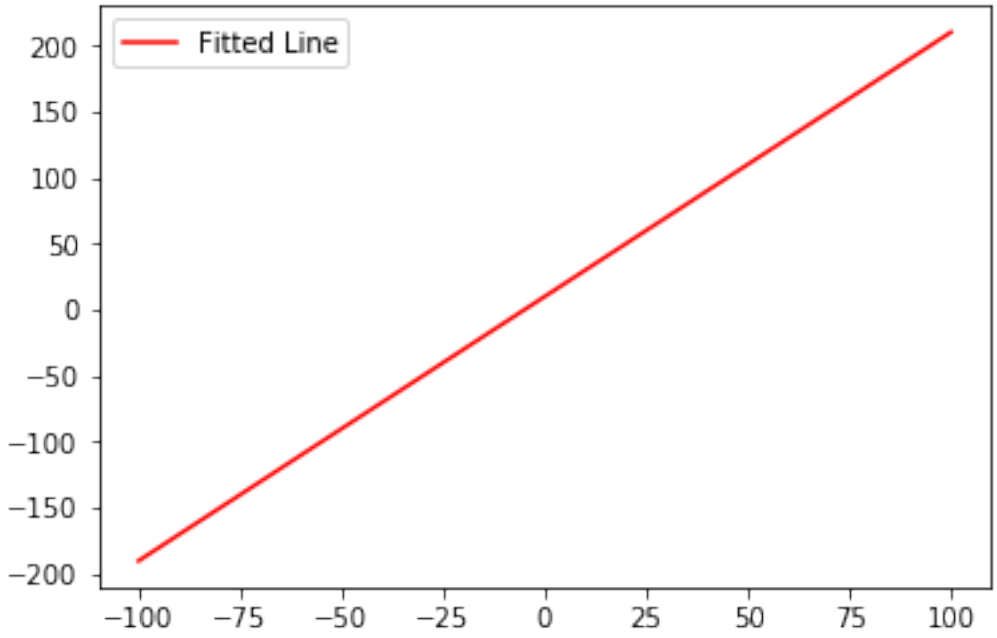
```
       [  85.,    1.],
       [  86.,    1.],
       [  87.,    1.],
       [  88.,    1.],
       [  89.,    1.],
       [  90.,    1.],
       [  91.,    1.],
       [  92.,    1.],
       [  93.,    1.],
       [  94.,    1.],
       [  95.,    1.],
       [  96.,    1.],
       [  97.,    1.],
       [  98.,    1.],
       [  99.,    1.],
       [ 100.,    1.]])
```

In [15]:
```
i, j=np.linalg.lstsq(A, y1)[0]
print(i, j)
```

```
2.000664844994095 10.000000000000002
```

```
c:\users\subin\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:1
To use the future default and silence this warning we advise to pass `rcond=None`, to keep usin
  """Entry point for launching an IPython kernel.
```

In [13]:
```
plt.plot(x, i*x+j, 'r', label='Fitted Line')
plt.legend()
plt.show()
```



So, the line that fits the noisy data by the least square error is above graph.

```
In [16]: print("Line Solution is y={i}x +{j}".format(i=i, j=j))

Line Solution is y=2.000664844994095x +10.000000000000002
```

And, the fitted line equation is above.

2 Github address : https://github.com/lauren026