hw4

November 1, 2021

0.1 , :

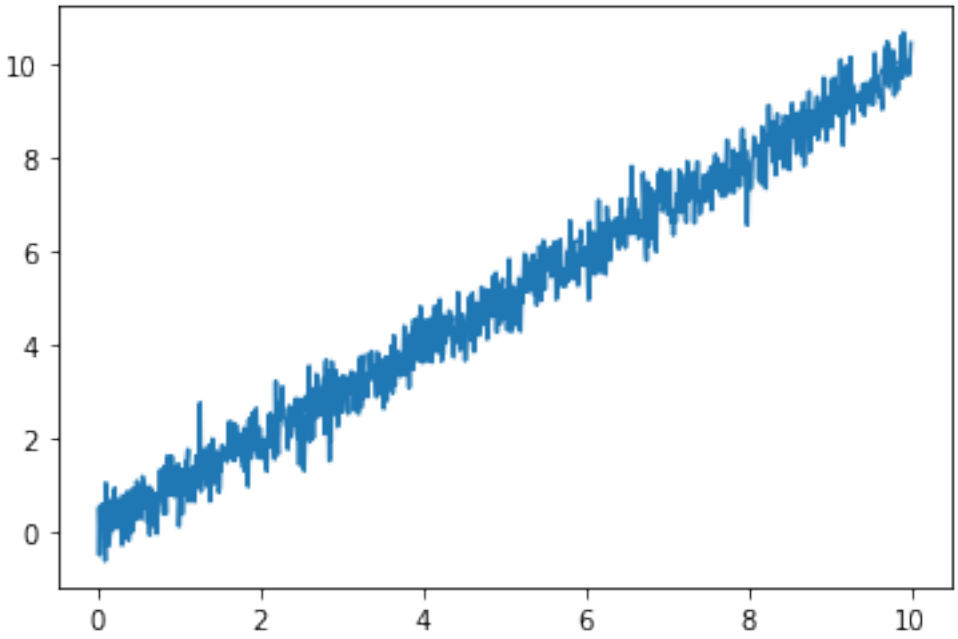
1. $L2$ cvxpy
2. scipy.io.loadmat('data.mat') , pip install scipy

scipy.io.loadmat x.mat, y.mat

[ ]:
```
from scipy.io import loadmat
X = loadmat('x.mat')['x'][0, :]
Y = loadmat('y.mat')['y'][0, :]
```

[ ]:
```
print('X dimension: ', X.shape[0])
print('Y dimension: ', Y.shape[0])
import matplotlib.pyplot as plt
plt.figure()
plt.plot(X, Y)
plt.show()
```

```
X dimension:  1000
Y dimension:  1000
```



X, Y 1000

$$\min_{a,b} \|aX + b - Y\|_2$$

a, b

python cvxpy

```
[ ]: import cvxpy as cp
     import numpy as np
     a = cp.Variable()
     b = cp.Variable()
     obj = cp.Minimize(cp.norm(a * X + b - Y))
     prob = cp.Problem(obj)
     prob.solve()
```

```
[ ]: 12.406181785315747
```

12.406

```
[ ]: print(f'Mean Absolute Deviation is {np.linalg.norm(a.value * X + b.value - Y,␣
      ↪ord=1) / X.shape[0]: .3f}.')
     print(f'The reconstruction formula is y = {a.value:.3f}x + {b.value:.3f}.')
```

```
Mean Absolute Deviation is  0.314.
The reconstruction formula is y = 0.994x + 0.029.
```

0.314

$$y = 0.994x + 0.029$$