

:

: R4136

1. Python.

```
import numpy as np
import matplotlib.pyplot as plt
import os
import random
import scipy
import torch
```

```
torch.cuda.synchronize()
torch.cuda.empty_cache()
```

```
cuda = torch.device('cuda')
print(torch.cuda.get_device_properties(cuda))
_CudaDeviceProperties(name='NVIDIA GeForce RTX 3080 Laptop
```

2.

.

```
name = random.choice(os.listdir("dataset"))
```

```
# name = 'testLab1Var7.csv'
```

```
print(f"Dataset: {name}")
```

```
dataset = np.genfromtxt(f"dataset/{name}", delimiter=',')
```

```
dataset = [dataset[:, i] for i in range(dataset.shape[1])]
```

```
title = ["time", "current", "voltage"]
```

```
dataset_dict = dict(zip(title, dataset))
```

```
Dataset: testLab1Var11.csv
```

3.

```
"""
```

```
"""
```

```
time_period = 0.1
```

```
time_interval = random.random() * (dataset_dict["time"][-1]
```

```
time_interval = (time_interval, time_interval + time_period
```

```
print(f"                {time_interval}")
```

```
(28.65413982391623, 28.75413982391623)
```

```
plt.plot(dataset_dict["time"], dataset_dict["current"])
```

```
plt.xlim(time_interval)
```

```
plt.xlabel('      ,  ')
```

```
plt.ylabel('      ,  ')
```

```
plt.legend(["          "])
```

4. L R.

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⋮

$$\left\{\begin{array}{l} u=e+R\times i+L\times\frac{di}{dt}\\ M-M_C=J\frac{d\omega}{dt}\\ M=C_M\times\Phi\times i\\ e=C_\omega\times\Phi\times\omega \end{array}\right.$$

u - ,

e - () ,

i - ,

Φ - , ,

M - ,

$$e = Y - X \times K,$$

$$:$$

$$S(K) = \sum e_i^2 = e^T \times e = (Y - X \times K)^T \times (Y - X \times K)$$

$$:$$

$$\sigma_Y = \sqrt{\frac{S(K)}{n}}$$

```
e2_Y = torch.mm(Y_tensor.T - torch.mm(X_tensor, K_approx).T, Y_tensor)
sigma2_Y = torch.divide(e2_Y, Y_tensor.shape[0])
```

```
sigma_Y = torch.sqrt(sigma2_Y)
sigma_Y = sigma_Y.cpu().numpy()[0][0]
```