```
import numpy as np
import torch
import time


current_time = time.time()

for i in range(1000):
    arr = np.zeros((4000,4000))
    brr = np.zeros((4000,4000))
    crr = np.zeros((4000,4000))
    drr = np.zeros((4000,4000))
    err = np.zeros((4000,4000))
    frr = np.zeros((4000,4000))
  #  grr = np.zeros((40000,40000))
  #  hrr = np.zeros((40000,40000))
  #  irr = np.zeros((40000,40000))
  #  jrr = np.zeros((40000,40000))
  #  krr = np.zeros((40000,40000))
  #  lrr = np.zeros((40000,40000))
  #  mrr = np.zeros((40000,40000))
  #  nrr = np.zeros((40000,40000))

finish_time = time.time()

print('cost time: ', finish_time- current_time)
```

```
cost time:  186.88993215560913
```

```
current_time = time.time()

for i in range(1000):
    arr = torch.empty((4000,4000))
    brr = torch.empty((4000,4000))
    crr = torch.empty((4000,4000))
    drr = torch.empty((4000,4000))
    err = torch.empty((4000,4000))
    frr = torch.empty((4000,4000))
  #  grr = np.zeros((40000,40000))
  #  hrr = np.zeros((40000,40000))
  #  irr = np.zeros((40000,40000))
  #  jrr = np.zeros((40000,40000))
  #  krr = np.zeros((40000,40000))
  #  lrr = np.zeros((40000,40000))
  #  mrr = np.zeros((40000,40000))
  #  nrr = np.zeros((40000,40000))

finish_time = time.time()

print('cost time: ', finish_time- current_time)
```

```
cost time:  2.8406753540039062
```

```
# 2. Array Operations

# torch
x = torch.rand(10000,10000)
y = torch.rand(10000,10000)

current_time = time.time()

a = x+y
b = x-y
c = x*y

end_time = time.time()
end_time - current_time
```

```
1.9914681911468506
```

```
# numpy
x = np.random.rand(10000,10000)
y = np.random.rand(10000,10000)

current_time = time.time()

a = x+y
b = x-y
c = x*y

end_time = time.time()
end_time - current_time
```

```
1.638838529586792
```

Code Text

```
# 3. array traversing

# numpy

x = np.random.rand(1,1000000000)

current_time = time.time()

y = x[0, (len(x)//2)]

end_time = time.time()
```

```
end_time - current_time
```

```
0.0005037784576416016
```

```
# torch

x = torch.rand(1,1000000000)

current_time = time.time()

y = x[0, (len(x)//2)]

end_time = time.time()

end_time - current_time
```

```
0.013945341110229492
```

```
# Linear Algebra


# using both

# numpy -> pytorch
tensor = torch.from_numpy(np_array)

#  pytorch -> numpy
ndarray = tensor.numpy()


# new tensor

# numpy
zeros = np.zeros((4,4))
ones = np.ones((4,4))
random = np.random.random((4,4))

# pytorch
zeros = torch.zeros(4,4)
ones = torch.ones(4,4)
random = torch.rand(4,4)




# Basic Linear Algebra


# indexing
```

```
# numpy
array[0,0]
array[0,:]

# pytorch
torch[0,0]
torch[0,:]


# addition & subtraction

# numpy
array1 + array2
array1 - array2

# pytorch
tensor1 + tensor2
tensor1- tensor2


# multiplication

# numpy
array*array
# matrix multiplication
array@ array

# pytorch
tensor * tensor
# matrix multiplication
tensor@tensor


# shape and dimensions

# numpy
shape = array.shape
num_dim = array.ndim

# pytorch
shape = tensor.shape
shape = tensor.size()
num_dim = tensor.dim()


# reshaping

# numpy
new_array = array.reshape((8,2))

# pytorch
new_tensor = tensor.view(8,2)
```