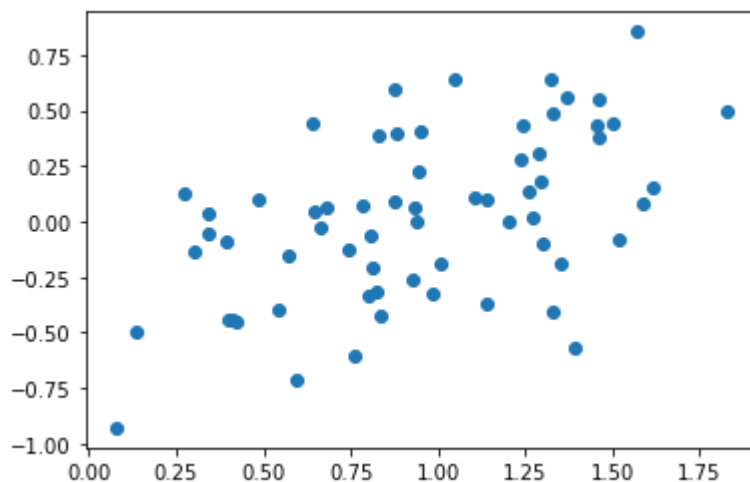


```
In [6]: import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

```
In [7]: #1
n = 64
x = np.linspace(0, 1, n) + np.random.rand(4,n)
x = np.vstack([x, np.ones(len(x.T))]).T
y = np.linspace(0, 1, n) + np.random.rand(n) - 1
```

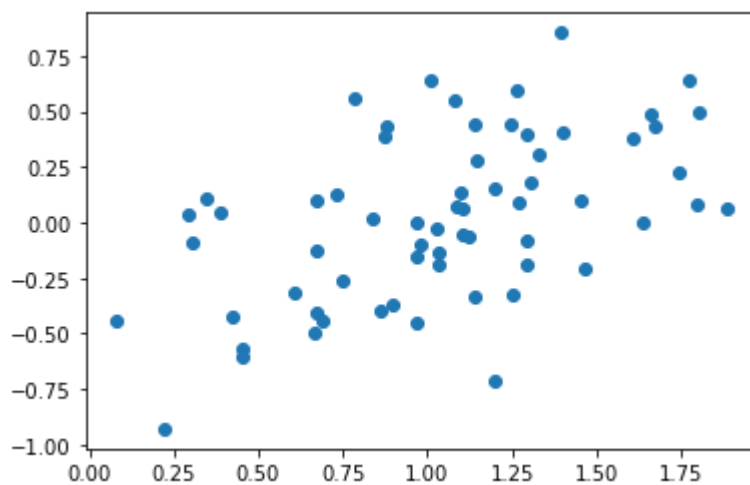
```
In [9]: plt.scatter(x.T[0],y)
```

Out[9]: <matplotlib.collections.PathCollection at 0x1f874930490>



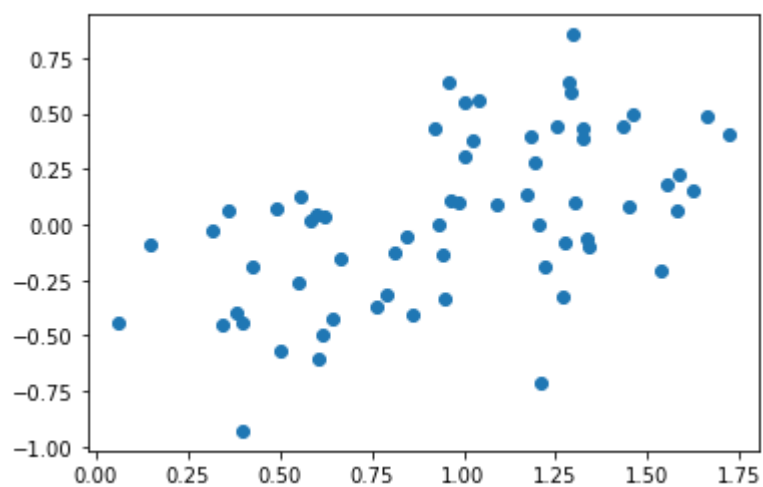
```
In [10]: plt.scatter(x.T[1], y)
```

Out[10]: <matplotlib.collections.PathCollection at 0x1f8749a7460>



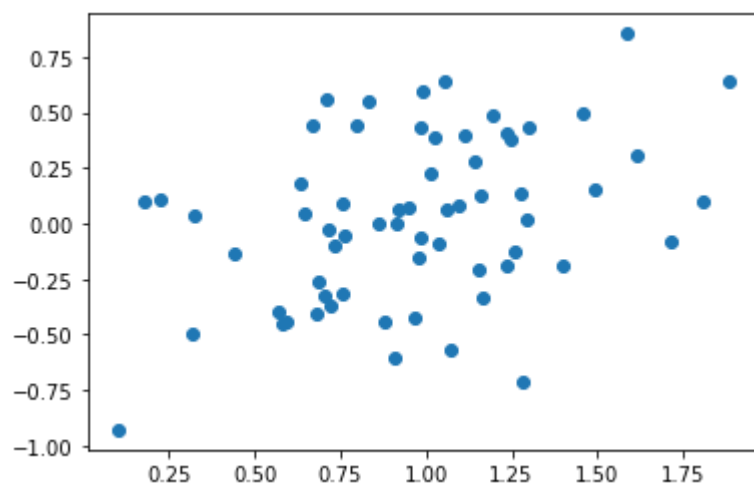
```
In [11]: plt.scatter(x.T[2], y)
```

```
Out[11]: <matplotlib.collections.PathCollection at 0x1f874a10a90>
```



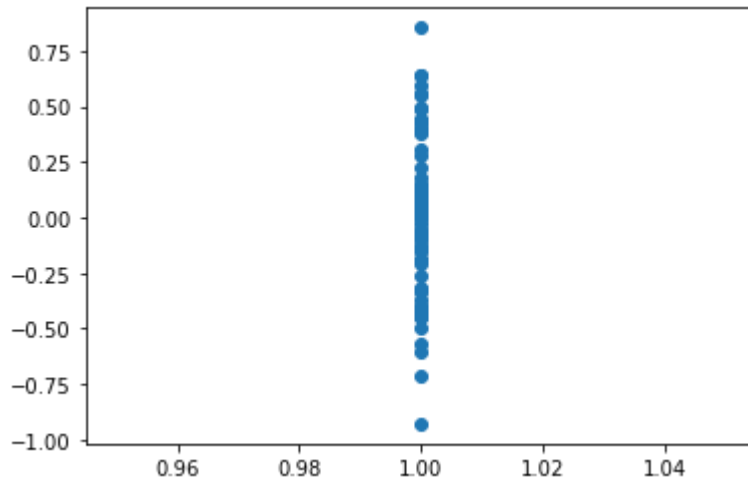
```
In [13]: plt.scatter(x.T[3], y)
```

```
Out[13]: <matplotlib.collections.PathCollection at 0x1f875abf730>
```



```
In [14]: plt.scatter(x.T[4], y)
```

```
Out[14]: <matplotlib.collections.PathCollection at 0x1f875b27bb0>
```



```
In [17]: #2
left = np.linalg.inv(np.dot(x.T, x))
right = np.dot(y.T, x)
np.dot(left, right)

beta = np.linalg.lstsq(x, y)[0]
beta
```

C:\Users\VivianHuo\AppData\Local\Temp\ipykernel_13772\2757500533.py:6: FutureWarning: `rcond` parameter will change to the default of machine precision times ``max(M, N)`` where M and N are the input matrix dimensions. To use the future default and silence this warning we advise to pass `rcond=None`, to keep using the old, explicitly pass `rcond=-1`.

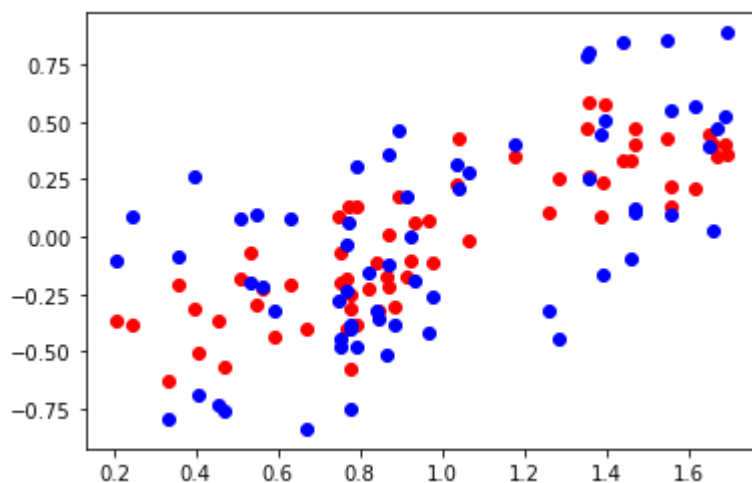
```
beta = np.linalg.lstsq(x, y)[0]
```

```
Out[17]: array([ 0.22068478,  0.17593864,  0.22090229,  0.05564429, -0.64007969])
```

```
In [18]: #3
pred = np.dot(x, beta)
```

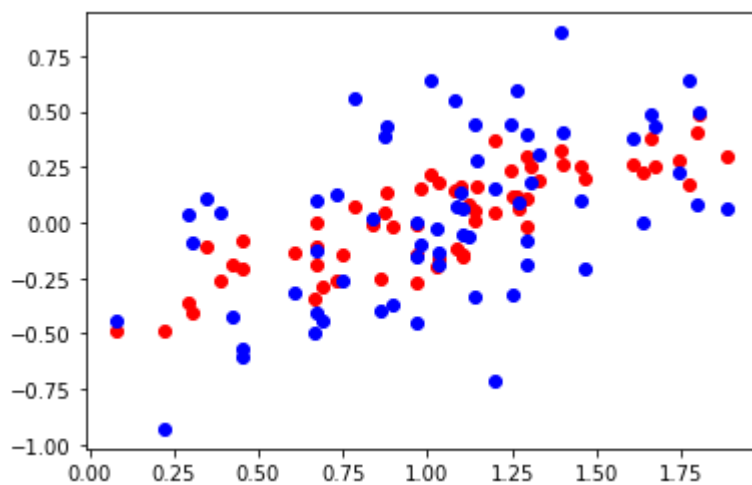
```
In [60]: plt.scatter(x.T[0], pred, c='red')  
plt.scatter(x.T[0], y, c='b')
```

Out[60]: <matplotlib.collections.PathCollection at 0x23dc80dd490>



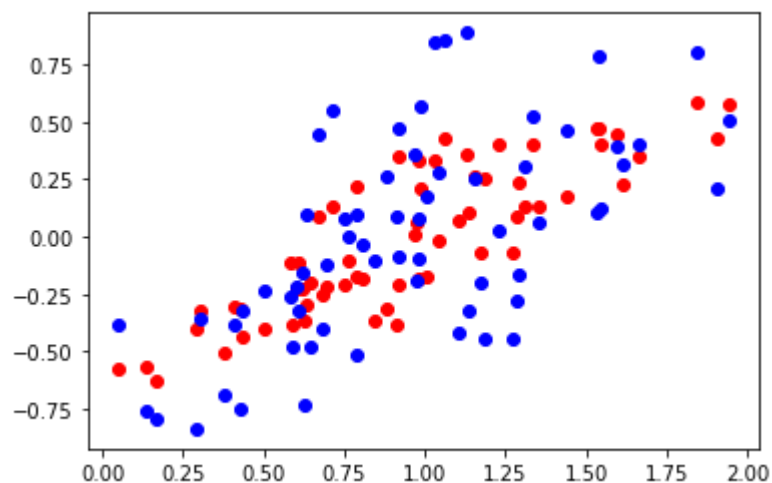
```
In [19]: plt.scatter(x.T[1], pred, c='red')  
plt.scatter(x.T[1], y, c='b')
```

Out[19]: <matplotlib.collections.PathCollection at 0x1f875ff9a60>



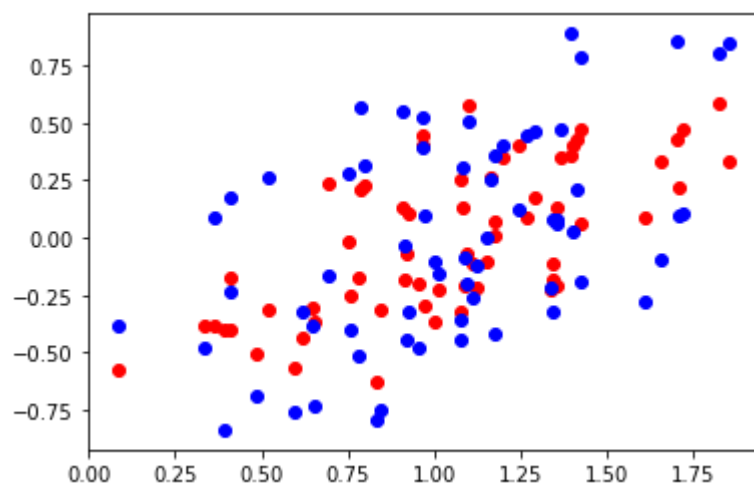
```
In [62]: plt.scatter(x.T[2], pred, c='red')  
plt.scatter(x.T[2], y, c='b')
```

Out[62]: <matplotlib.collections.PathCollection at 0x23dc8103be0>



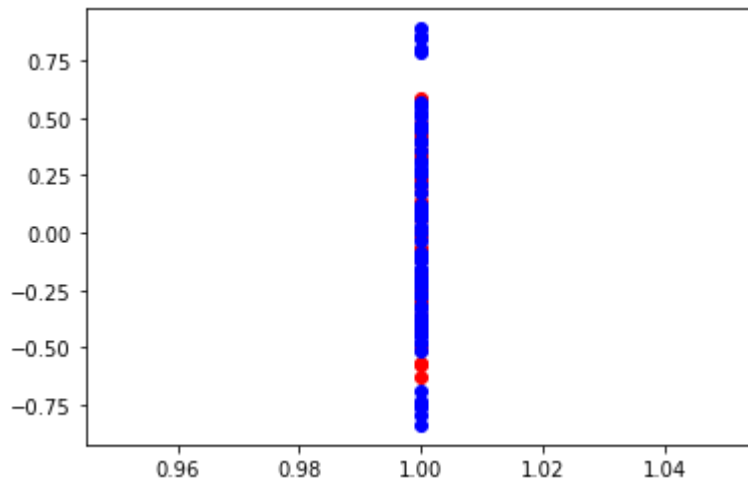
```
In [63]: plt.scatter(x.T[3], pred, c='red')  
plt.scatter(x.T[3], y, c='b')
```

Out[63]: <matplotlib.collections.PathCollection at 0x23dc7a8c400>



```
In [64]: plt.scatter(x.T[4], pred, c='red')
plt.scatter(x.T[4], y, c='b')
```

Out[64]: <matplotlib.collections.PathCollection at 0x23dc7a09dc0>



```
In [23]: #4
import requests
import pandas as pd
import numpy as np
url = 'https://raw.githubusercontent.com/jhuaap/mlnn/master/data/Credit.csv'
res = requests.get(url, allow_redirects=True)
with open('Credit.csv', 'wb') as file:
    file.write(res.content)
Credit = pd.read_csv('Credit.csv')
Credit.head()
```

Out[23]:

	Unnamed: 0	Income	Limit	Rating	Cards	Age	Education	Gender	Student	Married	Ethnicity
0	1	14.891	3606	283	2	34	11	Male	No	Yes	Caucasian
1	2	106.025	6645	483	3	82	15	Female	Yes	Yes	Asian
2	3	104.593	7075	514	4	71	11	Male	No	No	Asian
3	4	148.924	9504	681	3	36	11	Female	No	No	Asian
4	5	55.882	4897	357	2	68	16	Male	No	Yes	Caucasian

```
In [24]: columns = ['Age', 'Cards']  
X = Credit[columns].values  
  
X = np.vstack([X.T, np.ones(len(X))]).T  
X
```

```
Out[24]: array([[34.,  2.,  1.],  
               [82.,  3.,  1.],  
               [71.,  4.,  1.],  
               ...,  
               [67.,  5.,  1.],  
               [44.,  1.,  1.],  
               [64.,  5.,  1.]])
```

```
In [25]: Z = Credit['Rating']  
Z
```

```
Out[25]: 0      283  
         1      483  
         2      514  
         3      681  
         4      357  
         ...  
        395     307  
        396     296  
        397     321  
        398     192  
        399     415  
        Name: Rating, Length: 400, dtype: int64
```

```
In [ ]: #5  
plt.scatter(x.T[0], pred, c='red')  
plt.scatter(x.T[0], Z, c='b')
```

```
In [ ]:
```