

## 4.1.multiple\_linear\_regression\_prediction\_v2

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Multiple Linear Regression

Objective

How to make the prediction for multiple inputs.

How to use linear class to build more complex models.

How to build a custom module.

Table of Contents

In this lab, you will review how to make a prediction in several different ways by using PyTorch.

Prediction

Class Linear

Build Custom Modules

Estimated Time Needed: 15 min

Preparation

Import the libraries and set the random seed.

```
[ ]: # Import the libraries and set the random seed  
  
from torch import nn  
import torch  
torch.manual_seed(1)
```

Prediction

Set weight and bias.

```
[ ]: # Set the weight and bias  
  
w = torch.tensor([[2.0], [3.0]], requires_grad=True)  
b = torch.tensor([[1.0]], requires_grad=True)
```

Define the parameters. torch.mm uses matrix multiplication instead of scaler multiplication.

```
[ ]: # Define Prediction Function
```

```
def forward(x):
    yhat = torch.mm(x, w) + b
    return yhat
```

The function forward implements the following equation:

If we input a 1x2 tensor, because we have a 2x1 tensor as w, we will get a 1x1 tensor:

```
[ ]: # Calculate yhat

x = torch.tensor([[1.0, 2.0]])
yhat = forward(x)
print("The result: ", yhat)
```

## 1 Each row of the following tensor represents a sample:

```
[ ]: # Sample tensor X

X = torch.tensor([[1.0, 1.0], [1.0, 2.0], [1.0, 3.0]])
```

```
[ ]: # Make the prediction of X

yhat = forward(X)
print("The result: ", yhat)
```

Class Linear

We can use the linear class to make a prediction. You'll also use the linear class to build more complex models.

Let us create a model.

```
[ ]: # Make a linear regression model using build-in function

model = nn.Linear(2, 1)
```

Make a prediction with the first sample:

```
[ ]: # Make a prediction of x

yhat = model(x)
print("The result: ", yhat)
```

Predict with multiple samples X:

```
[ ]: # Make a prediction of X

yhat = model(X)
print("The result: ", yhat)
```

The function performs matrix multiplication as shown in this image:

Build Custom Modules

Now, you'll build a custom module. You can make more complex models by using this method later.

```
[ ]: # Create linear_regression Class

class linear_regression(nn.Module):

    # Constructor
    def __init__(self, input_size, output_size):
        super(linear_regression, self).__init__()
        self.linear = nn.Linear(input_size, output_size)

    # Prediction function
    def forward(self, x):
        yhat = self.linear(x)
        return yhat
```

Build a linear regression object. The input feature size is two.

```
[ ]: model = linear_regression(2, 1)
```

This will input the following equation:

You can see the randomly initialized parameters by using the parameters() method:

```
[ ]: # Print model parameters

print("The parameters: ", list(model.parameters()))
```

You can also see the parameters by using the state\_dict() method:

```
[ ]: # Print model parameters

print("The parameters: ", model.state_dict())
```

Now we input a 1x2 tensor, and we will get a 1x1 tensor.

```
[ ]: # Make a prediction of x

yhat = model(x)
print("The result: ", yhat)
```

The shape of the output is shown in the following image:

Make a prediction for multiple samples:

```
[ ]: # Make a prediction of X

yhat = model(X)
print("The result: ", yhat)
```

The shape is shown in the following image:

Practice

Build a model or object of type `linear_regression`. Using the `linear_regression` object will predict the following tensor:

```
[ ]: # Practice: Build a model to predict the follow tensor.

X = torch.tensor([[11.0, 12.0, 13, 14], [11, 12, 13, 14]])
```

[Double-click here for the solution.](#)

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## 1.1 Change Log

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2020-09-23	2.0	Shubham	Migrated Lab to Markdown and added to course repo in GitLab

##

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