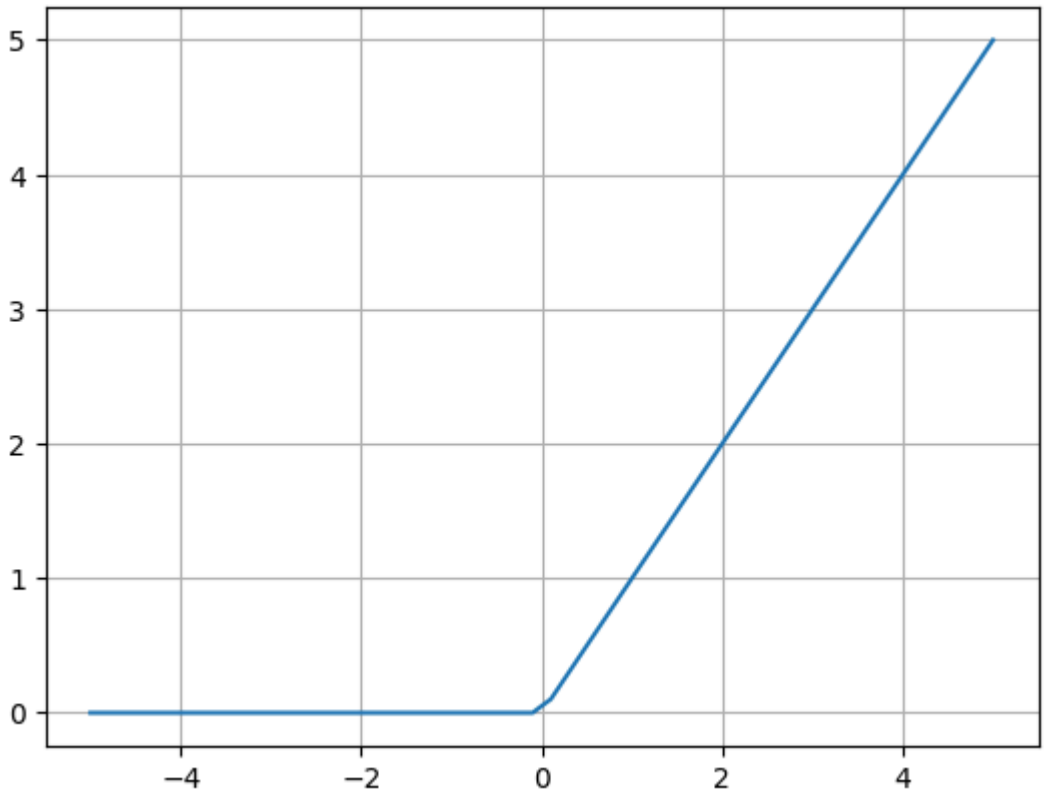
tutorial 5

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [ ]:
```
def relu(z):
    return np.maximum(0, z)
```

In [ ]:
```
x=np.linspace(-5,5,50)
z=relu(x)
```

In [ ]:
```
plt.plot(x,z)
plt.grid()
plt.show()
```



In [ ]:
```
def initialize_param(layer_sizes):
    params={}
    for i in range (1,len(layer_sizes)):
        params['W'+str(i)]=np.random.randn(layer_sizes[i],layer_sizes[i-1])
        params['b'+str(i)]=np.random.randn((layer_sizes[i],1))*0.01
    return params
```

In [ ]:
```
def forward_propagation(X_train,params):
    layers = len(params)//2
    values={}
    for i in range(1,layers+1):
        if i==1:
            values['z'+str(i)]=np.dot(params['w'+str(i)],X_train) +params['b'+str(i)]
            values['A'+str(i)]=relu(values['z'+str(i)])
        else:
```

```
            values['z'+str(i)]=np.dot(params['w'+str(i)],values['A'+str(i-1)])+params['b'+str(i)]
            if i==layers:
                values['A'+str(i)]=values['z'+str(i)]
            else:
                values['A'+str(i)]=relu(values['z'+str(i)])
    return values
```

Cost Function

$$J = \frac{1}{2m} \sum (J_{\text{true}} - J_{\text{pred}})^2$$

In [ ]:
```
def compute_cost(values,Y_train):
    layers=len(values)//2
    Y_pred=values['A'+str(layers)]
    cost=1/(2*len(Y_train))*np.sum(np.square(Y_pred-Y_train))
    return cost
```

In [ ]:
```
def train(inputs, expected_outputs, weights_input_hidden, bias_hidden, weights_hidden_output, bias_output, epochs, learning_ra
    for epoch in range(epochs):
        total_error = 0
        for i in range(len(inputs)):
            input_data = inputs[i]
            expected_output = expected_outputs[i]

            # Forward propagation
            predicted_output, hidden_output = forward_propagation(input_data, weights_input_hidden, bias_hidden, weights_hidde

            # Backward propagation
            weights_input_hidden, bias_hidden, weights_hidden_output, bias_output = backward_propagation(input_data, expected_

            # Calculate error
            total_error += mean_squared_error(expected_output, predicted_output)


            print(f'Epoch {epoch}, Error: {total_error}')
```

```
    return weights_input_hidden, bias_hidden, weights_hidden_output, bias_output
```

In [ ]:

```
def train(self, X, y, epochs, learning_rate):
        for epoch in range(epochs):
            total_error = 0
            for i in range(len(X)):
                input_data = X[i:i+1]
                expected_output = y[i:i+1]

                # Forward propagation
                predicted_output, hidden_output = self.forward_propagation(input_data)

                # Backward propagation
                self.backward_propagation(input_data, expected_output, predicted_output, hidden_output, learning_rate)

                # Calculate error
                total_error += self.mean_squared_error(expected_output, predicted_output)

            # Print error
            print(f'Epoch {epoch}, Error: {total_error}')
```