MNIST

Presentation for Data Classification

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01 MNIST

02 Hypothesis

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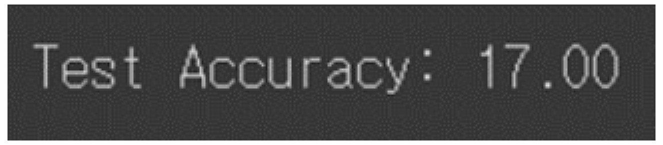
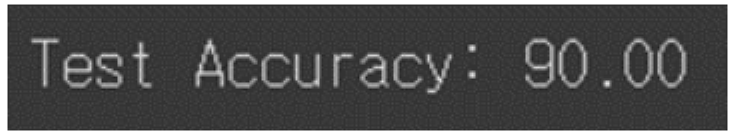
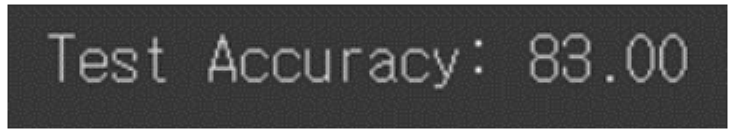
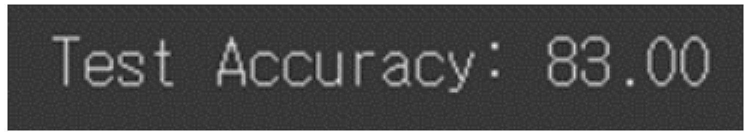
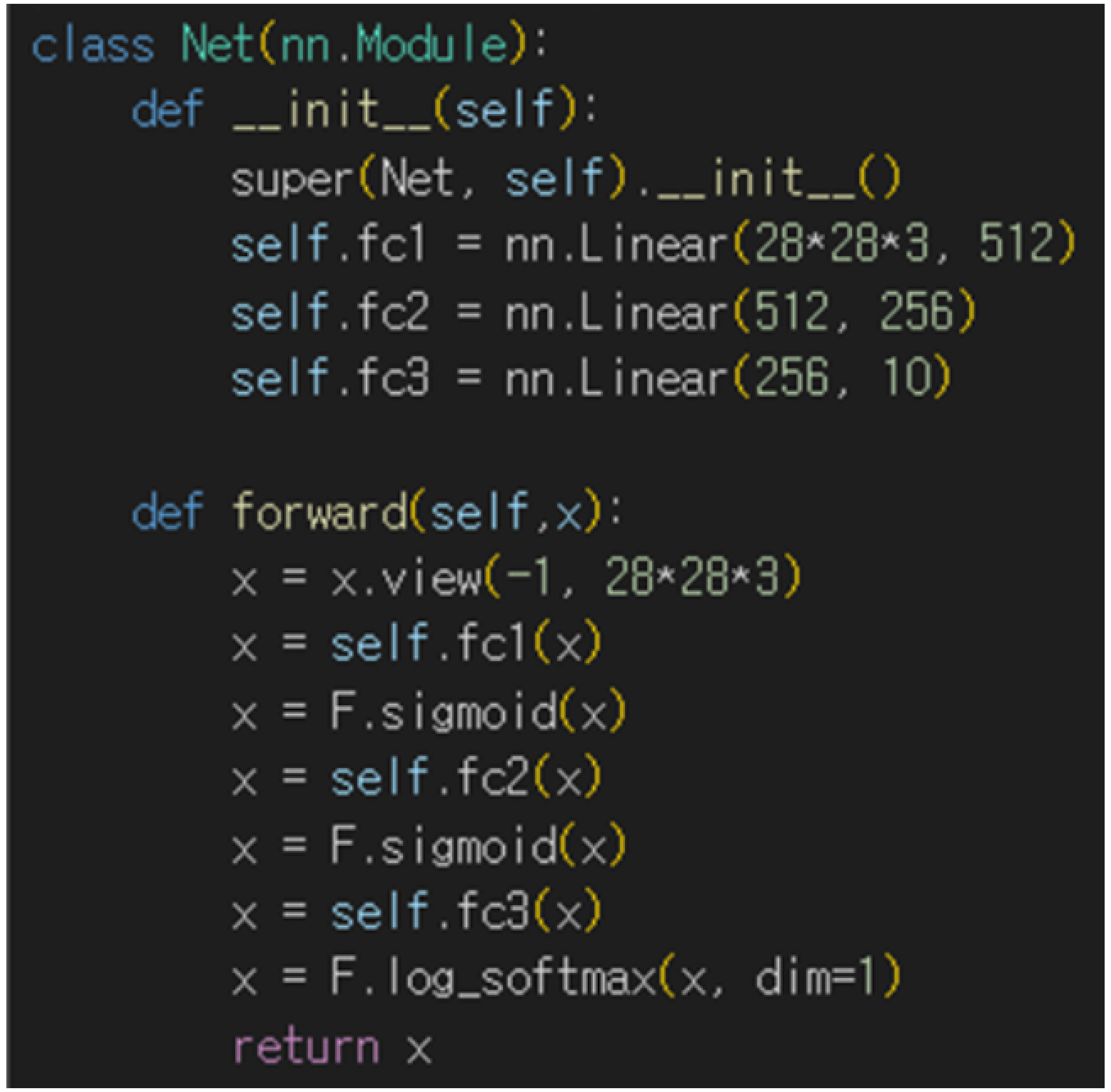
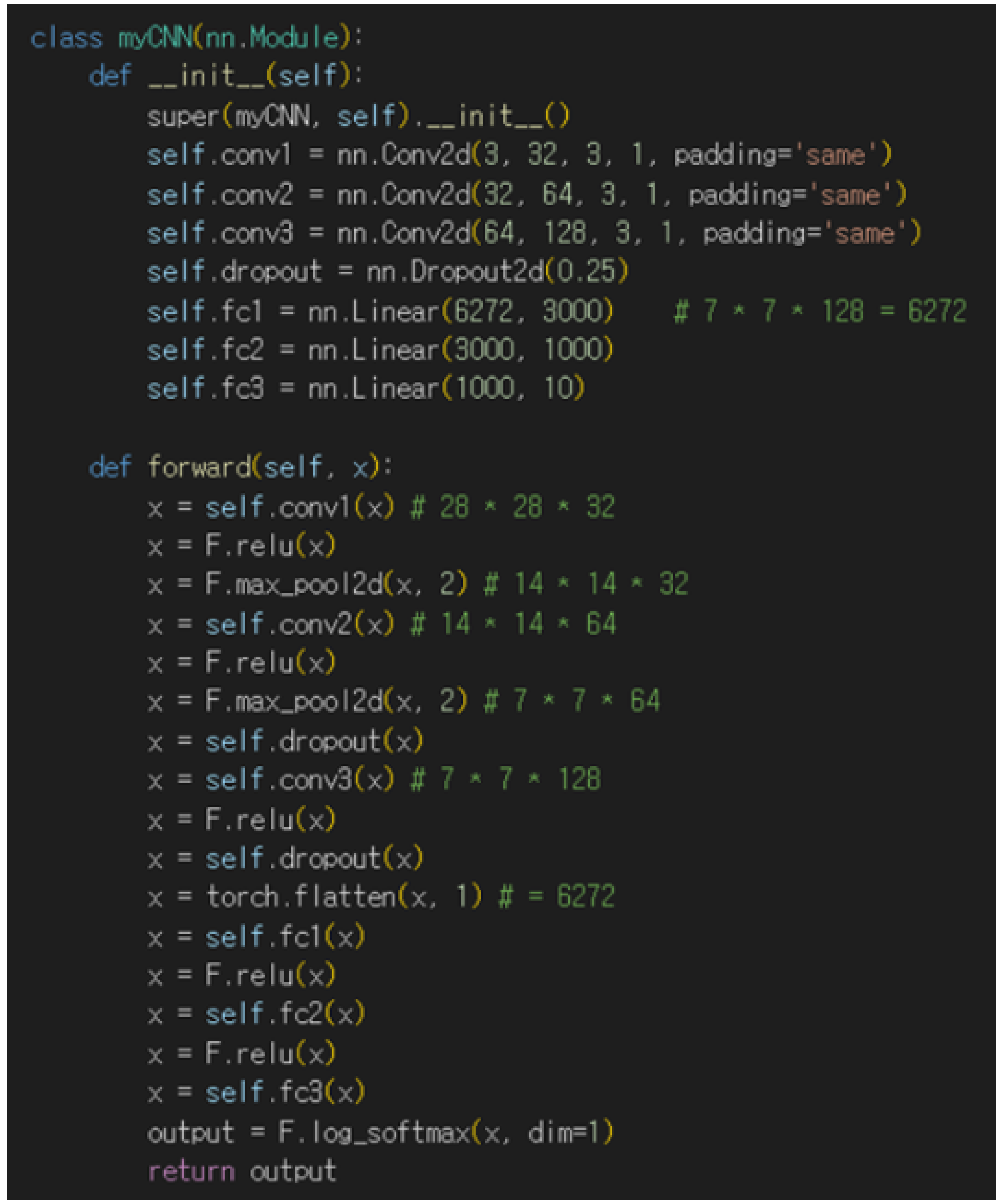
03 Experiment - Epoch

Epoch = 1	 Test Accuracy: 17.00
Epoch = 20	 Test Accuracy: 90.00
Epoch = 50	 Test Accuracy: 83.00
Epoch = 100	 Test Accuracy: 83.00

03 Experiment - Convolutional Layer

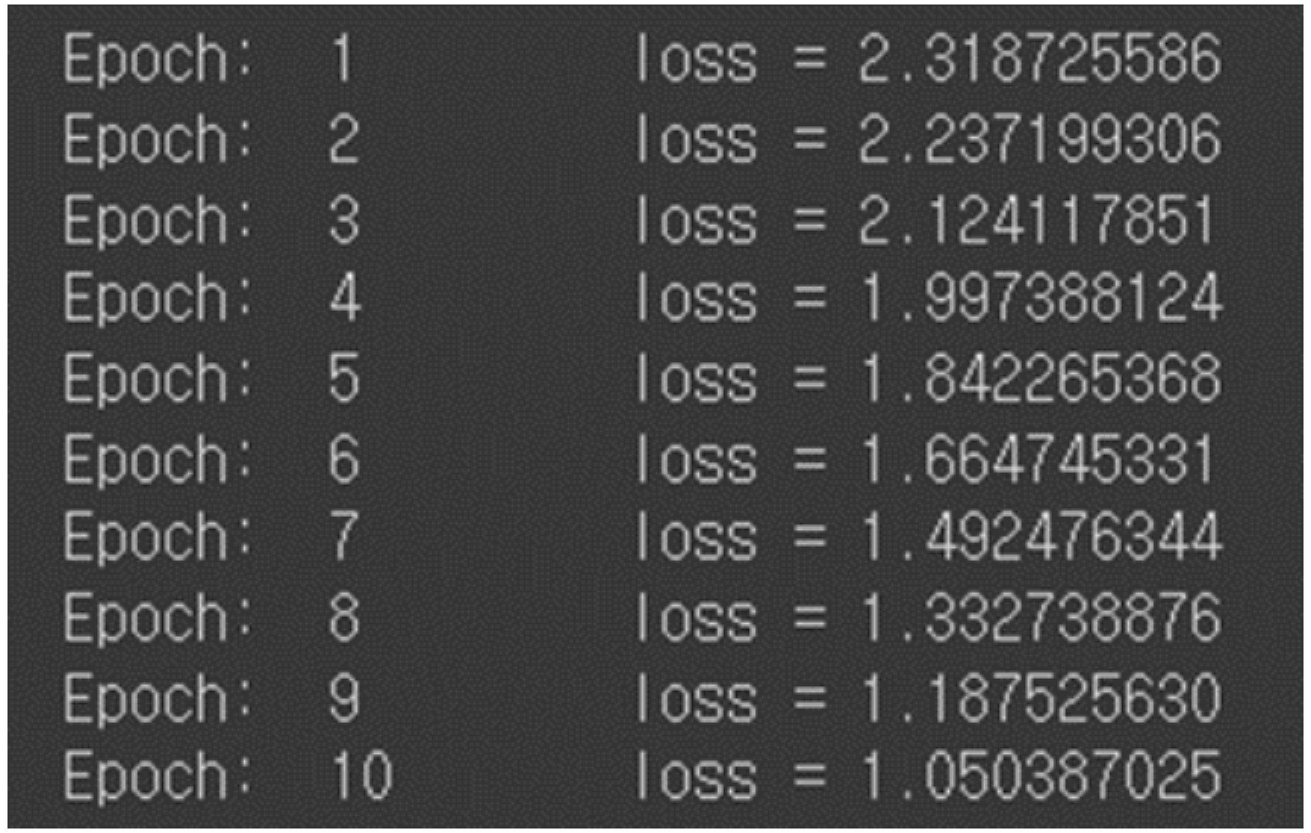


```python
class Net(nn.Module):
    def __init__(self):
        super(Net, self).__init__()
        self.fc1 = nn.Linear(28*28*3, 512)
        self.fc2 = nn.Linear(512, 256)
        self.fc3 = nn.Linear(256, 10)

    def forward(self,x):
        x = x.view(-1, 28*28*3)
        x = self.fc1(x)
        x = F.sigmoid(x)
        x = self.fc2(x)
        x = F.sigmoid(x)
        x = self.fc3(x)
        x = F.log_softmax(x, dim=1)
        return x
```

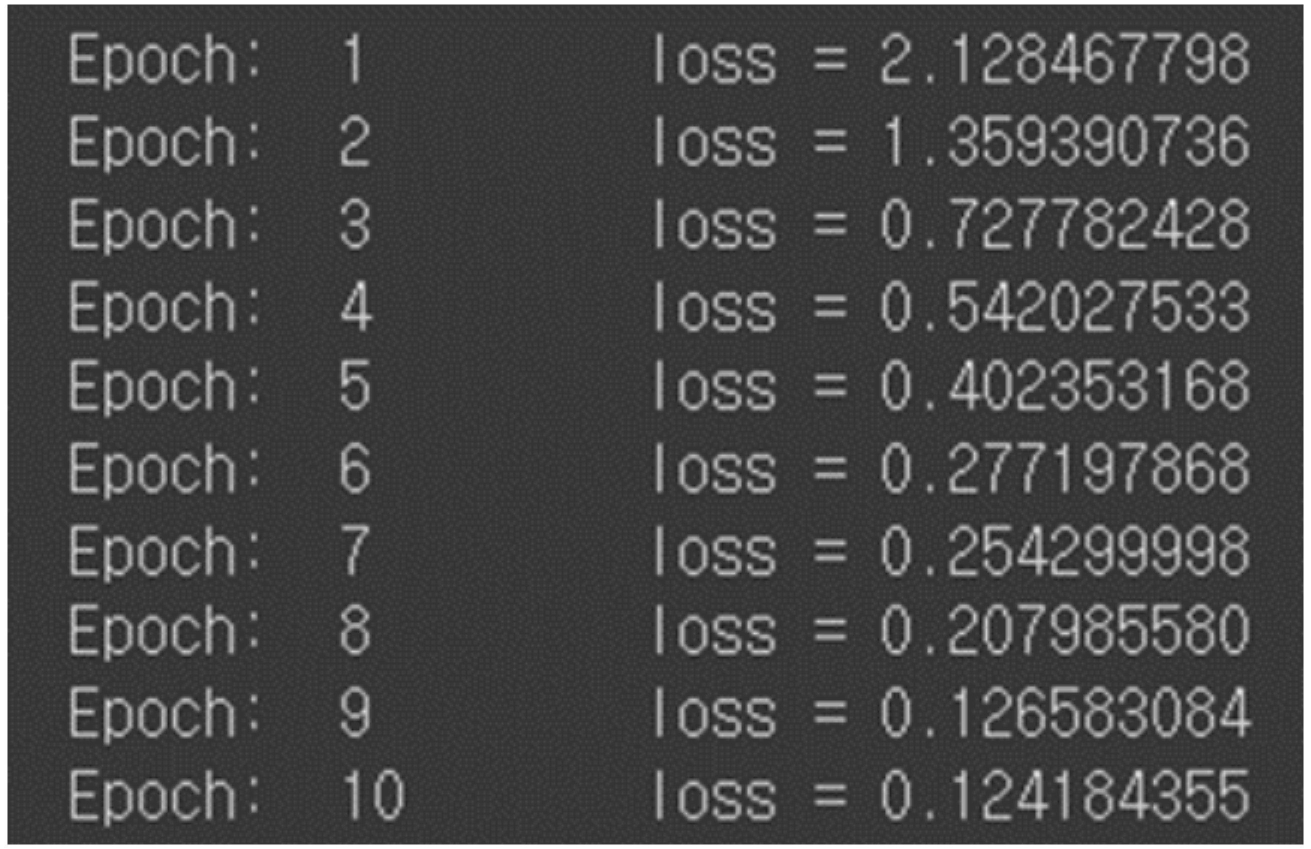


```python
class myCNN(nn.Module):
    def __init__(self):
        super(myCNN, self).__init__()
        self.conv1 = nn.Conv2d(3, 32, 3, 1, padding='same')
        self.conv2 = nn.Conv2d(32, 64, 3, 1, padding='same')
        self.conv3 = nn.Conv2d(64, 128, 3, 1, padding='same')
        self.dropout = nn.Dropout2d(0.25)
        self.fc1 = nn.Linear(6272, 3000)    # 7 * 7 * 128 = 6272
        self.fc2 = nn.Linear(3000, 1000)
        self.fc3 = nn.Linear(1000, 10)

    def forward(self, x):
        x = self.conv1(x) # 28 * 28 * 32
        x = F.relu(x)
        x = F.max_pool2d(x, 2) # 14 * 14 * 32
        x = self.conv2(x) # 14 * 14 * 64
        x = F.relu(x)
        x = F.max_pool2d(x, 2) # 7 * 7 * 64
        x = self.dropout(x)
        x = self.conv3(x) # 7 * 7 * 128
        x = F.relu(x)
        x = self.dropout(x)
        x = torch.flatten(x, 1) # = 6272
        x = self.fc1(x)
        x = F.relu(x)
        x = self.fc2(x)
        x = F.relu(x)
        x = self.fc3(x)
        output = F.log_softmax(x, dim=1)
        return output
```

03 Experiment - Convolutional Layer

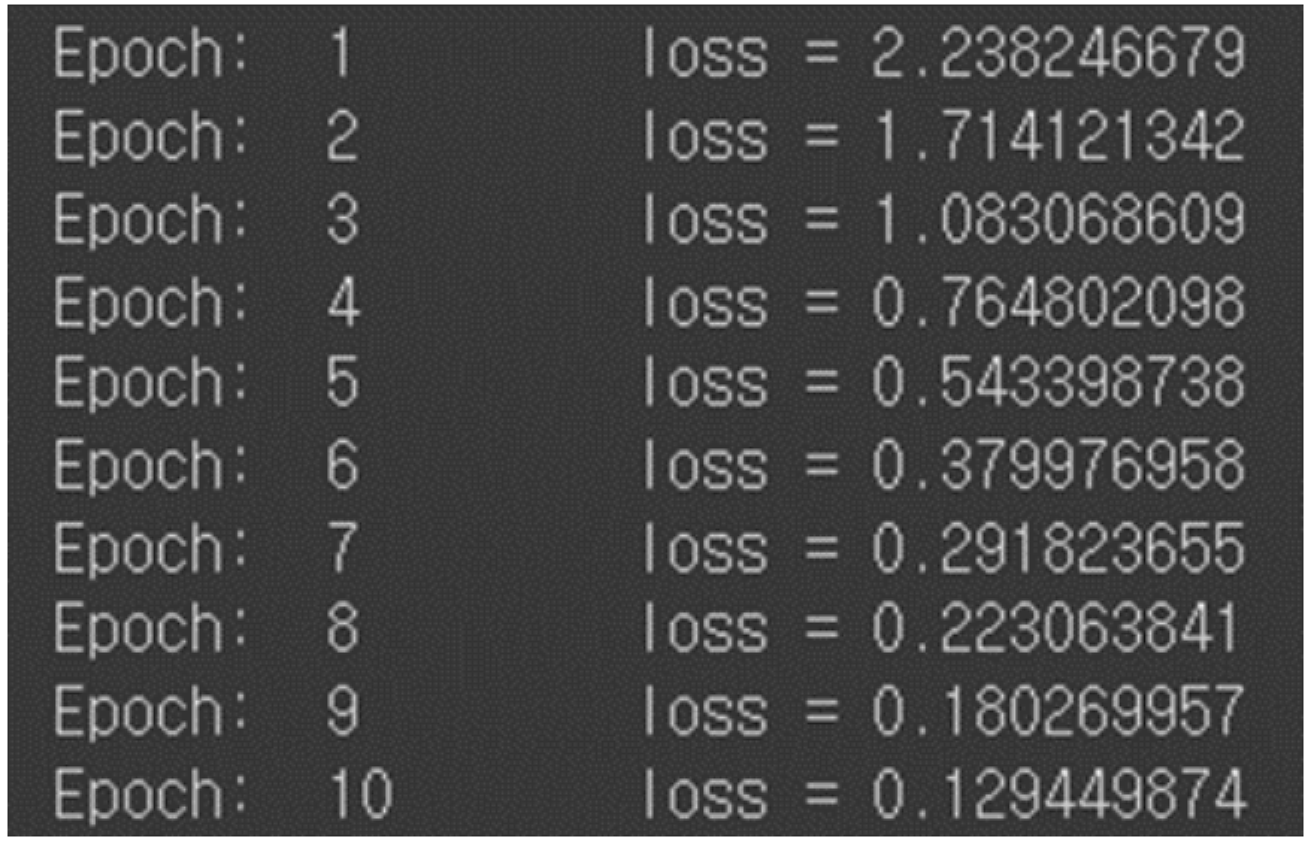


```
Epoch:  1          loss = 2.318725586
Epoch:  2          loss = 2.237199306
Epoch:  3          loss = 2.124117851
Epoch:  4          loss = 1.997388124
Epoch:  5          loss = 1.842265368
Epoch:  6          loss = 1.664745331
Epoch:  7          loss = 1.492476344
Epoch:  8          loss = 1.332738876
Epoch:  9          loss = 1.187525630
Epoch:  10         loss = 1.050387025
```

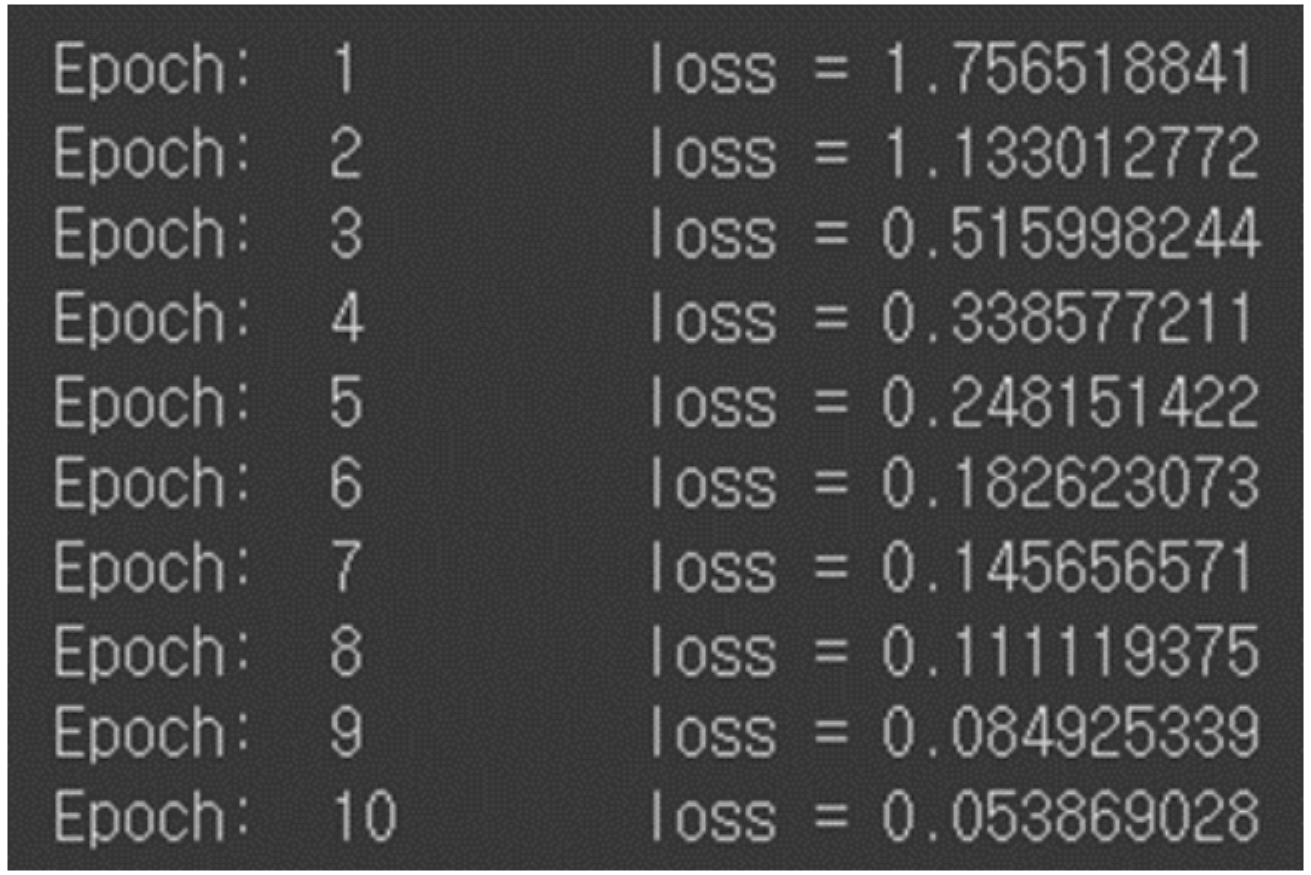


```
Epoch:  1          loss = 2.128467798
Epoch:  2          loss = 1.359390736
Epoch:  3          loss = 0.727782428
Epoch:  4          loss = 0.542027533
Epoch:  5          loss = 0.402353168
Epoch:  6          loss = 0.277197868
Epoch:  7          loss = 0.254299998
Epoch:  8          loss = 0.207985580
Epoch:  9          loss = 0.126583084
Epoch:  10         loss = 0.124184355
```

03 Experiment - Focal Loss



```
Epoch:  1          loss = 2.238246679
Epoch:  2          loss = 1.714121342
Epoch:  3          loss = 1.083068609
Epoch:  4          loss = 0.764802098
Epoch:  5          loss = 0.543398738
Epoch:  6          loss = 0.379976958
Epoch:  7          loss = 0.291823655
Epoch:  8          loss = 0.223063841
Epoch:  9          loss = 0.180269957
Epoch:  10         loss = 0.129449874
```



```
Epoch:  1          loss = 1.756518841
Epoch:  2          loss = 1.133012772
Epoch:  3          loss = 0.515998244
Epoch:  4          loss = 0.338577211
Epoch:  5          loss = 0.248151422
Epoch:  6          loss = 0.182623073
Epoch:  7          loss = 0.145656571
Epoch:  8          loss = 0.111119375
Epoch:  9          loss = 0.084925339
Epoch:  10         loss = 0.053869028
```

04 Conclusion

1. Epoch

2. Convolutional Layer

3. Focal Loss

05 Limitation

1. Visualization

2. Dataset

3. Activation Function