

# Assignment 12

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2025-11-13

## Exercise 1

- i. 70000
- ii. 28x28
- iii. 10 classes

## Exercise 2

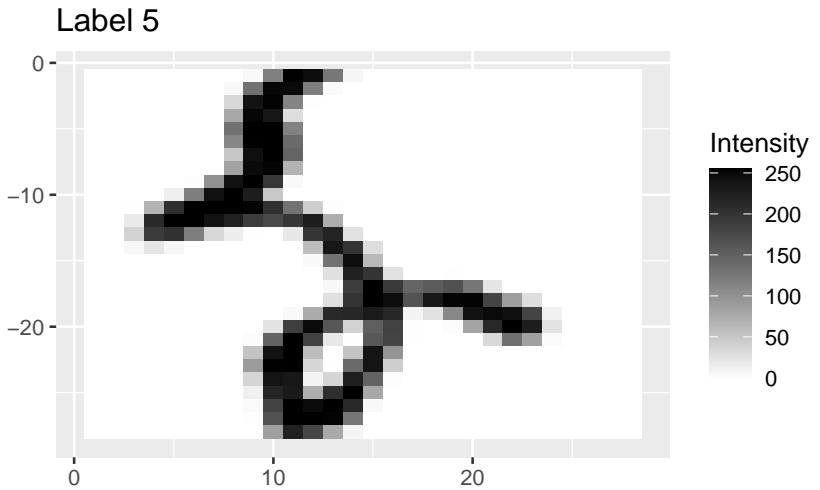
```
train_dl <- dataloader(  
  dataset = train_ds,  
  batch_size = 32,  
  shuffle = TRUE  
)
```

## Exercise 3

```
## [1] 32 784
```

## Exercise 4

-The image corresponds to the character “re.”-



### Exercise 5

```
valid_dl <- dataloader(
  dataset = valid_ds,
  batch_size = 32,
  shuffle = FALSE
)

test_dl <- dataloader(
  dataset = test_ds,
  batch_size = 32,
  shuffle = FALSE
)
```

### Exercise 6

```
net <- nn_module(
  initialize = function() {
    self$fc1 <- nn_linear(28*28, 128)
    self$fc2 <- nn_linear(128, 10)
  },
  forward = function(x) {
    x %>%
      self$fc1() %>%
      nnf_relu() %>%
      self$fc2()
  }
)
```

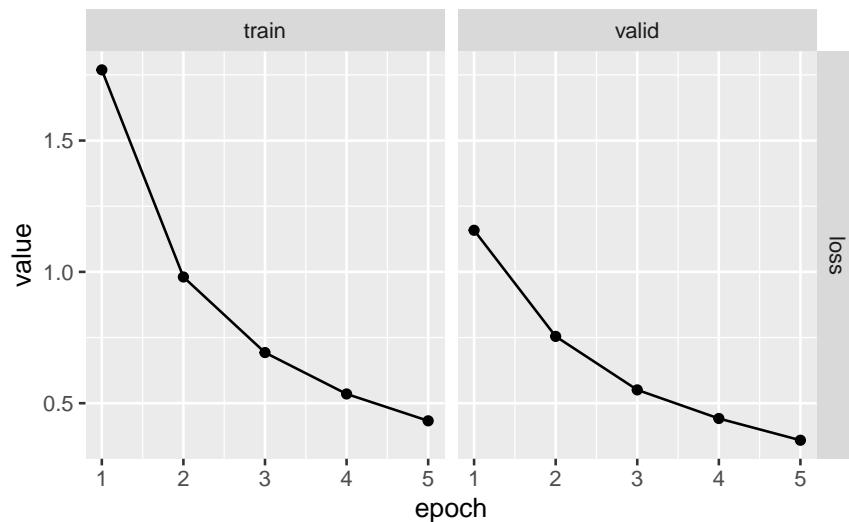
## Exercise 7

```
model1 <- luz::setup(  
  module = net,  
  optimizer = optim_adam,  
  loss = nn_cross_entropy_loss()  
)
```

## Exercise 8

```
## Epoch 1/5  
## Train metrics: Loss: 1.769  
## Valid metrics: Loss: 1.1584  
## Epoch 2/5  
## Train metrics: Loss: 0.9805  
## Valid metrics: Loss: 0.7543  
## Epoch 3/5  
## Train metrics: Loss: 0.6928  
## Valid metrics: Loss: 0.5507  
## Epoch 4/5  
## Train metrics: Loss: 0.5353  
## Valid metrics: Loss: 0.4418  
## Epoch 5/5  
## Train metrics: Loss: 0.433  
## Valid metrics: Loss: 0.359
```

## Exercise 9



-Looking at the graph, you can see a pattern in which the training loss steadily descends as the epoch passes.

-The validation loss also decreases overall or shows a similar trend, The difference from training loss is not significantly widened, so overfitting does not seem severe.

-Overall, it was a form that showed that the model was being learned stably.

## Exercise 10

- The test loss was slightly higher than the training and verification losses. This means that the model does not work well with the new model. This usually occurs because the model sees the training and verification set several times, but the test set is considered completely new. Still, the difference is not significant, so the model does not appear to be severely overfitted.

```
## A 'luz_module_evaluation'  
## -- Results -----  
## loss: 1.2192
```