

# Homework5

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## Homework Assignment 5 (Due: March 17, 2019, midnight EST)

Use the `fashion_mnist` data that comes with Keras to answer the questions below. The `fashion_mnist` dataset has 60,000 training images and 10,000 test images. All images are 28\*28 arrays and are grey scale images. The images are individual articles of clothing labeled as 0-9 as follows: 0: T-shirt/top, 1: Trouser, 2: Pullover, 3: Dress, 4: Coat, 5: Sandal, 6: Shirt, 7: Sneaker, 8: Bag, 9: Ankle boot. You can follow the example from last week to answer questions 1-6.

```
library(keras)
```

1. Load the data into a variable called `fashion`.

```
fashion <- dataset_fashion_mnist()
```

2. Load the `train_images`, `train_labels`, `test_images`, and `test_labels` into appropriate variables.

```
train_images <- fashion$train$x  
train_labels <- fashion$train$y  
test_images <- fashion$test$x  
test_labels <- fashion$test$y
```

3. Build the network with one hidden layer with 512 units, and “relu” activation function.

```
network <- keras_model_sequential() %>%  
  layer_dense(units = 512, activation = "relu", input_shape = c(28 * 28)) %>%  
  layer_dense(units = 10, activation = "softmax")
```

4. Compile the network with “rmsprop” as the optimizer, “categorical\_crossentropy” as the loss function, and “accuracy” as the metric.

```
network %>% compile(  
  optimizer = "rmsprop",  
  loss = "categorical_crossentropy",  
  metrics = c("accuracy")  
)
```

5. Train the network.

Remember that you will have to reshape the images and categorically encode the labels first.

```

train_images_reshaped <- array_reshape(train_images, c(60000, 28 * 28))
train_images_reshaped <- train_images_reshaped / 255

test_images_reshaped <- array_reshape(test_images, c(10000, 28 * 28))
test_images_reshaped <- test_images_reshaped / 255

train_labels_categorical <- to_categorical(train_labels)
test_labels_categorical <- to_categorical(test_labels)

network %>% fit(train_images_reshaped, train_labels_categorical, epochs = 5, batch_size = 128)

```

6. Evaluate the network using the test images.

```

network %>% evaluate(test_images_reshaped, test_labels_categorical)

## $loss
## [1] 0.3661913
##
## $acc
## [1] 0.8674

```

7. How many categories of clothing are there in the test set?

```

dim(test_labels_categorical)[2]

## [1] 10

```

8. What category did the model predict test image 1?

```

class_names = c('T-shirt/top',
                 'Trouser',
                 'Pullover',
                 'Dress',
                 'Coat',
                 'Sandal',
                 'Shirt',
                 'Sneaker',
                 'Bag',
                 'Ankle boot')

img_num <- 1
predictions <- network %>% predict(test_images_reshaped)
predictions[img_num]

## [1] 1.757177e-07

class_num <- apply(predictions, 1, which.max)[img_num]
paste(class_names[class_num])

## [1] "Ankle boot"

```

9. What is the test label for test image 1?

```
paste(class_names[test_labels[1] + 1])
```

```
## [1] "Ankle boot"
```

10. Plot the image for test image #1 and verify the result.

```
plot(as.raster(test_images[1,,], max = 255))
```

