Test Docker

November 14, 2021

This document is a test of Docker. The code is drawn from Section 10.9.1 of ISLR2. Please click `Knit` to verify that you can successfully compile this document.

First let's load some libraries (all of which are packaged in this Docker container).

```
library (ISLR2)      # for Hitters data
library(kableExtra) # for nice tables
library(glmnet)      # for lasso
library(keras)       # for deep learning
library(tidyverse)   # for everything else
```

First let's run the linear model:

```
# ------------------
# test linear model
# ------------------

# create data; sample test observations
Gitters <- na.omit (Hitters)
n <- nrow (Gitters)
set.seed (13)
ntest <- trunc (n / 3)
testid <- sample (1:n, ntest)

# fit linear model and compute prediction error
lfit <- lm(Salary ~ ., data = Gitters[-testid , ])
lpred <- predict (lfit , Gitters[testid , ])
lm_error = with (Gitters[testid , ], mean (abs (lpred - Salary)))
```

Next let's run the lasso:

```
# ------------------
# test glmnet
# ------------------

# load glmnet library for lasso
library (glmnet)

# fit lasso
x <- scale(model.matrix(Salary ~ . - 1, data = Gitters))
y <- Gitters$Salary
cvfit <- cv.glmnet (x[-testid , ], y[-testid],
                        type.measure = "mae")
```

```
# compute prediction error
cpred <- predict (cvfit , x[testid , ], s = "lambda.min")
lasso_error = mean(abs (y[testid] - cpred))
```

Finally we train a neural network:

```
# ------------------
# test keras
# ------------------

# load keras library for deep learning
library (keras)

# define neural network structure
modnn <- keras_model_sequential() %>%
   layer_dense(units = 50, activation = "relu",
                   input_shape = ncol(x)) %>%
   layer_dropout(rate = 0.4) %>%
   layer_dense(units = 1)
```

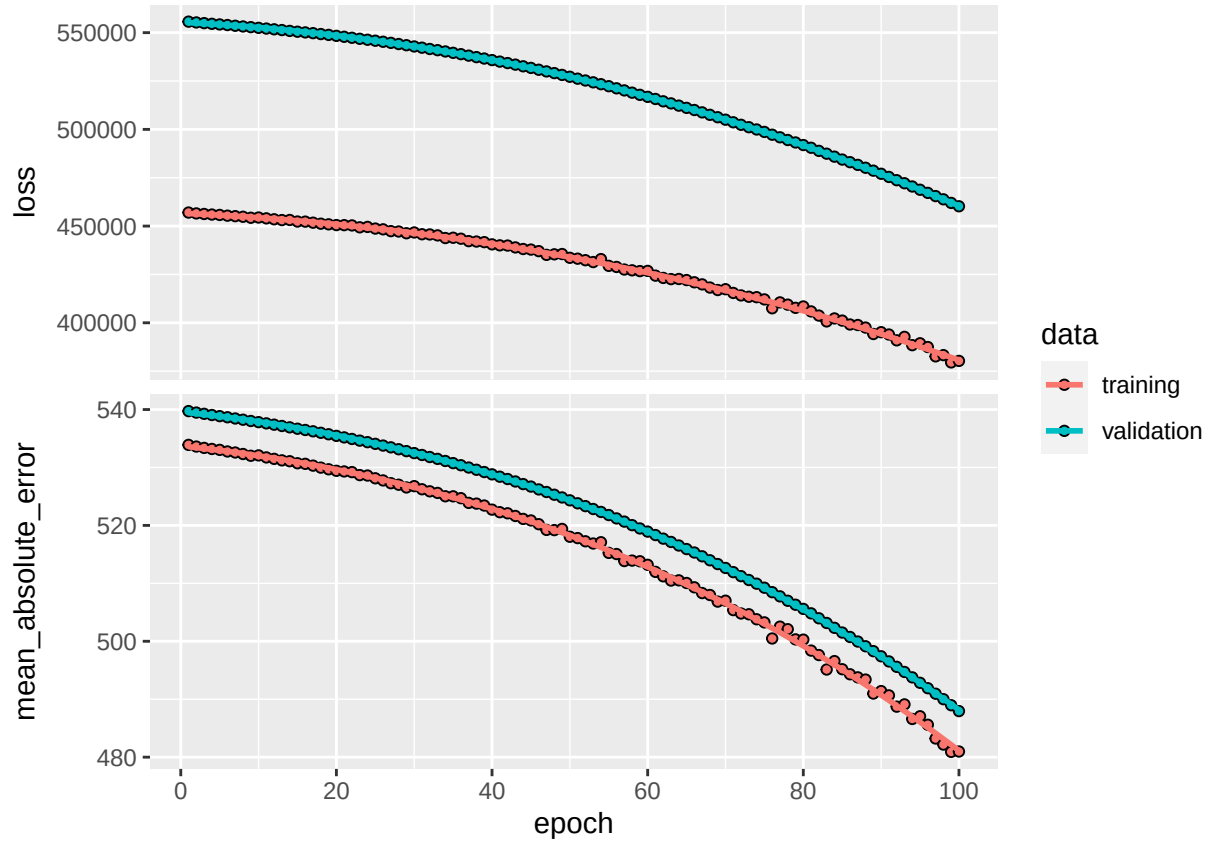
```
## Loaded Tensorflow version 2.7.0
```

```
# compile the model
modnn %>% compile(loss = "mse",
                  optimizer = optimizer_rmsprop(),
                  metrics = list("mean_absolute_error"))

# fit the model
history <- modnn %>% fit(x[-testid, ],
                         y[-testid],
                         epochs = 100,
                         batch_size = 32,
                         validation_data = list(x[testid, ], y[testid]))

# plot training progress
plot(history)
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
# evaluate test error
npred <- predict(modnn, x[testid, ])
deep_learning_error = mean(abs(y[testid] - npred))
```

Let's compare the prediction errors:

```
tibble(Method = c("Linear Model", "Lasso", "Neural Network"),
       `Mean absolute error` = c(lm_error, lasso_error, deep_learning_error)) %>%
   kable(format = "latex", row.names = NA,
                          booktabs = TRUE,
                          digits = 2,
                          caption = "Comparing the test errors of three different
         prediction methods.") %>%
   kable_styling(position = "center") %>%
   kable_styling(latex_options = "HOLD_position")
```

Table 1: Comparing the test errors of three different prediction methods.

Method	Mean absolute error
Linear Model	254.67
Lasso	252.30
Neural Network	487.95

Table 1 shows the three prediction errors. Here the neural network does poorly, but this is a reflection that we did not use enough epochs.