This appendix contains the parameters and results of the tuning done for the nn and cnn models.

# Neural Net tuning

## NN Model 1

### NN Model 1 architecture

nn\_model %>%

layer\_dense(units = 256, activation = 'relu', input\_shape = c(ncols-1)) %>%

layer\_dropout(rate = 0.4) %>%

layer\_dense(units = 128, activation = 'relu') %>%

layer\_dropout(rate = 0.3) %>%

layer\_dense(units = 6, activation = 'softmax')

Layer (type) Output Shape Param #

====================================================================================

dense\_25 (Dense) (None, 256) 2639360

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dropout\_1 (Dropout) (None, 256) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dense\_26 (Dense) (None, 128) 32896

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dropout\_2 (Dropout) (None, 128) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dense\_27 (Dense) (None, 6) 774

====================================================================================

Total params: 2,673,030

Trainable params: 2,673,030

Non-trainable params: 0

### NN Model 1 tuning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Plot ref | Loss function | Optimizer | Epochs | Batch Size | Validation split | Loss | Val\_acc |
| 1.1 | categorical\_crossentropy | rmsprop | 50 | 500 | 20% | 0.4548467 | 0.8474227 |
| 1.2 | categorical\_crossentropy | rmsprop | 50 | 400 | 20% | 0.4958594 | 0.8274914 |
| 1.3 | categorical\_crossentropy | rmsprop | 50 | 32 | 20% | 0.7263632 | 0.7079038 |
| 1.4 | categorical\_crossentropy | Adam | 50 | 400 | 20% | 0.872403 | 0.6054983 |
| 1.5 | categorical\_crossentropy | rmsprop | 50 | 200 | 20% | 0.9134078 | 0.5814433 |
| 1.6 | categorical\_crossentropy | rmsprop | 50 | 100 | 20% | 1.433739 | 0.4068729 |

### NN Model 1 performance

|  |  |
| --- | --- |
| Plot | Result |
| 1.1 |  |
| 1.2 |  |
| 1.3 |  |
| 1.4 |  |
| 1.5 |  |
| 1.6 |  |
|  |  |

# Convolutional Neural Net tuning

## CNN Model 1

### CNN Model 1 architecture

cnn\_model %>%

# embedding layer maps vocab indices into embedding\_dims dimensions

layer\_embedding(max\_features, embedding\_dims, input\_length = maxlen) %>%

# add some dropout

layer\_dropout(0.5) %>%

# convolutional layer

layer\_conv\_1d(

filters = 100,

kernel\_size = 3,

padding = "valid", # "valid" means no padding, as we did it already

activation = "relu",

strides = 2 ) %>%

layer\_global\_max\_pooling\_1d() %>%

layer\_dense(128) %>%

layer\_activation("relu") %>%

layer\_dense(128) %>%

layer\_dropout(0.5) %>%

layer\_activation("relu") %>%

layer\_dense(6) %>% # single unit output layer

layer\_activation("softmax")

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param #

====================================================================================

embedding\_2 (Embedding) (None, 300, 10) 20000

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dropout\_3 (Dropout) (None, 300, 10) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

conv1d\_2 (Conv1D) (None, 149, 100) 3100

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

global\_max\_pooling1d\_2 (GlobalMaxPoo (None, 100) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dense\_4 (Dense) (None, 128) 12928

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

activation\_4 (Activation) (None, 128) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dense\_5 (Dense) (None, 128) 16512

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dropout\_4 (Dropout) (None, 128) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

activation\_5 (Activation) (None, 128) 0

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dense\_6 (Dense) (None, 6) 774

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

activation\_6 (Activation) (None, 6) 0

====================================================================================

Total params: 53,314

Trainable params: 53,314

Non-trainable params: 0

### CNN Model 4 tuning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Plot ref | Loss function | Optimizer | Epochs | Batch Size | Validation split | Loss | Val\_acc |
| 4.1 | categorical\_crossentropy | Nadam | 10 | 400 | 20% | 1.138601 | 0.556694 |
| 4.2 | categorical\_crossentropy | Adam | 10 | 400 | 20% | 1.223028 | 0.5491803 |
| 4.3 | categorical\_crossentropy | Rmsprop | 10 | 400 | 20% | 1.15393 | 0.545765 |
| 4.4 | categorical\_crossentropy | Adamax | 10 | 400 | 20% | 1.318988 | 0.4911202 |
| 4.5 | categorical\_crossentropy | Adadelta | 10 | 400 | 20% | 1.389502 | 0.4487705 |