

## Appendix S3

R source code for the definition and training of the primary model.

```
#####  
#           DEFINE THE MODEL  
#####  
  
TENSOR_input <- layer_input(shape = DIM_MATRIX, name =  
"TENSOR_input")  
VEKTOR_input <- layer_input(shape = DIM_VECTOR, name =  
"VEKTOR_input")  
  
tensor_flat_out <- TENSOR_input %>%  
  layer_conv_2d(filters = 4, kernel_size = c(1, DIM_MATRIX[2]),  
activation = "relu", input_shape = DIM_MATRIX) %>%  
  layer_flatten()  
  
main_output <- layer_concatenate(c(tensor_flat_out, VEKTOR_input))  
%>%  
  layer_dropout(rate = 0.5) %>%  
  layer_dense(units = 512, activation = "relu") %>%  
  layer_dense(units = 256, activation = "relu") %>%  
  layer_dense(units = 128, activation = "relu") %>%  
  layer_dense(units = 1, activation = "sigmoid", name =  
"main_output")  
  
model <- keras_model(  
  inputs = c(TENSOR_input, VEKTOR_input),  
  outputs = c(main_output)  
)  
  
#####  
#   COMPILE THE MODEL  
#####  
  
model %>% compile(  
  loss = "binary_crossentropy",
```

```

optimizer = optimizer_adam(lr = 1e-5),
metrics = c("accuracy",
            "binary_crossentropy",
            tf$keras$metrics$AUC(name="auc")
          )
)
#####
#     TRAIN THE MODEL
# USING HOLDOUT VALIDATION
#####

history <- model %>% fit(

x=list(TRAIN_TENSOR_ATC_ICD_MATCH_KONT_NAIVMM_KANDO_1_5_DIAG_S_ATC_S
_ARVECKA_4D, TRAIN_VEKTOR_DEMOGR_MATCH_KONT_NAIVMM_KANDO_1_5),
  y=FACIT_MM_TRAIN,
  epochs = 300,
  batch_size = 1000,
  validation_data =
list(list(VAL_TENSOR_ATC_ICD_MATCH_KONT_NAIVMM_KANDO_1_5_DIAG_S_ATC_S
_ARVECKA_4D_WEIGHED,
VAL_VEKTOR_DEMOGR_MATCH_KONT_NAIVMM_KANDO_1_5_WEIGHED),
FACIT_MM_VAL_WEIGHED),
  class_weight = list("0"=1,"1"=5),
  callbacks = list(
    callback_csv_logger(filename=paste0(logspath, modelnamebest,
    ".txt"),
                        append=TRUE, separator="\t"),
    callback_model_checkpoint(filepath=paste0(logspath,
modelnamebest,
                                "// epoch : 02d //-// val_auc:.4f //",
    ".h5"),
                                save_best_only=TRUE,
                                monitor="val_auc",
                                mode="max")
  ))

```