SESSION 13 – ASSIGNMENT 13.1 _13.2_13.3 DECISION TREES

Date: 18th Feb 2019

Use the given link below:
https://archive.ics.uci.edu/ml/machine-learning-databases/00304/

Problem- prediction of the number of comments in the upcoming 24 hours on those blogs, the train data was generated from different base times that may temporally overlap. Therefore, if you simply split the train into disjoint partitions, the underlying time intervals may overlap. Therefore, the you should use the provided, temporally disjoint train and test splits to ensure that the evaluation is fair.

ASSIGNMENT NO # 13.1
a. Read the dataset and identify the right features.
b. Clean dataset, impute missing values and perform exploratory data analysis.
c. Visualize the dataset and make inferences from that.
d. Perform any 3 hypothesis tests using columns of your choice, make conclusions.

```
---
title: "Assignment 13.1"
author: "Vineet Bhardwaj"
date: "19 February 2019"
output:
  word_document: default
  html_document: default
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```

```{r}
#setting the Working directory
setwd("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedback")
getwd()

#loading all the required libraries
library(ggplot2)
library(rstan)
```

```r
library(rstanarm)
library(class)
library(png)
library(grid)
library(data.table)
library(foreach)
library(MatrixModels)
library(xgboost)
library(ranger)
library(foreach)
library(e1071)
library(FNN)
library(glmnet)

#combine all files except "blogData_train.csv" into one dataframe

setwd("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedback")
filenames=list.files(full.names=TRUE)
allTest=lapply(filenames,function(i){ read.csv(i, header=FALSE)})
blog.test= do.call(rbind.data.frame, allTest)
View(blog.test)

blog.full <- read.csv('C:/Users/Vineet Bhardwaj/Desktop/BlogFeedback/blogData_train.csv', header = FALSE)

#Writing the combined Test Data into one file
write.csv(blog.test, "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blog.test.csv", row.names = F)

#reading the Test combined Data
blog.test <- read.csv("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blog.test.csv",header=TRUE)
View(blog.test)

#As the data doesnot have headers, after understanding the same from the link
#naming the variables in TRAIN Data
att_names <- c( paste(rep(c("comm_","links_"),each=5),
              c(".tot",".pre.1day",".pre.2day",
                ".post.1day",".pre.vsday"), sep=""))

names(blog.full) <- c( paste(c("avg","sd","min","max","med"),
                 ".",rep(att_names,each=5),sep=""),
              att_names,
              "pubtime", "length",
              paste("bagwords_",1:200,sep=""),
              paste("basetime_",c("Mo","Tu","We","Th","Fr","Sa","Su"),sep=""),
              paste("pubtime_",c("Mo","Tu","We","Th","Fr","Sa","Su"),sep=""),
              "_parents",
              paste(c("min_","max_","avg_"),".comm.parents",sep=""),
              "comm.next24" )
```

```r
#naming the variables in TEST Data
names(blog.test) <- names(blog.full)

# drop continous variables without variation
drop = c(8, 13, 28, 33, 38, 40, 43, 50, 278)
blog.full1 <- blog.full[, !(names(blog.full) %in% drop)]
blog.test1 <- blog.test[, !(names(blog.test) %in% drop)]


# log-transform
blog.full1<-data.table(blog.full1)
blog.full1[, comm.next24 := log(1 + comm.next24)]
blog.test1<-data.table(blog.test1)
blog.test1[, comm.next24 := log(1 + comm.next24)]


#Saving the Train and Test Data
write.csv(blog.test1, "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Test.csv", row.names = F)
write.csv(blog.full1, "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Train.csv", row.names = F)
```
```

The working directory was changed to C:/Users/Vineet Bhardwaj/Desktop/BlogFeedback inside a notebook chunk. The working directory will be reset when the chunk is finished running. Use the knitr root.dir option in the setup chunk to change the working directory for notebook chunks.[1] "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedback"

```r
#reading the Final files after naming the headers
test<- read.csv("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Test.csv",header=TRUE)
train<-read.csv("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Train.csv",header=TRUE)

#checking the headers of both the data
str(train)
str(test)
```
```
'data.frame':   60021 obs. of  281 variables:
 $ avg.comm_.tot       : num  10.63 43.44 1.73 27.23 4.5 ...
 $ sd.comm_.tot        : num  17.88 75.59 3.04 45.97 6.68 ...
 $ min.comm_.tot       : int  1 0 0 0 0 0 0 0 0 ...
 $ max.comm_.tot       : int  259 634 9 371 18 970 191 1065 188 0 ...
 $ med.comm_.tot       : num  5 20 0 14 0.5 28 1 87 7.5 0 ...
 $ avg.comm_.pre.1day  : num  4.018 15.999 0.733 10.784 3 ...
 $ sd.comm_.pre.1day   : num  10.4 44.56 1.53 24.21 4 ...
 $ min.comm_.pre.1day  : int  0 0 0 0 0 0 0 0 0 ...
 $ max.comm_.pre.1day  : int  235 473 5 228 10 725 179 491 174 0 ...
 $ med.comm_.pre.1day  : num  1 2 0 4 0.5 16 0 19.5 1.5 0 ...
 $ avg.comm_.pre.2day  : num  3.817 15.47 0.667 9.998 1.333 ...
 $ sd.comm_.pre.2day   : num  10.3 44.69 1.53 24.4 2.56 ...
 $ min.comm_.pre.2day  : int  0 0 0 0 0 0 0 0 0 ...
 $ max.comm_.pre.2day  : int  235 473 5 228 7 725 179 491 174 0 ...
 $ med.comm_.pre.2day  : num  1 1 0 2 0 3 0 14 1 0 ...
 $ avg.comm_.post.1day : num  9.78 40.97 1.13 22.56 2.83 ...
 $ sd.comm_.post.1day  : num  16.07 70.31 1.82 39.76 3.67 ...
```

```
$ min.comm_.post.1day : int   1 0 0 0 0 0 0 0 0 0 ...
$ max.comm_.post.1day : int   192 479 5 337 8 913 189 786 186 0 ...
$ med.comm_.post.1day : num   5 18 0 10 0.5 26 0 74 5.5 0 ...
$ avg.comm_.pre.vsday : num   0.201 0.5289 0.0667 0.7866 1.6667 ...
$ sd.comm_.pre.vsday  : num   13.95 62.13 1.73 30.36 2.21 ...
$ min.comm_.pre.vsday : int   -229 -461 -5 -156 0 -519 -178 -418 -161 0 ...
$ max.comm_.pre.vsday : int   217 473 4 228 6 725 170 491 174 0 ...
$ med.comm_.pre.vsday : num   0 0 0 0 0.5 2 0 -3 0 0 ...
$ avg.links_.tot      : num   0.252 0.193 0.333 0.11 0 ...
$ sd.links_.tot       : num   0.904 0.458 0.699 0.356 0 ...
$ min.links_.tot      : int   0 0 0 0 0 0 0 0 0 0 ...
$ max.links_.tot      : int   14 2 2 2 0 0 6 0 1 0 ...
$ med.links_.tot      : num   0 0 0 0 0 0 0 0 0 0 ...
$ avg.links_.pre.1day : num   0.0944 0.0733 0.1333 0.0432 0 ...
$ sd.links_.pre.1day  : num   0.507 0.286 0.34 0.215 0 ...
$ min.links_.pre.1day : int   0 0 0 0 0 0 0 0 0 0 ...
$ max.links_.pre.1day : int   12 2 1 2 0 0 5 0 1 0 ...
$ med.links_.pre.1day : num   0 0 0 0 0 0 0 0 0 0 ...
$ avg.links_.pre.2day : num   0.0919 0.0677 0.1333 0.0408 0 ...
$ sd.links_.pre.2day  : num   0.504 0.278 0.34 0.21 0 ...
$ min.links_.pre.2day : int   0 0 0 0 0 0 0 0 0 0 ...
$ max.links_.pre.2day : int   12 2 1 2 0 0 5 0 1 0 ...
$ med.links_.pre.2day : num   0 0 0 0 0 0 0 0 0 0 ...
$ avg.links_.post.1day: num   0.2335 0.1763 0.2 0.0983 0 ...
$ sd.links_.post.1day : num   0.855 0.43 0.4 0.321 0 ...
$ min.links_.post.1day: int   0 0 0 0 0 0 0 0 0 0 ...
$ max.links_.post.1day: int   13 2 1 2 0 0 5 0 1 0 ...
$ med.links_.post.1day: num   0 0 0 0 0 0 0 0 0 0 ...
$ avg.links_.pre.vsday: num   0.00245 0.00564 0 0.0024 0 ...
$ sd.links_.pre.vsday : num   0.675 0.404 0.365 0.29 0 ...
$ min.links_.pre.vsday: int   -10 -2 -1 -2 0 0 -5 0 -1 0 ...
$ max.links_.pre.vsday: int   12 2 1 2 0 0 5 0 1 0 ...
$ med.links_.pre.vsday: num   0 0 0 0 0 0 0 0 0 0 ...
$ comm_.tot           : int   35 21 2 3 0 12 103 61 7 0 ...
$ comm_.pre.1day      : int   35 0 2 3 0 10 0 17 1 0 ...
$ comm_.pre.2day      : int   0 2 0 0 2 103 44 6 0 ...
$ comm_.post.1day     : int   35 21 2 3 0 8 103 46 6 0 ...
$ comm_.pre.vsday     : int   35 -2 2 3 0 8 -103 -27 -5 0 ...
$ links_.tot          : int   0 0 2 0 0 0 5 0 0 0 ...
$ links_.pre.1day     : int   0 0 2 0 0 0 0 0 0 0 ...
$ links_.pre.2day     : int   0 0 0 0 0 0 5 0 0 0 ...
$ links_.post.1day    : int   0 0 2 0 0 0 5 0 0 0 ...
$ links_.pre.vsday    : int   0 0 2 0 0 0 -5 0 0 0 ...
$ pubtime             : int   9 62 13 9 5 27 39 39 53 13 ...
$ length              : int   0 696 8361 2751 187 10314 6933 1961 330 6113 ...
$ bagwords_1          : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_2          : int   0 0 1 0 0 0 1 0 0 0 ...
$ bagwords_3          : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_4          : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_5          : int   0 0 1 0 0 1 1 1 0 1 ...
$ bagwords_6          : int   0 1 1 0 0 1 0 0 0 0 ...
$ bagwords_7          : int   0 0 1 0 0 1 1 1 0 0 ...
$ bagwords_8          : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_9          : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_10         : int   0 0 0 0 0 0 0 1 0 0 ...
$ bagwords_11         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_12         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_13         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_14         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_15         : int   0 0 0 0 0 1 0 0 0 0 ...
$ bagwords_16         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_17         : int   0 0 1 0 0 1 1 0 0 1 ...
$ bagwords_18         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_19         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_20         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_21         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_22         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_23         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_24         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_25         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_26         : int   0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_27         : int   0 0 0 0 0 1 0 0 0 0 ...
```

```
$ bagwords_28        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_29        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_30        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_31        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_32        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_33        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_34        : int  0 0 1 0 0 0 1 0 0 0 ...
$ bagwords_35        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_36        : int  0 0 0 0 0 0 0 0 0 0 ...
$ bagwords_37        : int  0 0 0 0 0 0 0 0 0 0 ...
 [list output truncated]
```

```r
# error measure
mse = function(y_hat, y) {
  mse = mean((y - y_hat)^2)

  return(mse)
}


# create design matrices
train_x = model.Matrix(comm.next24 ~ . - 1, data = train, sparse = F)
train_y = train$comm.next24

test_x = model.Matrix(comm.next24 ~ . - 1, data = test, sparse = F)
test_y = test$comm.next24


train_xgb = xgb.DMatrix(data = as.matrix(train_x), label = train_y)
test_xgb = xgb.DMatrix(data = as.matrix(test_x), label = test_y)


# number of models
n = 5
```

```r
# fit XGBoost
pred_xgb = foreach(i = 1:n, .combine = cbind) %do% {
  mdl_xgb = xgboost(data = train_xgb, nround = 500, nthread = 4, max_depth = 6, eta = 0.025, subsample = 0.7,
gamma = 3)

  return(predict(mdl_xgb, test_xgb))
}

```
```
[1]       train-rmse:1.123186
[2]       train-rmse:1.105701
[3]       train-rmse:1.088757
[4]       train-rmse:1.072397
[5]       train-rmse:1.056423
[6]       train-rmse:1.041183
[7]       train-rmse:1.026381
[8]       train-rmse:1.011974
[9]       train-rmse:0.998238
[10]      train-rmse:0.984913
```

```
[11]     train-rmse:0.972034
[12]     train-rmse:0.959588
[13]     train-rmse:0.947549
[14]     train-rmse:0.935749
[15]     train-rmse:0.924511
[16]     train-rmse:0.913737
[17]     train-rmse:0.903260
[18]     train-rmse:0.893045
[19]     train-rmse:0.883163
[20]     train-rmse:0.873720
[21]     train-rmse:0.864738
[22]     train-rmse:0.856106
[23]     train-rmse:0.847699
[24]     train-rmse:0.839538
[25]     train-rmse:0.831753
[26]     train-rmse:0.824216
[27]     train-rmse:0.816951
[28]     train-rmse:0.809951
[29]     train-rmse:0.803264
[30]     train-rmse:0.796772
[31]     train-rmse:0.790452
[32]     train-rmse:0.784304
[33]     train-rmse:0.778498
[34]     train-rmse:0.772825
[35]     train-rmse:0.767387
[36]     train-rmse:0.762091
[37]     train-rmse:0.757060
[38]     train-rmse:0.752152
[39]     train-rmse:0.747396
[40]     train-rmse:0.742876
[41]     train-rmse:0.738552
[42]     train-rmse:0.734432
[43]     train-rmse:0.730351
[44]     train-rmse:0.726516
[45]     train-rmse:0.722733
[46]     train-rmse:0.719147
[47]     train-rmse:0.715837
[48]     train-rmse:0.712466
[49]     train-rmse:0.709245
[50]     train-rmse:0.706081
[51]     train-rmse:0.703068
[52]     train-rmse:0.700274
[53]     train-rmse:0.697465
[54]     train-rmse:0.694845
[55]     train-rmse:0.692313
[56]     train-rmse:0.689902
[57]     train-rmse:0.687533
[58]     train-rmse:0.685292
[59]     train-rmse:0.683013
[60]     train-rmse:0.680884
[61]     train-rmse:0.678814
[62]     train-rmse:0.676867
[63]     train-rmse:0.674901
[64]     train-rmse:0.673031
[65]     train-rmse:0.671206
[66]     train-rmse:0.669421
[67]     train-rmse:0.667655
[68]     train-rmse:0.665976
[69]     train-rmse:0.664358
[70]     train-rmse:0.662832
[71]     train-rmse:0.661362
[72]     train-rmse:0.659999
[73]     train-rmse:0.658653
[74]     train-rmse:0.657297
[75]     train-rmse:0.655958
[76]     train-rmse:0.654695
[77]     train-rmse:0.653493
[78]     train-rmse:0.652295
[79]     train-rmse:0.651007
[80]     train-rmse:0.649865
[81]     train-rmse:0.648709
[82]     train-rmse:0.647565
```

```
[83]    train-rmse:0.646556
[84]    train-rmse:0.645484
[85]    train-rmse:0.644571
[86]    train-rmse:0.643600
[87]    train-rmse:0.642682
[88]    train-rmse:0.641750
[89]    train-rmse:0.640850
[90]    train-rmse:0.639959
[91]    train-rmse:0.639135
[92]    train-rmse:0.638272
[93]    train-rmse:0.637431
[94]    train-rmse:0.636689
[95]    train-rmse:0.635924
[96]    train-rmse:0.635252
[97]    train-rmse:0.634550
[98]    train-rmse:0.633897
[99]    train-rmse:0.633199
[100]   train-rmse:0.632538
[101]   train-rmse:0.631829
[102]   train-rmse:0.631266
[103]   train-rmse:0.630622
[104]   train-rmse:0.629997
[105]   train-rmse:0.629475
[106]   train-rmse:0.628889
[107]   train-rmse:0.628356
[108]   train-rmse:0.627734
[109]   train-rmse:0.627164
[110]   train-rmse:0.626648
[111]   train-rmse:0.626169
[112]   train-rmse:0.625696
[113]   train-rmse:0.625198
[114]   train-rmse:0.624718
[115]   train-rmse:0.624216
[116]   train-rmse:0.623752
[117]   train-rmse:0.623234
[118]   train-rmse:0.622800
[119]   train-rmse:0.622407
[120]   train-rmse:0.621962
[121]   train-rmse:0.621454
[122]   train-rmse:0.621036
[123]   train-rmse:0.620704
[124]   train-rmse:0.620250
[125]   train-rmse:0.619885
[126]   train-rmse:0.619455
[127]   train-rmse:0.619091
[128]   train-rmse:0.618616
[129]   train-rmse:0.618210
[130]   train-rmse:0.617725
[131]   train-rmse:0.617339
[132]   train-rmse:0.616984
[133]   train-rmse:0.616647
[134]   train-rmse:0.616271
[135]   train-rmse:0.615904
[136]   train-rmse:0.615585
[137]   train-rmse:0.615193
[138]   train-rmse:0.614904
[139]   train-rmse:0.614427
[140]   train-rmse:0.614048
[141]   train-rmse:0.613779
[142]   train-rmse:0.613473
[143]   train-rmse:0.613158
[144]   train-rmse:0.612857
[145]   train-rmse:0.612606
[146]   train-rmse:0.612363
[147]   train-rmse:0.612108
[148]   train-rmse:0.611830
[149]   train-rmse:0.611612
[150]   train-rmse:0.611342
[151]   train-rmse:0.611107
[152]   train-rmse:0.610801
[153]   train-rmse:0.610500
[154]   train-rmse:0.610227
```

```
[155]    train-rmse:0.609939
[156]    train-rmse:0.609673
[157]    train-rmse:0.609422
[158]    train-rmse:0.609165
[159]    train-rmse:0.608900
[160]    train-rmse:0.608735
[161]    train-rmse:0.608487
[162]    train-rmse:0.608289
[163]    train-rmse:0.608003
[164]    train-rmse:0.607756
[165]    train-rmse:0.607487
[166]    train-rmse:0.607277
[167]    train-rmse:0.607079
[168]    train-rmse:0.606868
[169]    train-rmse:0.606667
[170]    train-rmse:0.606455
[171]    train-rmse:0.606213
[172]    train-rmse:0.606045
[173]    train-rmse:0.605836
[174]    train-rmse:0.605702
[175]    train-rmse:0.605472
[176]    train-rmse:0.605217
[177]    train-rmse:0.605000
[178]    train-rmse:0.604759
[179]    train-rmse:0.604552
[180]    train-rmse:0.604378
[181]    train-rmse:0.604196
[182]    train-rmse:0.604068
[183]    train-rmse:0.603831
[184]    train-rmse:0.603575
[185]    train-rmse:0.603410
[186]    train-rmse:0.603263
[187]    train-rmse:0.603046
[188]    train-rmse:0.602781
[189]    train-rmse:0.602585
[190]    train-rmse:0.602439
[191]    train-rmse:0.602267
[192]    train-rmse:0.602131
[193]    train-rmse:0.601958
[194]    train-rmse:0.601855
[195]    train-rmse:0.601521
[196]    train-rmse:0.601285
[197]    train-rmse:0.601147
[198]    train-rmse:0.601033
[199]    train-rmse:0.600834
[200]    train-rmse:0.600683
[201]    train-rmse:0.600503
[202]    train-rmse:0.600357
[203]    train-rmse:0.600203
[204]    train-rmse:0.600114
[205]    train-rmse:0.599935
[206]    train-rmse:0.599675
[207]    train-rmse:0.599521
[208]    train-rmse:0.599329
[209]    train-rmse:0.599196
[210]    train-rmse:0.598996
[211]    train-rmse:0.598787
[212]    train-rmse:0.598580
[213]    train-rmse:0.598393
[214]    train-rmse:0.598150
[215]    train-rmse:0.598033
[216]    train-rmse:0.597907
[217]    train-rmse:0.597793
[218]    train-rmse:0.597713
[219]    train-rmse:0.597607
[220]    train-rmse:0.597500
[221]    train-rmse:0.597395
[222]    train-rmse:0.597238
[223]    train-rmse:0.597067
[224]    train-rmse:0.596923
[225]    train-rmse:0.596770
[226]    train-rmse:0.596611
```

```
[227]    train-rmse:0.596521
[228]    train-rmse:0.596470
[229]    train-rmse:0.596387
[230]    train-rmse:0.596234
[231]    train-rmse:0.596174
[232]    train-rmse:0.596082
[233]    train-rmse:0.595850
[234]    train-rmse:0.595680
[235]    train-rmse:0.595588
[236]    train-rmse:0.595375
[237]    train-rmse:0.595286
[238]    train-rmse:0.595101
[239]    train-rmse:0.594901
[240]    train-rmse:0.594775
[241]    train-rmse:0.594654
[242]    train-rmse:0.594453
[243]    train-rmse:0.594234
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[319]    train-rmse:0.585909
[320]    train-rmse:0.585750
[321]    train-rmse:0.585633
[322]    train-rmse:0.585425
[323]    train-rmse:0.585274
[324]    train-rmse:0.585206
[325]    train-rmse:0.585090
[326]    train-rmse:0.584901
[327]    train-rmse:0.584795
[328]    train-rmse:0.584717
[329]    train-rmse:0.584611
[330]    train-rmse:0.584501
[331]    train-rmse:0.584414
[332]    train-rmse:0.584319
[333]    train-rmse:0.584286
[334]    train-rmse:0.584151
[335]    train-rmse:0.583975
[336]    train-rmse:0.583955
[337]    train-rmse:0.583848
[338]    train-rmse:0.583732
[339]    train-rmse:0.583682
[340]    train-rmse:0.583648
[341]    train-rmse:0.583619
[342]    train-rmse:0.583546
[343]    train-rmse:0.583509
[344]    train-rmse:0.583385
[345]    train-rmse:0.583276
[346]    train-rmse:0.583145
[347]    train-rmse:0.583026
[348]    train-rmse:0.582967
[349]    train-rmse:0.582847
[350]    train-rmse:0.582729
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[352]    train-rmse:0.582531
[353]    train-rmse:0.582509
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[357]    train-rmse:0.581879
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[361]    train-rmse:0.581398
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[368]    train-rmse:0.580667
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[370]    train-rmse:0.580515
[371]    train-rmse:0.580406
[372]    train-rmse:0.580329
[373]    train-rmse:0.580266
[374]    train-rmse:0.580202
[375]    train-rmse:0.580123
[376]    train-rmse:0.580077
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[379]    train-rmse:0.579766
[380]    train-rmse:0.579582
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[383]    train-rmse:0.579261
[384]    train-rmse:0.579193
[385]    train-rmse:0.579123
[386]    train-rmse:0.579053
```

```
[387]    train-rmse:0.579007
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[390]    train-rmse:0.578778
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[393]    train-rmse:0.578508
[394]    train-rmse:0.578449
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[409]    train-rmse:0.577064
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[413]    train-rmse:0.576818
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[415]    train-rmse:0.576577
[416]    train-rmse:0.576454
[417]    train-rmse:0.576385
[418]    train-rmse:0.576327
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[422]    train-rmse:0.576026
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[427]    train-rmse:0.575642
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[446]    train-rmse:0.574173
[447]    train-rmse:0.574116
[448]    train-rmse:0.574041
[449]    train-rmse:0.573907
[450]    train-rmse:0.573830
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[452]    train-rmse:0.573695
[453]    train-rmse:0.573660
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[455]    train-rmse:0.573527
[456]    train-rmse:0.573506
[457]    train-rmse:0.573425
[458]    train-rmse:0.573277
```

```
[459]    train-rmse:0.573205
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[461]    train-rmse:0.573014
[462]    train-rmse:0.572956
[463]    train-rmse:0.572911
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[465]    train-rmse:0.572690
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[468]    train-rmse:0.572342
[469]    train-rmse:0.572220
[470]    train-rmse:0.572163
[471]    train-rmse:0.572155
[472]    train-rmse:0.572082
[473]    train-rmse:0.571992
[474]    train-rmse:0.571893
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[484]    train-rmse:0.571446
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[486]    train-rmse:0.571223
[487]    train-rmse:0.571112
[488]    train-rmse:0.571070
[489]    train-rmse:0.571020
[490]    train-rmse:0.571003
[491]    train-rmse:0.570843
[492]    train-rmse:0.570798
[493]    train-rmse:0.570772
[494]    train-rmse:0.570674
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[496]    train-rmse:0.570512
[497]    train-rmse:0.570416
[498]    train-rmse:0.570368
[499]    train-rmse:0.570193
[500]    train-rmse:0.570069
```

```{r}
# fit random forest
pred_rf = foreach(i = 1:n, .combine = cbind) %do% {
  mdl_rf = ranger(comm.next24 ~ ., data = train, num.trees = 1000, mtry = 120, write.forest = T)
  return(predict(mdl_rf, test)$predictions)
  }
```

```
Growing trees.. Progress: 5%. Estimated remaining time: 10 minutes, 40 seconds.
Growing trees.. Progress: 10%. Estimated remaining time: 9 minutes, 45 seconds.
Growing trees.. Progress: 15%. Estimated remaining time: 8 minutes, 59 seconds.
Growing trees.. Progress: 20%. Estimated remaining time: 8 minutes, 31 seconds.
Growing trees.. Progress: 25%. Estimated remaining time: 8 minutes, 2 seconds.
Growing trees.. Progress: 30%. Estimated remaining time: 7 minutes, 29 seconds.
Growing trees.. Progress: 35%. Estimated remaining time: 6 minutes, 57 seconds.
Growing trees.. Progress: 39%. Estimated remaining time: 6 minutes, 27 seconds.
Growing trees.. Progress: 44%. Estimated remaining time: 5 minutes, 57 seconds.
Growing trees.. Progress: 49%. Estimated remaining time: 5 minutes, 23 seconds.
Growing trees.. Progress: 54%. Estimated remaining time: 4 minutes, 53 seconds.
Growing trees.. Progress: 59%. Estimated remaining time: 4 minutes, 24 seconds.
Growing trees.. Progress: 64%. Estimated remaining time: 3 minutes, 51 seconds.
Growing trees.. Progress: 69%. Estimated remaining time: 3 minutes, 20 seconds.
Growing trees.. Progress: 74%. Estimated remaining time: 2 minutes, 49 seconds.
Growing trees.. Progress: 79%. Estimated remaining time: 2 minutes, 18 seconds.
```

```
Growing trees.. Progress: 83%. Estimated remaining time: 1 minute, 46 seconds.
Growing trees.. Progress: 88%. Estimated remaining time: 1 minute, 14 seconds.
Growing trees.. Progress: 93%. Estimated remaining time: 43 seconds.
Growing trees.. Progress: 98%. Estimated remaining time: 11 seconds.
Growing trees.. Progress: 5%. Estimated remaining time: 10 minutes, 28 seconds.
Growing trees.. Progress: 9%. Estimated remaining time: 9 minutes, 57 seconds.
Growing trees.. Progress: 14%. Estimated remaining time: 9 minutes, 21 seconds.
Growing trees.. Progress: 19%. Estimated remaining time: 8 minutes, 50 seconds.
Growing trees.. Progress: 24%. Estimated remaining time: 8 minutes, 17 seconds.
Growing trees.. Progress: 29%. Estimated remaining time: 7 minutes, 42 seconds.
Growing trees.. Progress: 34%. Estimated remaining time: 7 minutes, 10 seconds.
Growing trees.. Progress: 39%. Estimated remaining time: 6 minutes, 39 seconds.
Growing trees.. Progress: 44%. Estimated remaining time: 6 minutes, 6 seconds.
Growing trees.. Progress: 48%. Estimated remaining time: 5 minutes, 34 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 5 minutes, 4 seconds.
Growing trees.. Progress: 58%. Estimated remaining time: 4 minutes, 32 seconds.
Growing trees.. Progress: 63%. Estimated remaining time: 3 minutes, 57 seconds.
Growing trees.. Progress: 68%. Estimated remaining time: 3 minutes, 25 seconds.
Growing trees.. Progress: 73%. Estimated remaining time: 2 minutes, 54 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 2 minutes, 23 seconds.
Growing trees.. Progress: 83%. Estimated remaining time: 1 minute, 52 seconds.
Growing trees.. Progress: 88%. Estimated remaining time: 1 minute, 18 seconds.
Growing trees.. Progress: 93%. Estimated remaining time: 45 seconds.
Growing trees.. Progress: 98%. Estimated remaining time: 14 seconds.
Growing trees.. Progress: 5%. Estimated remaining time: 10 minutes, 57 seconds.
Growing trees.. Progress: 10%. Estimated remaining time: 9 minutes, 50 seconds.
Growing trees.. Progress: 14%. Estimated remaining time: 9 minutes, 21 seconds.
Growing trees.. Progress: 19%. Estimated remaining time: 8 minutes, 48 seconds.
Growing trees.. Progress: 24%. Estimated remaining time: 8 minutes, 19 seconds.
Growing trees.. Progress: 29%. Estimated remaining time: 7 minutes, 46 seconds.
Growing trees.. Progress: 33%. Estimated remaining time: 7 minutes, 14 seconds.
Growing trees.. Progress: 38%. Estimated remaining time: 6 minutes, 44 seconds.
Growing trees.. Progress: 43%. Estimated remaining time: 6 minutes, 12 seconds.
Growing trees.. Progress: 48%. Estimated remaining time: 5 minutes, 39 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 5 minutes, 8 seconds.
Growing trees.. Progress: 58%. Estimated remaining time: 4 minutes, 35 seconds.
Growing trees.. Progress: 63%. Estimated remaining time: 4 minutes, 4 seconds.
Growing trees.. Progress: 67%. Estimated remaining time: 3 minutes, 33 seconds.
Growing trees.. Progress: 72%. Estimated remaining time: 3 minutes, 1 seconds.
Growing trees.. Progress: 77%. Estimated remaining time: 2 minutes, 29 seconds.
Growing trees.. Progress: 82%. Estimated remaining time: 1 minute, 57 seconds.
Growing trees.. Progress: 87%. Estimated remaining time: 1 minute, 26 seconds.
Growing trees.. Progress: 92%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 97%. Estimated remaining time: 21 seconds.
Growing trees.. Progress: 5%. Estimated remaining time: 10 minutes, 14 seconds.
Growing trees.. Progress: 10%. Estimated remaining time: 9 minutes, 43 seconds.
Growing trees.. Progress: 14%. Estimated remaining time: 9 minutes, 18 seconds.
Growing trees.. Progress: 19%. Estimated remaining time: 8 minutes, 50 seconds.
Growing trees.. Progress: 24%. Estimated remaining time: 8 minutes, 17 seconds.
Growing trees.. Progress: 29%. Estimated remaining time: 7 minutes, 47 seconds.
Growing trees.. Progress: 34%. Estimated remaining time: 7 minutes, 10 seconds.
Growing trees.. Progress: 39%. Estimated remaining time: 6 minutes, 39 seconds.
Growing trees.. Progress: 43%. Estimated remaining time: 6 minutes, 10 seconds.
Growing trees.. Progress: 48%. Estimated remaining time: 5 minutes, 38 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 5 minutes, 7 seconds.
Growing trees.. Progress: 57%. Estimated remaining time: 4 minutes, 37 seconds.
Growing trees.. Progress: 62%. Estimated remaining time: 4 minutes, 7 seconds.
Growing trees.. Progress: 67%. Estimated remaining time: 3 minutes, 34 seconds.
Growing trees.. Progress: 72%. Estimated remaining time: 3 minutes, 4 seconds.
Growing trees.. Progress: 77%. Estimated remaining time: 2 minutes, 31 seconds.
Growing trees.. Progress: 82%. Estimated remaining time: 2 minutes, 1 seconds.
Growing trees.. Progress: 86%. Estimated remaining time: 1 minute, 35 seconds.
Growing trees.. Progress: 90%. Estimated remaining time: 1 minute, 4 seconds.
Growing trees.. Progress: 95%. Estimated remaining time: 33 seconds.
Growing trees.. Progress: 100%. Estimated remaining time: 1 seconds.
Growing trees.. Progress: 5%. Estimated remaining time: 10 minutes, 59 seconds.
Growing trees.. Progress: 10%. Estimated remaining time: 9 minutes, 58 seconds.
Growing trees.. Progress: 15%. Estimated remaining time: 9 minutes, 12 seconds.
Growing trees.. Progress: 20%. Estimated remaining time: 8 minutes, 34 seconds.
Growing trees.. Progress: 25%. Estimated remaining time: 8 minutes, 1 seconds.
Growing trees.. Progress: 30%. Estimated remaining time: 7 minutes, 29 seconds.
Growing trees.. Progress: 35%. Estimated remaining time: 6 minutes, 54 seconds.
```

```
Growing trees.. Progress: 40%. Estimated remaining time: 6 minutes, 24 seconds.
Growing trees.. Progress: 45%. Estimated remaining time: 5 minutes, 48 seconds.
Growing trees.. Progress: 50%. Estimated remaining time: 5 minutes, 17 seconds.
Growing trees.. Progress: 55%. Estimated remaining time: 4 minutes, 44 seconds.
Growing trees.. Progress: 60%. Estimated remaining time: 4 minutes, 13 seconds.
Growing trees.. Progress: 65%. Estimated remaining time: 3 minutes, 40 seconds.
Growing trees.. Progress: 70%. Estimated remaining time: 3 minutes, 8 seconds.
Growing trees.. Progress: 75%. Estimated remaining time: 2 minutes, 35 seconds.
Growing trees.. Progress: 81%. Estimated remaining time: 2 minutes, 2 seconds.
Growing trees.. Progress: 86%. Estimated remaining time: 1 minute, 30 seconds.
Growing trees.. Progress: 91%. Estimated remaining time: 56 seconds.
Growing trees.. Progress: 96%. Estimated remaining time: 26 seconds.
```

```r
# weighted average

weighted_average = mse(rowMeans(pred_rf) * 0.25 + rowMeans(pred_xgb) * 0.75, test_y)
weighted_average

View(pred_rf)
View(pred_xgb)
```
```
[1] 0.2620389
```

```r
### Stacked Generalization ###
#test<- read.csv("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Test.csv",header=TRUE)
#train<-read.csv("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/blogData_Train.csv",header=TRUE)


train<-data.table(train)
test<-data.table(test)

# error measure
mse = function(y_hat, y) {
  mse = mean((y - y_hat)^2)
  return(mse)
 }

# create design matrices
train_y = train$comm.next24
train_y
test_y = test$comm.next24
test_y

test_x = model.Matrix(comm.next24 ~ . - 1, data = test, sparse = F)
test_x_sparse = model.Matrix(comm.next24 ~ . - 1, data = test, sparse = T)
test_xgb = xgb.DMatrix(data = as.matrix(test_x), label = test_y)


# divide training set into k folds
k = 5
```

```
cv_index = 1:nrow(train)
cv_index_split = split(cv_index, cut(seq_along(cv_index), k, labels = FALSE))
```

```
  [1] 0.6931472 0.0000000 0.0000000 0.6931472 3.3322045 0.0000000 0.0000000 3.3322045 2.3025851
2.3025851 0.0000000 0.0000000 1.0986123 0.0000000
 [15] 2.6390573 2.7725887 1.3862944 2.7725887 2.6390573 0.6931472 3.0910425 0.6931472 3.0910425
0.6931472 1.3862944 1.3862944 1.3862944 1.3862944
 [29] 1.0986123 1.0986123 1.7917595 1.7917595 0.0000000 0.0000000 3.0910425 0.0000000 0.0000000
1.3862944 0.0000000 0.0000000 0.0000000 1.0986123
 [43] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 2.7080502 2.5649494 2.0794415 0.0000000 0.0000000
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 [57] 0.0000000 0.0000000 2.0794415 1.3862944 0.6931472 0.6931472 0.6931472 1.0986123 1.0986123
0.0000000 0.0000000 1.7917595 2.8903718 1.7917595
 [71] 0.0000000 1.0986123 0.0000000 0.6931472 0.0000000 0.6931472 2.1972246 0.0000000 0.0000000
3.6109179 0.6931472 1.0986123 2.5649494 2.3025851
 [85] 2.1972246 2.3025851 2.1972246 1.6094379 2.1972246 0.6931472 0.6931472 1.3862944 1.3862944
1.0986123 1.0986123 0.6931472 0.6931472 1.3862944
 [99] 1.3862944 1.0986123 1.0986123 1.3862944 1.3862944 3.2958369 1.0986123 0.6931472 1.7917595
0.6931472 1.3862944 1.0986123 1.3862944 3.2188758
[113] 3.2188758 1.0986123 1.0986123 1.3862944 0.6931472 4.2766661 0.0000000 0.0000000 1.6094379
1.7917595 1.7917595 1.7917595 1.6094379 1.6094379
[127] 1.6094379 1.9459101 1.9459101 1.9459101 3.8286414 3.8286414 2.1972246 2.1972246 0.0000000
0.0000000 1.6094379 1.6094379 2.0794415 0.0000000
[141] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 2.5649494 0.0000000 1.9459101 0.6931472
1.6094379 0.6931472 0.0000000 0.0000000 1.9459101
[155] 0.0000000 1.9459101 1.0986123 1.0986123 2.0794415 2.0794415 1.7917595 1.7917595 1.6094379
1.6094379 0.6931472 0.6931472 0.6931472 0.0000000
[169] 4.3174881 0.0000000 4.3174881 3.0445224 3.0445224 1.7917595 1.7917595 2.9444390 2.9444390
0.6931472 0.6931472 2.1972246 0.0000000 0.0000000
[183] 1.0986123 0.0000000 0.0000000 1.9459101 0.0000000 0.0000000 0.0000000 1.0986123 0.6931472
0.6931472 0.0000000 0.0000000 0.0000000 0.6931472
[197] 0.6931472 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000 3.1780538 2.1972246 1.7917595
[211] 1.6094379 1.6094379 1.6094379 1.6094379 0.0000000 1.3862944 0.0000000 1.3862944 1.6094379
1.6094379 3.8712010 3.8712010 0.6931472 3.8712010
[225] 0.6931472 1.6094379 0.6931472 0.6931472 1.6094379 4.3694479 4.3694479 4.3694479 0.6931472
0.0000000 0.0000000 0.0000000 0.0000000 2.3025851
[239] 2.3025851 2.3025851 0.0000000 0.0000000 0.0000000 1.3862944 1.3862944 1.3862944 0.6931472
0.6931472 0.6931472 0.6931472 1.3862944 0.0000000
[253] 0.0000000 1.3862944 1.3862944 0.6931472 0.6931472 0.6931472 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000 0.0000000 2.0794415 2.0794415
[267] 2.0794415 1.6094379 1.6094379 1.6094379 2.0794415 2.0794415 2.0794415 1.3862944 1.3862944
0.6931472 0.6931472 2.5649494 0.0000000 0.0000000
[281] 2.5649494 1.9459101 1.9459101 1.6094379 1.6094379 1.9459101 1.9459101 1.9459101 0.6931472
0.6931472 0.6931472 1.3862944 1.3862944 1.3862944
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2.4849066 2.4849066 1.3862944 1.3862944 1.3862944
[309] 1.0986123 1.0986123 0.0000000 0.0000000 0.0000000 1.0986123 1.0986123 1.3862944 1.3862944
0.6931472 0.6931472 0.0000000 0.0000000 2.3025851
[323] 2.3025851 2.3025851 2.0794415 2.0794415 2.3025851 1.0986123 3.6109179 3.6109179 1.0986123
1.0986123 1.0986123 2.3978953 2.1972246 1.0986123
[337] 2.1972246 0.0000000 1.0986123 0.0000000 0.0000000 1.0986123 1.0986123 2.3025851 2.3025851 2.1972246
2.0794415 2.0794415 2.1972246 0.0000000 1.7917595
[351] 1.7917595 0.0000000 0.0000000 0.6931472 0.6931472 0.0000000 0.0000000 0.6931472 0.0000000
1.3862944 0.0000000 1.3862944 0.6931472 4.0253517
[365] 4.0253517 2.7080502 2.7080502 0.0000000 0.0000000 2.1972246 1.6094379 0.6931472 2.4849066
1.0986123 0.0000000 1.6094379 1.0986123 0.6931472
[379] 1.0986123 1.0986123 0.0000000 0.0000000 0.0000000 0.0000000 2.3978953 2.3978953 2.3978953
2.3978953 2.9957323 1.7917595 2.9957323 2.7725887
[393] 1.7917595 2.7725887 2.7725887 1.3862944 1.6094379 1.6094379 1.9459101 1.3862944 1.3862944
1.3862944 1.3862944 1.9459101 1.3862944 0.6931472
[407] 2.1972246 2.1972246 2.3978953 0.6931472 0.0000000 0.0000000 0.0000000 2.3978953 0.6931472
0.0000000 1.6094379 0.0000000 1.6094379 0.0000000
[421] 1.7917595 1.3862944 2.3978953 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
1.0986123 1.0986123 2.1972246 2.9957323 2.1972246
[435] 2.9957323 0.6931472 1.6094379 0.6931472 1.6094379 2.3025851 2.3025851 0.0000000 0.0000000
1.9459101 1.9459101 0.6931472 0.6931472 0.6931472
[449] 0.6931472 1.0986123 1.0986123 1.3862944 1.3862944 4.0943446 4.0943446 0.0000000 0.0000000
2.9444390 2.9444390 1.6094379 0.0000000 0.0000000
```

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  [463] 1.6094379 2.0794415 1.9459101 1.9459101 1.6094379 2.0794415 0.0000000 0.0000000 1.6094379
1.7917595 1.3862944 1.7917595 1.3862944 1.9459101
  [477] 1.9459101 4.8283137 4.8283137 4.8283137 4.8283137 4.0253517 4.0253517 4.0253517 4.0253517
3.0910425 3.0910425 3.0910425 3.0910425 2.3025851
  [491] 2.3025851 0.6931472 0.6931472 0.6931472 0.6931472 3.4657359 3.4657359 2.0794415 2.0794415
1.3862944 1.3862944 1.0986123 1.0986123 0.0000000
  [505] 0.0000000 2.1972246 2.1972246 1.6094379 1.6094379 1.6094379 2.3025851 2.3025851 2.3025851
1.3862944 1.3862944 1.3862944 0.0000000 0.0000000
  [519] 0.0000000 0.0000000 2.1972246 2.1972246 0.0000000 2.1972246 0.0000000 0.0000000 0.0000000
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  [561] 0.6931472 0.0000000 1.7917595 1.0986123 2.1972246 2.7725887 2.3025851 0.6931472 0.6931472
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  [463] 2.6390573 0.0000000 0.0000000 0.0000000 0.6931472 0.0000000 0.0000000 0.6931472 0.0000000
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  [645] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
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  [743] 3.1354942 0.0000000 0.0000000 1.7917595 0.0000000 2.0794415 1.3862944 0.0000000 0.0000000
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  [771] 3.7612001 0.6931472 0.0000000 0.0000000 0.0000000 0.6931472 3.6888795 0.0000000 0.0000000
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  [939] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
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  [953] 0.0000000 0.0000000 0.0000000 0.0000000 0.6931472 0.0000000 0.0000000 0.0000000 0.0000000
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[967] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.6931472 0.0000000
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[981] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 3.2580965 0.0000000 4.7874917
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[995] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 2.0794415
[ reached getOption("max.print") -- omitted 59021 entries ]
```

```{r}
# meta features from kNN
library(Matrix)
meta_knn_test = rep(0, nrow(test))
meta_knn_train = foreach(i = 1:k, .combine = c) %do% {
  # split the raining set into two disjoint sets
  train_index = setdiff(1:nrow(train), cv_index_split[[i]])
  train_set1 = model.Matrix(comm.next24 ~ . - 1, data = train[train_index], sparse = T)
  train_set2 = model.Matrix(comm.next24 ~ . - 1, data = train[cv_index_split[[i]]], sparse = T)
    # level 0 prediction
  meta_pred = knn.reg(train_set1, train_set2, train[train_index]$comm.next24, k = 19)$pred
  meta_knn_test = meta_knn_test + knn.reg(train_set1, test_x_sparse, train[train_index]$comm.next24, k =
19)$pred / k
    return(meta_pred)
  }
```

```{r}
# meta features from LASSO
meta_glm_test = rep(0, nrow(test))
meta_glm_train = foreach(i = 1:k, .combine = c) %do% {
  # split the raining set into two disjoint sets
  train_index = setdiff(1:nrow(train), cv_index_split[[i]])
  train_set1 = model.Matrix(comm.next24 ~ . - 1, data = train[train_index], sparse = T)
  train_set2 = model.Matrix(comm.next24 ~ . - 1, data = train[cv_index_split[[i]]], sparse = T)
  # level 0 prediction
  temp_glm = cv.glmnet(train_set1, train[train_index]$comm.next24, family = "gaussian", alpha = 1)
  meta_pred = predict(temp_glm, newx = train_set2)
  meta_glm_test = meta_glm_test + predict(temp_glm, newx = test_x_sparse) / k
  return(meta_pred)
  }

```

```{r}
# meta features from SVM
meta_svm_test = rep(0, nrow(test))
meta_svm_train = foreach(i = 1:k, .combine = c) %do% {
  # split the raining set into two disjoint sets
  train_index = setdiff(1:nrow(train), cv_index_split[[i]])
  train_set1 = train[train_index]
  train_set2 = train[cv_index_split[[i]]]
    # level 0 prediction
```

```{r}
  temp_svm = svm(comm.next24 ~ comm_.pre.1day + comm_.pre.vsday + pubtime + comm_.tot +
comm_.post.1day + avg.comm_.pre.vsday +
          avg.comm_.pre.1day + med.comm_.pre.1day, data = train_set1,
        kernel = "radial", cost = 2, gamma = 0.25)
  meta_pred = predict(temp_svm, train_set2)
  meta_svm_test = meta_svm_test + predict(temp_svm, test) / k
  return(meta_pred)
  }
```

```{r}
# meta features from random forest
meta_rf_test = rep(0, nrow(test))
meta_rf_train = foreach(i = 1:k, .combine = c) %do% {
  # split the raining set into two disjoint sets
  train_index = setdiff(1:nrow(train), cv_index_split[[i]])
  train_set1 = train[train_index]
  train_set2 = train[cv_index_split[[i]]]
  # level 0 prediction
  temp_rf = ranger(comm.next24 ~ ., data = train_set1, num.trees = 500, mtry = 120, write.forest = T)
  meta_pred = predict(temp_rf, train_set2)$predictions
  meta_rf_test = meta_rf_test + predict(temp_rf, test)$predictions / k
  return(meta_pred)
  }
```

```
Growing trees.. Progress: 12%. Estimated remaining time: 3 minutes, 51 seconds.
Growing trees.. Progress: 24%. Estimated remaining time: 3 minutes, 16 seconds.
Growing trees.. Progress: 36%. Estimated remaining time: 2 minutes, 42 seconds.
Growing trees.. Progress: 49%. Estimated remaining time: 2 minutes, 11 seconds.
Growing trees.. Progress: 62%. Estimated remaining time: 1 minute, 34 seconds.
Growing trees.. Progress: 76%. Estimated remaining time: 1 minute, 0 seconds.
Growing trees.. Progress: 89%. Estimated remaining time: 27 seconds.
Growing trees.. Progress: 13%. Estimated remaining time: 3 minutes, 40 seconds.
Growing trees.. Progress: 27%. Estimated remaining time: 2 minutes, 51 seconds.
Growing trees.. Progress: 40%. Estimated remaining time: 2 minutes, 24 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 1 minute, 52 seconds.
Growing trees.. Progress: 66%. Estimated remaining time: 1 minute, 21 seconds.
Growing trees.. Progress: 79%. Estimated remaining time: 50 seconds.
Growing trees.. Progress: 93%. Estimated remaining time: 16 seconds.
Growing trees.. Progress: 13%. Estimated remaining time: 3 minutes, 40 seconds.
Growing trees.. Progress: 27%. Estimated remaining time: 2 minutes, 54 seconds.
Growing trees.. Progress: 42%. Estimated remaining time: 2 minutes, 16 seconds.
Growing trees.. Progress: 55%. Estimated remaining time: 1 minute, 46 seconds.
Growing trees.. Progress: 68%. Estimated remaining time: 1 minute, 15 seconds.
Growing trees.. Progress: 82%. Estimated remaining time: 42 seconds.
Growing trees.. Progress: 95%. Estimated remaining time: 11 seconds.
Growing trees.. Progress: 12%. Estimated remaining time: 3 minutes, 47 seconds.
Growing trees.. Progress: 25%. Estimated remaining time: 3 minutes, 4 seconds.
Growing trees.. Progress: 37%. Estimated remaining time: 2 minutes, 41 seconds.
Growing trees.. Progress: 49%. Estimated remaining time: 2 minutes, 12 seconds.
Growing trees.. Progress: 61%. Estimated remaining time: 1 minute, 38 seconds.
Growing trees.. Progress: 74%. Estimated remaining time: 1 minute, 5 seconds.
Growing trees.. Progress: 88%. Estimated remaining time: 30 seconds.
Growing trees.. Progress: 13%. Estimated remaining time: 3 minutes, 31 seconds.
Growing trees.. Progress: 26%. Estimated remaining time: 3 minutes, 1 seconds.
Growing trees.. Progress: 39%. Estimated remaining time: 2 minutes, 27 seconds.
Growing trees.. Progress: 52%. Estimated remaining time: 1 minute, 55 seconds.
Growing trees.. Progress: 65%. Estimated remaining time: 1 minute, 23 seconds.
Growing trees.. Progress: 79%. Estimated remaining time: 51 seconds.
Growing trees.. Progress: 92%. Estimated remaining time: 19 seconds.
```

```{r}
# meta features from XGBoost
meta_xgb_test = rep(0, nrow(test))
meta_xgb_train = foreach(i = 1:k, .combine = c) %do% {
 # split the raining set into two disjoint sets
 train_index = setdiff(1:nrow(train), cv_index_split[[i]])
 train_set1 = model.Matrix(comm.next24 ~ . - 1, data = train[train_index], sparse = F)
 train_set2 = model.Matrix(comm.next24 ~ . - 1, data = train[cv_index_split[[i]]], sparse = F)
 # xgb data
 train_set1_xgb = xgb.DMatrix(data = as.matrix(train_set1), label = train[train_index]$comm.next24)
 train_set2_xgb = xgb.DMatrix(data = as.matrix(train_set2), label = train[cv_index_split[[i]]]$comm.next24)
 # level 0 prediction
 temp_xgb = xgboost(data = train_set1_xgb, nround = 500, nthread = 4, max_depth = 6, eta = 0.025, subsample =
0.7, gamma = 3)
 meta_pred = predict(temp_xgb, train_set2_xgb)
 meta_xgb_test = meta_xgb_test + predict(temp_xgb, test_xgb) / k
 return(meta_pred)
 }
```

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[489]    train-rmse:0.579027
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[499]    train-rmse:0.578039
[500]    train-rmse:0.577873
```

```{r}
# combine meta features
sg_col = c("meta_knn", "meta_glm", "meta_svm", "meta_rf", "meta_xgb", "y")
sg_col

train_y = train$comm.next24
test_y = test$comm.next24

train_sg = data.frame(meta_knn_train, meta_glm_train, meta_svm_train, meta_rf_train, meta_xgb_train, train_y)
test_sg = data.frame(meta_knn_test, meta_glm_test, meta_svm_test, meta_rf_test, meta_xgb_test, test_y)

colnames(train_sg) = sg_col
colnames(test_sg) = sg_col

View(test_sg)
View(train_sg)

write.csv(train_sg, "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/train_sg.csv", row.names = F)
write.csv(test_sg, "C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew/test_sg.csv", row.names = F)
```

```
[1] "meta_knn" "meta_glm" "meta_svm" "meta_rf"  "meta_xgb" "y"
```

```{r}
# ensemble with elastic-net regression
train_sg_sparse = model.Matrix(y ~ . - 1, data = train_sg, sparse = T)
View(train_sg_sparse)
test_sg_sparse = model.Matrix(y ~ . - 1, data = test_sg, sparse = T)
mdl_glm = cv.glmnet(train_sg_sparse, train_y, family = "gaussian", alpha = 0.2)
summary(mdl_glm)
pred_glm = predict(mdl_glm, newx = test_sg_sparse, s = "lambda.min")
mse(pred_glm, test_y)
```

```
            Length Class  Mode
lambda      85     -none- numeric
cvm         85     -none- numeric
cvsd        85     -none- numeric
cvup        85     -none- numeric
cvlo        85     -none- numeric
nzero       85     -none- numeric
name         1     -none- character
glmnet.fit  12     elnet  list
lambda.min   1     -none- numeric
```

```
lambda.1se  1     -none- numeric
[1] 0.3277673
```

Basic testing model Model	Error
k-NN	0.638315
LASSO	0.635483
SVM	0.445464
Random Forest	0.396741
Boosting	0.382399

Weighted Average Model	Error
Best RF	0.396415
Best BST	0.382642
Mean RF	0.396803
Mean BST	0.382934
Best RF + BST	0.380572
Mean RF + BST	0.381167

Stacked Generalization
1. **Split the training dataset in to k folds.**
2. **For i-th fold of training data, train models with each of the level-0 learners on the rest of the training data.**
3. **Make predictions using the models we trained:**
   a. **make predictions on i-th fold of data.**
   b. **make predictions on the test set.**
4. **Repeat 2. and 3. until we used all k folds of training data.**
5. **Generate the level-1 data using predictions we obtained:**
   a. **generate level-1 training data by concatenating the predictions we made on each fold of the training data.**
   b. **generate level-1 test data by averaging the predictions we made on the test set.**
6. **Train a level-1 generalizer using the level-1 data and the correct responses, make predictions.**

Model	Error
LV-1 k-NN	0.631110
LV-1 LASSO	0.624957
LV-1 SVM	0.443895
LV-1 RF	0.393018
LV-1 BST	0.379804
Stacked	0.382274

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```{r cars}
summary(cars)
```

Including Plots

You can also embed plots, for example:

```{r pressure, echo=FALSE}
plot(pressure)
```

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.