SESSION 13 – ASSIGNMENT 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 # 13.2

a. Create a linear regression model to predict the number of comments in the next 24 hours (relative to base time).
b. Fine tune the model and represent important features Visualize the dataset and make inferences from that.
c. Interpret the summary of the linear model.
d. Report the test accuracy vs. the training accuracy

ASSIGNMENT NO # 13.3

a. Interpret the final model coefficients.
b. Plot the model result and compare it with assumptions of the model.

```
---
title: "Assignment No 13.2 and 13.3"
author: "Vineet Bhardwaj"
date: "19 February 2019"
output:
  pdf_document: default
  html_document: default
  word_document: default
---

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

```{r}
```
```

#ASSIGNMENT NO # 13.2
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#b. Fine tune the model and represent important features Visualize the dataset and make inferences from that.
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#ASSIGNMENT NO # 13.3
#a. a. Interpret the final model coefficients.
#b. Plot the model result and compare it with assumptions of the model

#setting the Working directory
setwd("C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew")

#loading all the required libraries
library(ISLR)
library(tidyverse)
library(tidyr)

train_sg<- read.csv('train_sg.csv', header = TRUE)
test_sg<- read.csv('test_sg.csv', header = TRUE)

View(train_sg)
View(test_sg)
str(train_sg)

write.csv(train_sg,'train_sg2.csv')
write.csv(test_sg,'test_sg2.csv')
```
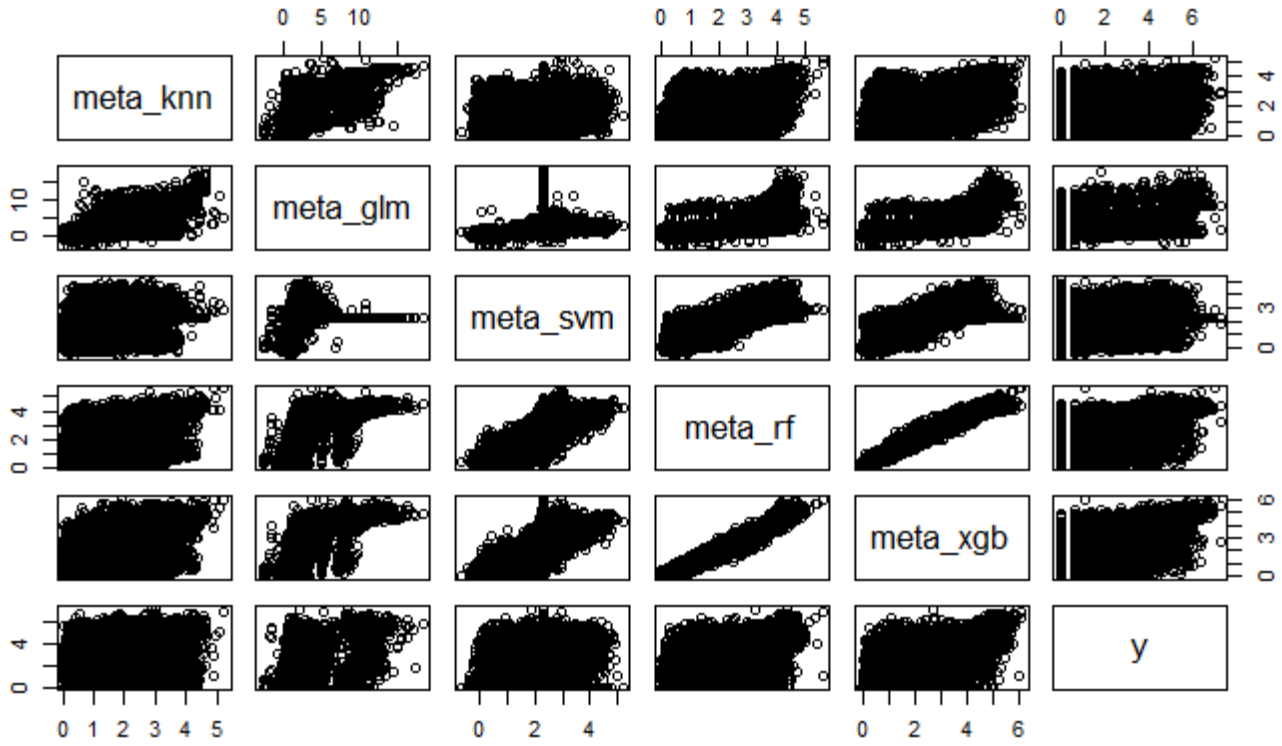
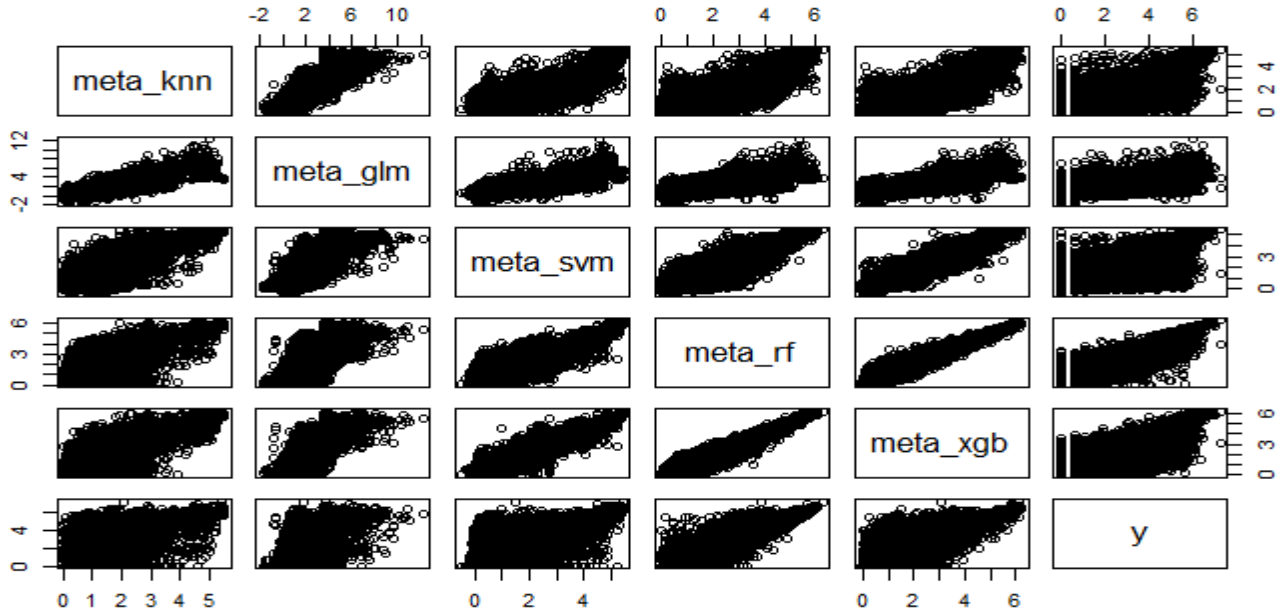
The working directory was changed to C:/Users/Vineet Bhardwaj/Desktop/BlogFeedbackNew inside a notebook chunk. The working directory will be reset when the chunk is finished running. Use the knitr root.dir option in the setup chunk to change the working directory for notebook chunks.--
Attaching packages ---------------------------------------- tidyverse 1.2.1 --
v tibble  1.4.2     v purrr   0.2.5
v tidyr   0.8.2     v dplyr   0.7.8
v readr   1.3.1     v stringr 1.3.1
v tibble  1.4.2     v forcats 0.3.0
-- Conflicts ------------------------------------------- tidyverse_conflicts() --
x purrr::accumulate() masks foreach::accumulate()
x dplyr::between()    masks data.table::between()
x tidyr::expand()     masks Matrix::expand()
x tidyr::extract()    masks rstan::extract()
x dplyr::filter()     masks stats::filter()
x dplyr::first()      masks data.table::first()
x dplyr::lag()        masks stats::lag()
x dplyr::last()       masks data.table::last()
x dplyr::slice()      masks xgboost::slice()
x purrr::transpose()  masks data.table::transpose()
x purrr::when()       masks foreach::when()
'data.frame':    52397 obs. of  6 variables:
 $ meta_knn: num  0.814 0.781 0.781 0.814 0.781 ...
 $ meta_glm: num  0.798 0.513 0.513 0.798 0.48 ...
 $ meta_svm: num  1.024 0.308 0.308 1.024 0.245 ...
 $ meta_rf : num  0.926 0.342 0.342 0.926 0.23 ...
 $ meta_xgb: num  1.019 0.473 0.473 1.019 0.268 ...
 $ y

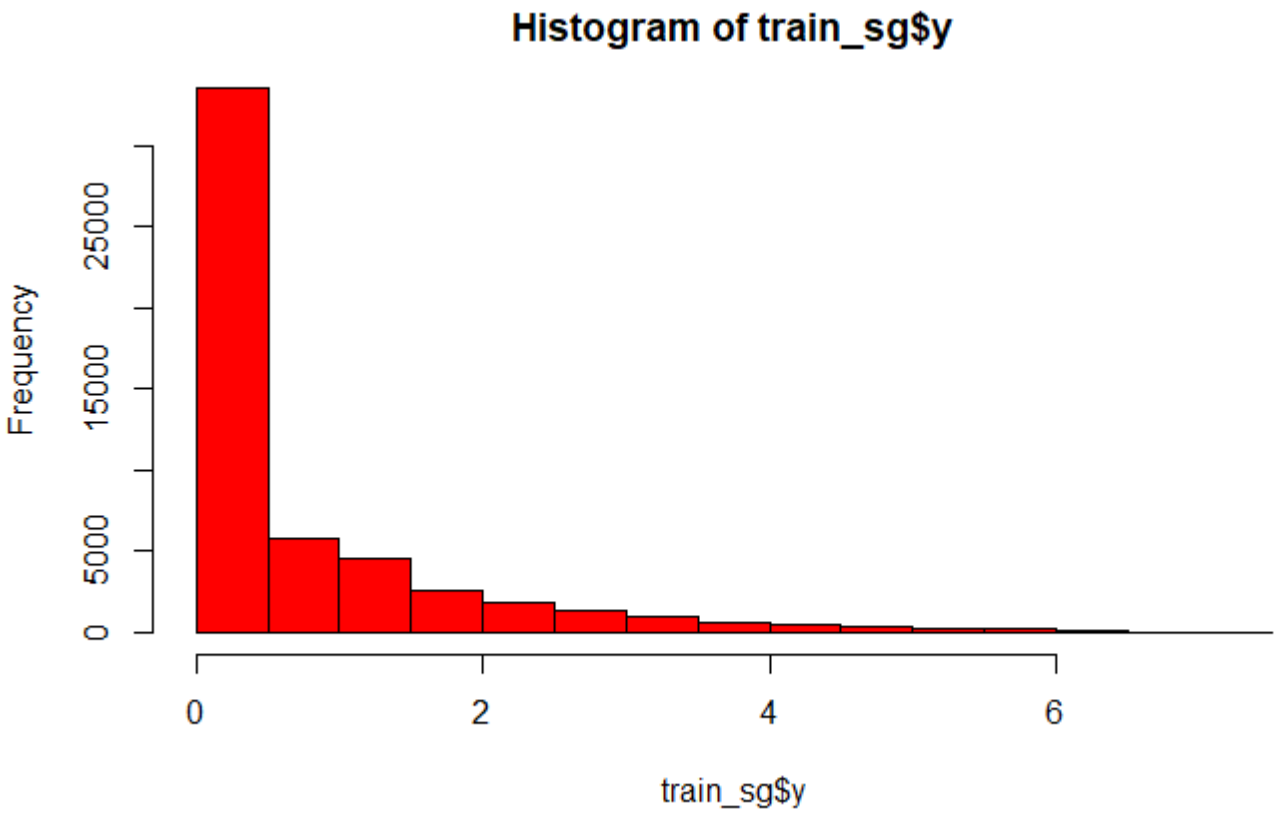
```{r}

pairs(train_sg)
```



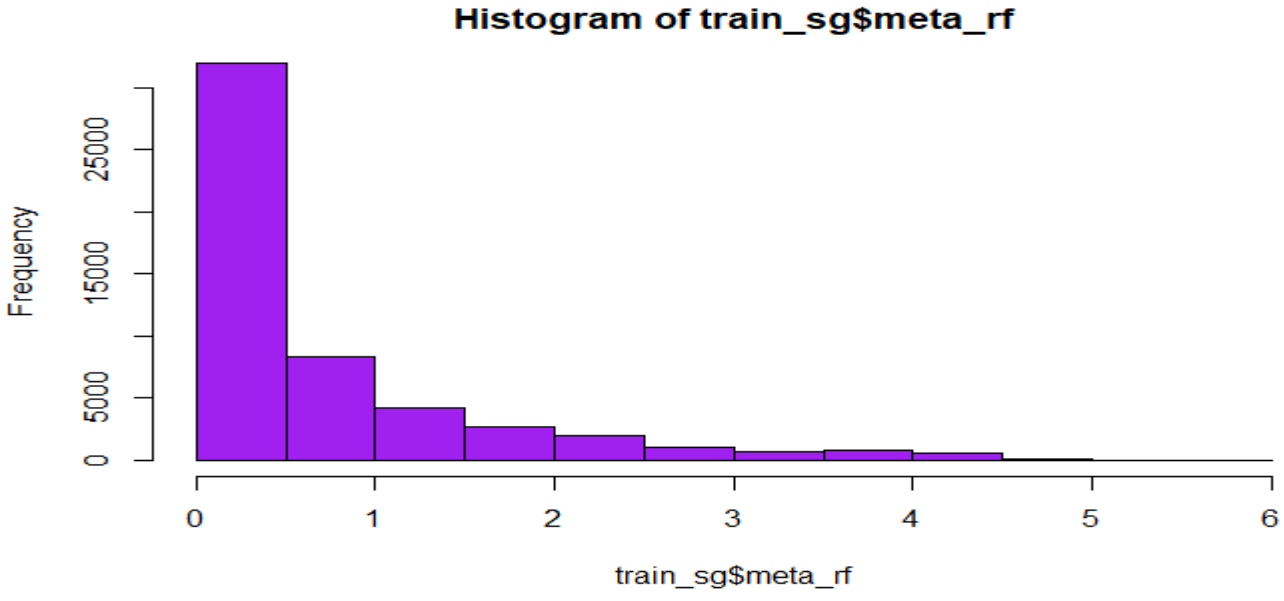

```{r}
pairs(test_sg)
```




```{r}
hist(train_sg$y,col='red')
```
```

```



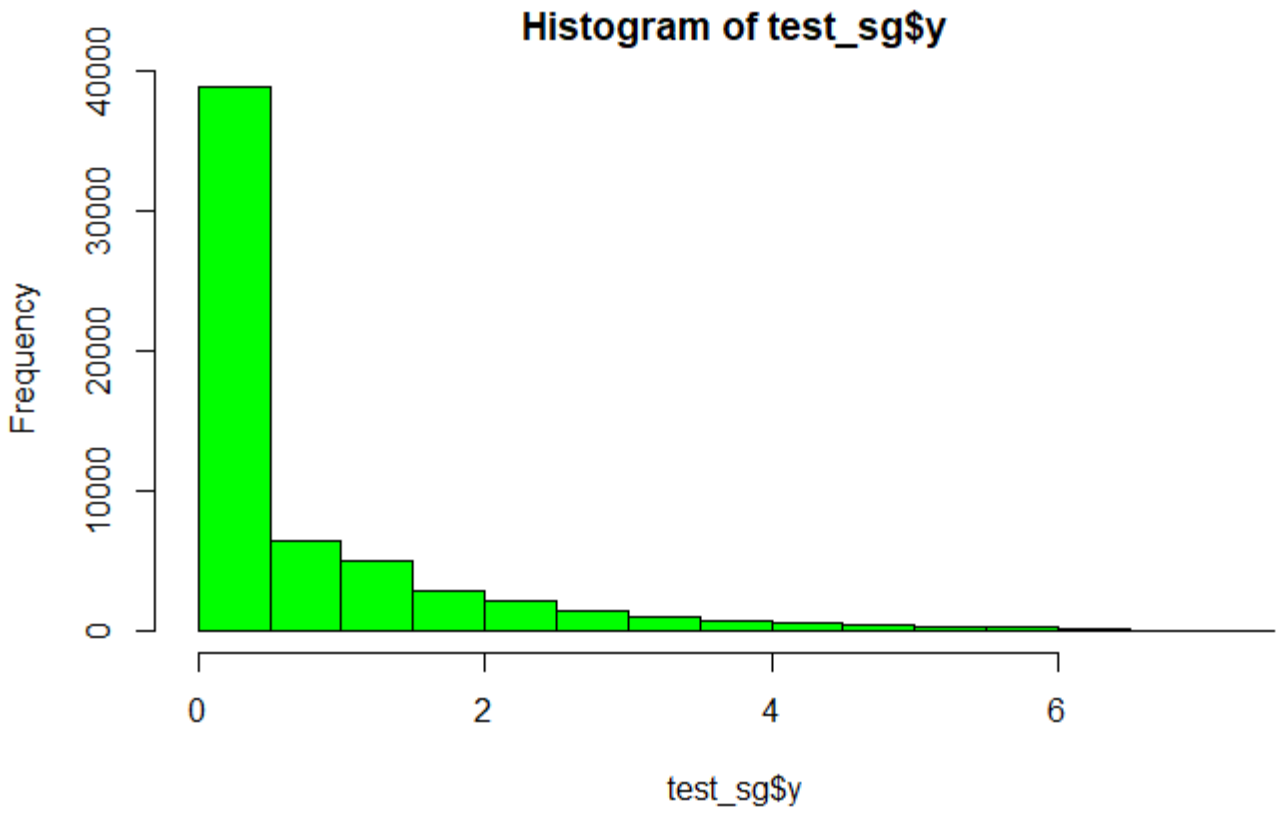

```{r}
hist(train_sg$meta_rf,col="purple")
```



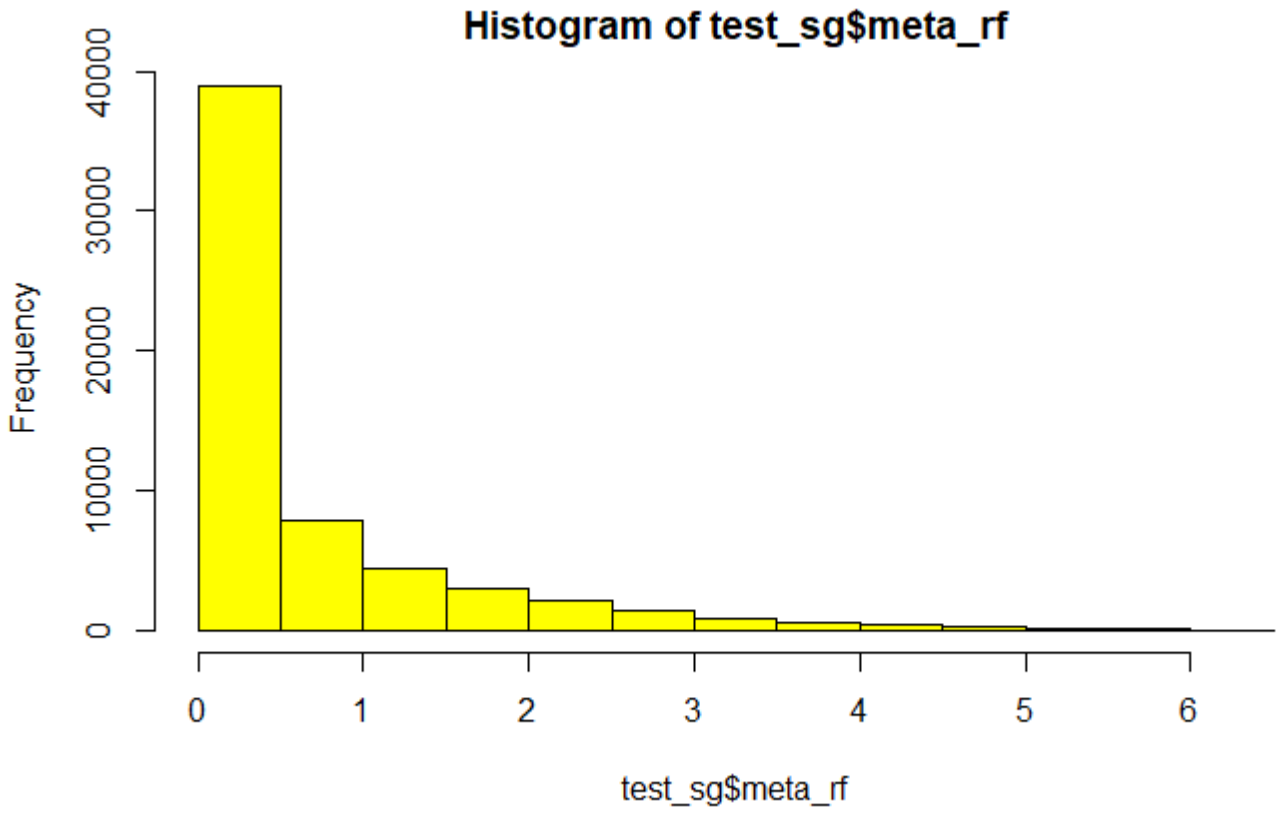

```{r}
library(tree)
tree.train_sg<-tree(meta_knn~.-meta_rf,train_sg)
summary(tree.train_sg)
```
```

Regression tree:
tree(formula = meta_knn ~ . - meta_rf, data = train_sg)
Variables actually used in tree construction:
[1] "meta_glm" "meta_xgb"
Number of terminal nodes: 6
Residual mean deviance: 0.2537 = 13290 / 52390
Distribution of residuals:
    Min. 1st Qu.   Median   Mean 3rd Qu.   Max.
-2.67600 -0.28190 -0.08136 0.00000 0.15870 3.49200

```{r}
hist(test_sg$y,col='green')
```



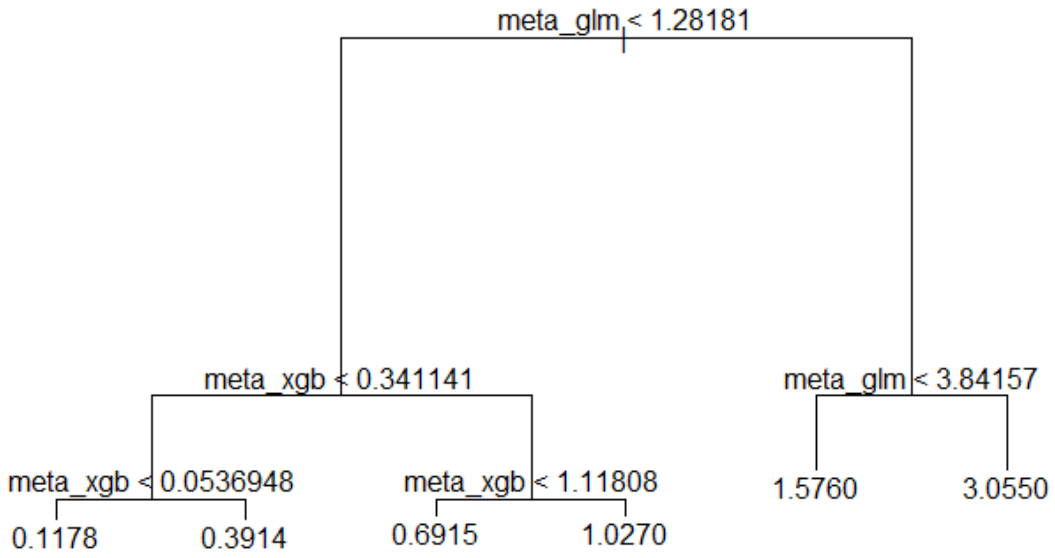

```{r}
hist(test_sg$meta_rf,col="yellow")
```



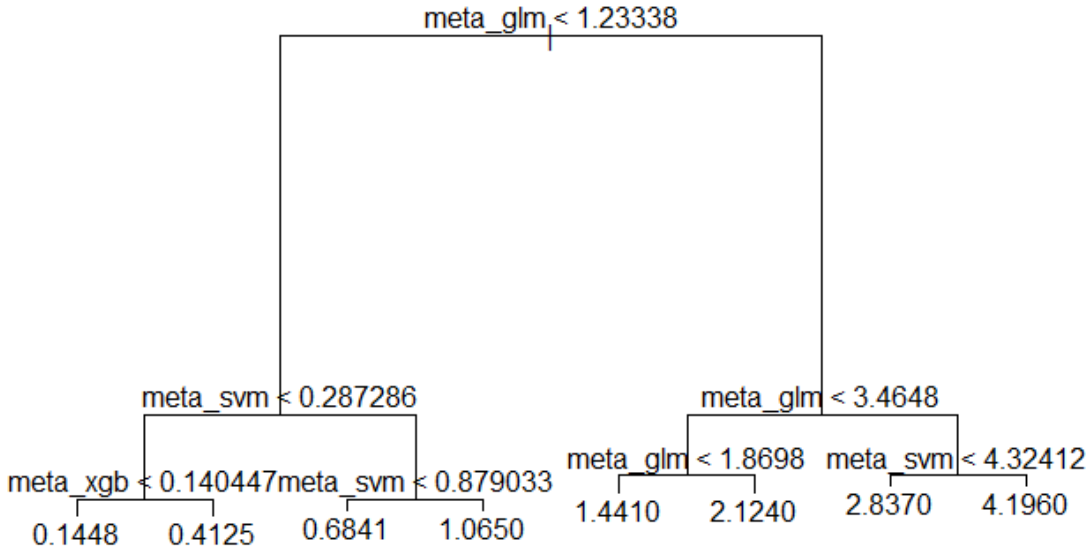

```{r}
tree.test_sg<-tree(meta_knn~.-meta_rf,test_sg)
summary(tree.test_sg)
```

Regression tree:
tree(formula = meta_knn ~ . - meta_rf, data = test_sg)
Variables actually used in tree construction:
[1] "meta_glm" "meta_svm" "meta_xgb"
Number of terminal nodes: 8
Residual mean deviance: 0.1196 = 7178 / 60010
Distribution of residuals:
    Min. 1st Qu.   Median   Mean 3rd Qu.   Max.
-2.28300 -0.14480 -0.06457 0.00000 0.13170 2.34200

```{r}
plot(tree.train_sg)
text(tree.train_sg,pretty = 0)
```




```{r}
plot(tree.test_sg)
text(tree.test_sg,pretty = 0)
```




```{r}
t.test(train_sg$meta_knn,mu=0.6)
```

```
    One Sample t-test
```

```
data:  train_sg$meta_knn
t = 8.1447, df = 52396, p-value = 3.887e-16
alternative hypothesis: true mean is not equal to 0.6
95 percent confidence interval:
 0.6201033 0.6328453
sample estimates:
mean of x
0.6264743
```

```{r}
t.test(train_sg$meta_rf, mu=0.7)
```
```
   One Sample t-test

data:  train_sg$meta_rf
t = -2.0181, df = 52396, p-value = 0.04358
alternative hypothesis: true mean is not equal to 0.7
95 percent confidence interval:
 0.6842712 0.6997701
sample estimates:
mean of x
0.6920207
```

```{r}
t.test(train_sg$meta_rf,mu=0.5,conf.level =0.80 )
```
```
One Sample t-test

data:  train_sg$meta_rf
t = 48.566, df = 52396, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0.5
80 percent confidence interval:
 0.6869536 0.6970877
sample estimates:
mean of x
0.6920207
```

```{r}
t.test(train_sg$y, mu=0.5)
```
```
One Sample t-test

data:  train_sg$y
t = 28.673, df = 52396, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0.5
95 percent confidence interval:
 0.6321481 0.6515403
sample estimates:
mean of x
0.6418442
```

```{r}
t.test(test_sg$meta_knn,mu=0.6)
```
```
One Sample t-test

data:  test_sg$meta_knn
```

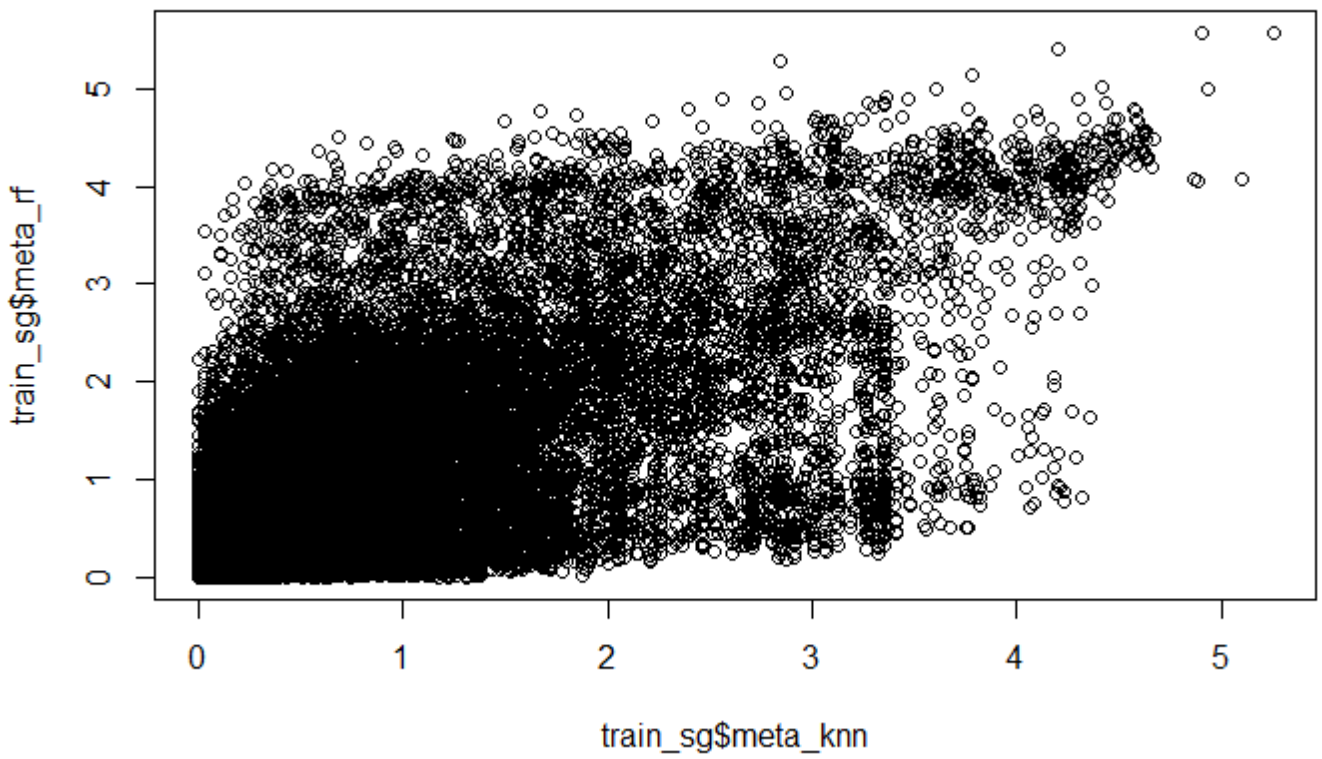
```
t = -2.1255, df = 60020, p-value = 0.03355
alternative hypothesis: true mean is not equal to 0.6
95 percent confidence interval:
 0.5880386 0.5995153
sample estimates:
mean of x
 0.593777
```

```{r}
t.test(test_sg$meta_rf, mu=0.7)
```
```
One Sample t-test

data:  test_sg$meta_rf
t = -15.703, df = 60020, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0.7
95 percent confidence interval:
 0.6318464 0.6469716
sample estimates:
mean of x
 0.639409
```

```{r}
t.test(test_sg$meta_rf,mu=0.5,conf.level =0.80 )
```
```
One Sample t-test

data:  test_sg$meta_rf
t = 36.131, df = 60020, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0.5
80 percent confidence interval:
 0.6344641 0.6443539
sample estimates:
mean of x
 0.639409
```

```{r}
t.test(test_sg$y, mu=0.5)
```
```
One Sample t-test

data:  test_sg$y
t = 27.911, df = 60020, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0.5
95 percent confidence interval:
 0.6189695 0.6369402
sample estimates:
mean of x
0.6279549
```

```{r}
plot(train_sg$meta_knn,train_sg$meta_rf)
```




```{r}
cor(train_sg$meta_knn,train_sg$meta_rf)
```
```
[1] 0.6854705
```

```{r}
mod<-lm(train_sg$meta_knn~train_sg$meta_rf)
summary(mod)
```
```
Call:
lm(formula = train_sg$meta_knn ~ train_sg$meta_rf)

Residuals:
    Min      1Q  Median      3Q     Max
-2.2798 -0.2535 -0.1287  0.1688  3.6202

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)       0.236491   0.002979   79.38   <2e-16 ***
train_sg$meta_rf 0.563542   0.002615  215.50   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5418 on 52395 degrees of freedom
Multiple R-squared:  0.4699,     Adjusted R-squared:  0.4699
F-statistic: 4.644e+04 on 1 and 52395 DF,  p-value: < 2.2e-16
```

```{r}
predict(mod)
```

1	2	3	4	5	6	7	8	9
10	11	12	13	14				
0.7582879	0.4289468	0.4289468	0.7582879	0.3662611	0.2823756	0.2823756	0.3662611	1.1372576
1.1372576	0.4340446	0.3212206	2.2638540	0.2820621				
15	16	17	18	19	20	21	22	23
24	25	26	27	28				
2.1666686	0.9808919	0.4820616	0.9808919	2.1666686	1.0454912	1.0454374	0.5048222	1.0454374
1.0454912	0.4100854	1.0018121	1.0018121	0.4100854				
29	30	31	32	33	34	35	36	37
38	39	40	41	42				
0.6335864	0.6335864	0.4292484	0.4292484	0.7156972	0.7156972	1.9773005	0.4729348	0.4729348
1.2391371	0.4729348	0.2688045	0.2688045	0.5383561				
43	44	45	46	47	48	49	50	51
52	53	54	55	56				
0.2688045	0.2897015	0.2897015	0.2897015	1.3319360	1.0596799	1.0592019	0.6502184	0.6502184
0.6502184	0.3119868	0.3119868	0.3119868	0.3067690				
57	58	59	60	61	62	63	64	65
66	67	68	69	70				
0.3067690	0.3067690	1.5217183	0.8276564	0.5125032	1.4144488	1.4144488	0.4508216	0.4508216
0.4306549	0.4306549	1.0622617	1.8006589	1.0622617				
71	72	73	74	75	76	77	78	79
80	81	82	83	84				
0.7919558	1.1717724	0.7919558	0.3786194	0.4434095	0.3786194	0.9253833	0.7366320	0.3565369
1.6570063	1.1731520	0.5313014	1.0448492	1.9301133				
85	86	87	88	89	90	91	92	93
94	95	96	97	98				
0.8721208	1.9301133	0.7161099	0.7495447	0.7161099	0.7335527	0.7335527	2.3676390	2.3676390
0.5082415	0.5082415	0.4153376	0.4153376	0.5064097				
99	100	101	102	103	104	105	106	107
108	109	110	111	112				
0.5064097	0.6541148	0.6541148	0.6177055	0.6177055	1.7733013	1.3295277	0.6156593	0.8433838
0.6481743	1.4346388	0.4416417	1.4346388	0.5381990				
113	114	115	116	117	118	119	120	121
122	123	124	125	126				
0.5381990	1.1108386	1.1108386	1.4481435	0.4545750	2.5786357	0.3892865	1.2364164	0.3856078
1.4298092	1.4298092	1.4298092	0.6742461	0.6742461				
127	128	129	130	131	132	133	134	135
136	137	138	139	140				
0.6742461	0.5270970	0.5270970	0.5270970	1.6159999	1.6159999	1.0839166	1.0839166	0.8657580
0.8657580	1.6569067	1.6569067	1.4613310	0.5768033				
141	142	143	144	145	146	147	148	149
150	151	152	153	154				
0.5768033	0.7639924	0.3782014	0.3782014	0.3686151	1.4001109	1.0348004	1.8729161	0.5515640
0.7470053	0.5425649	1.4586232	0.3547623	1.4032955				
155	156	157	158	159	160	161	162	163
164	165	166	167	168				
0.3199376	1.4032955	0.7607375	0.7607375	0.4493372	0.4493372	1.2617010	1.2617010	0.8036947
0.8036947	0.5884683	0.5884683	1.6213629	0.5399731				
169	170	171	172	173	174	175	176	177
178	179	180	181	182				
1.5445324	0.4223713	1.5615958	1.3713867	1.3680477	0.9413430	0.9410814	0.6652115	0.6883800
1.4261295	1.4261295	1.4366130	0.4615646	0.4615646				
183	184	185	186	187	188	189	190	191
192	193	194	195	196				
0.9465593	0.3179305	0.3179305	0.5616388	1.0434093	1.8261652	1.8261652	0.2936445	0.4381603
0.4381603	0.4698746	0.4288451	0.4288451	1.1431093				
197	198	199	200	201	202	203	204	205
206	207	208	209	210				
1.1431093	0.4753402	0.4753402	0.2798026	0.2798026	0.7608712	0.7608712	0.3060625	0.3060625
0.2972909	0.2972909	2.0477797	1.1901901	0.8917040				
211	212	213	214	215	216	217	218	219
220	221	222	223	224				
1.6068818	1.6068818	0.6191337	0.6191337	0.5824474	1.9375800	0.5824474	1.9375800	0.5329499
0.5329499	1.3700053	1.3700053	0.5584584	1.3700053				
225	226	227	228	229	230	231	232	233
234	235	236	237	238				
0.5584584	1.0265314	1.1533803	1.1533803	1.0265314	2.4025970	2.4025970	2.4025970	1.1533803
0.5803800	0.5012736	0.5012736	0.5803800	1.2409471				
239	240	241	242	243	244	245	246	247
248	249	250	251	252				
1.2409471	1.2409471	0.5012736	0.3022217	0.3022217	0.9289855	0.9289855	0.9289855	0.9503562
0.9503562	0.4332424	0.4332424	0.9442844	0.3941565				
253	254	255	256	257	258	259	260	261
262	263	264	265	266				
0.3941565	0.9442844	0.9442844	0.5444453	0.5444453	0.5444453	0.9060257	0.3632286	0.3632286
0.3632286	0.3237350	0.3069249	1.5810486	1.5810486				

```
      267       268       269       270       271       272       273       274       275
276       277       278       279       280
1.5810486 0.8254852 0.8254852 0.8254852 0.4951082 0.4951082 0.4951082 1.2756375 1.2756375
0.4953254 0.4953254 2.3396733 0.3773769 0.3773769
      281       282       283       284       285       286       287       288       289
290       291       292       293       294
2.3396733 0.8304117 0.8304117 0.6361031 0.6361031 0.9512431 0.9512431 0.9512431 0.7818353
0.7818353 0.7818353 0.4713451 0.4713451 0.4713451
      295       296       297       298       299       300       301       302       303
304       305       306       307       308
1.7461376 1.7461376 0.6941056 0.6941056 0.4813361 0.4813361 1.3939171 1.3939171 1.3939171
2.1774423 2.1774423 0.5511671 0.5511671 0.5511671
      309       310       311       312       313       314       315       316       317
318       319       320       321       322
0.9677372 0.9677372 0.5790172 0.5790172 0.5790172 0.5898046 0.5898046 0.6949767 0.6949767
0.5646362 0.5646362 0.4086438 0.4086438 1.8391396
      323       324       325       326       327       328       329       330       331
332       333       334       335       336
1.8391396 0.8549391 1.1405039 1.1405039 0.8549391 0.7550207 0.7567723 0.7567723 0.7550207
1.2584002 1.2584002 1.7613683 2.3788971 0.7453686
      337       338       339       340       341       342       343       344       345
346       347       348       349       350
2.3788971 0.8009463 0.4542894 0.8009463 0.5965595 0.5965595 1.3485778 1.3485778 0.8035246
0.7017254 0.7017254 0.8035246 0.7843865 0.6635257
      351       352       353       354       355       356       357       358       359
360       361       362       363       364
0.6635257 0.7843865 0.9161982 0.6216364 0.6216364 0.9161982 0.5366636 1.4314234 0.5366636
0.3000348 0.4498900 0.3000348 0.3021620 1.8643180
      365       366       367       368       369       370       371       372       373
374       375       376       377       378
1.8643180 1.2328212 1.2328212 0.8924332 0.8924332 1.5397689 0.9006221 1.1687229 0.5159268
0.5201686 0.5258430 1.4115307 0.6250158 0.4595833
      379       380       381       382       383       384       385       386       387
388       389       390       391       392
0.6262311 0.6262311 0.3803403 0.3803403 0.2906672 0.2906672 1.1198838 1.1198838 0.9756865
0.9756865 1.6513808 0.8424965 1.6513808 1.5998220
      393       394       395       396       397       398       399       400       401
402       403       404       405       406
0.8424965 1.5998220 1.5998220 1.2986348 1.0793480 1.0793480 1.4316396 1.2986348 0.9450083
0.9450083 0.9450083 1.4316396 1.2986348 0.4692576
      407       408       409       410       411       412       413       414       415
416       417       418       419       420
0.5944941 0.5944941 0.6605800 0.4692576 0.4639237 0.4639237 0.4639237 0.6605800 0.4692576
0.4202190 0.8831550 0.4202190 0.8831550 0.4202190
      421       422       423       424       425       426       427       428       429
430       431       432       433       434
1.5177143 0.7912068 0.4748497 0.4735288 0.4735288 0.3035956 0.3035956 0.3234187 0.3234187
1.3520505 1.3520505 0.4921204 1.5301973 0.4921204
      435       436       437       438       439       440       441       442       443
444       445       446       447       448
1.5301973 0.7702274 1.0307524 0.7702274 1.0307524 0.5227573 0.5227573 1.4781976 1.4781976
0.3588065 0.3588065 0.7564139 0.7564139 1.1393826
      449       450       451       452       453       454       455       456       457
458       459       460       461       462
1.1393826 0.4396670 0.4396670 0.4337817 0.4337817 1.5753507 1.5753507 1.0199075 1.0199075
1.1251667 1.1251667 1.4344378 0.2811382 0.2811382
      463       464       465       466       467       468       469       470       471
472       473       474       475       476
1.4344378 1.5783204 0.9814843 0.9814843 0.5033185 1.5783204 0.2843322 0.2843322 0.5033185
0.7445578 0.5402593 0.7445578 0.5402593 0.7854568
      477       478       479       480       481       482       483       484       485
486       487       488       489       490
0.7854568 1.4211772 1.4211772 1.4211772 1.4211772 1.2425384 1.2425384 1.2425384 1.2425384
1.2586685 1.2586685 1.2586685 1.2586685 1.3931123
      491       492       493       494       495       496       497       498       499
500       501       502       503       504
1.3931123 0.9335552 0.9335552 0.6160662 0.6160662 1.3675653 1.3675653 1.0412396 1.0412396
0.7524173 0.7524173 1.0495750 1.0495750 0.5057520
      505       506       507       508       509       510       511       512       513
514       515       516       517       518
0.5057520 0.3869152 0.3869152 0.7927821 0.7927821 0.7927821 0.6551587 0.6551587 0.6551587
0.8556421 0.8556421 0.8556421 0.7594557 0.7594557
      519       520       521       522       523       524       525       526       527
528       529       530       531       532
0.4611074 0.4611074 0.8571888 0.8571888 0.2983836 0.8571888 0.2983836 0.7825251 0.7825251
0.7825251 0.3349463 0.3349463 0.3349463 0.9253833
```

533	534	535	536	537	538	539	540	541
542	543	544	545	546				
0.7453509	1.1393046	1.4481435	1.4481435	1.4481435	0.9440833	0.9440833	0.9440833	0.8592517
0.8592517	0.8592517	1.6466678	1.6466678	1.4587845				
547	548	549	550	551	552	553	554	555
556	557	558	559	560				
0.5662119	0.5662119	1.4587845	1.4587845	1.2257579	0.5059870	0.5059870	1.2257579	1.2257579
1.2320279	1.2320279	1.2320279	1.5931286	1.0342662				
561	562	563	564	565	566	567	568	569
570	571	572	573	574				
0.6652287	1.1076546	0.4577377	0.8389484	0.8884352	0.8443398	1.0506216	1.7116982	1.7116982
0.5254841	0.5254841	0.3843192	0.3843192	1.1240680				
575	576	577	578	579	580	581	582	583
584	585	586	587	588				
1.1240680	1.1240680	1.0134273	1.0134273	1.0134273	0.7861054	0.7861054	0.7861054	1.3928674
1.3928674	0.9620799	0.9620799	0.4580706	0.4580706				
589	590	591	592	593	594	595	596	597
598	599	600	601	602				
0.9515611	0.9515611	1.8047665	0.3508437	0.3508437	1.8047665	1.8047665	1.8047665	0.7263102
0.2771164	0.2771164	0.7263102	0.7263102	0.7263102				
603	604	605	606	607	608	609	610	611
612	613	614	615	616				
0.4832200	0.4832200	0.4832200	0.4832200	0.8724060	0.8724060	0.9539252	0.4425394	0.9539252
0.4425394	1.0628472	0.5177956	1.0628472	0.5177956				
617	618	619	620	621	622	623	624	625
626	627	628	629	630				
0.7676304	0.7676304	1.4266397	1.4266397	0.7818796	1.0518616	1.8380286	1.8380286	1.8380286
1.0518616	0.7818796	0.7155963	0.7085552	0.9422539				
631	632	633	634	635	636	637	638	639
640	641	642	643	644				
0.9422539	0.9422539	0.7085552	0.7155963	0.5312058	0.3968317	0.3968317	0.3968317	0.5312058
1.0618080	1.0618080	0.8006883	0.8006883	0.5605510				
645	646	647	648	649	650	651	652	653
654	655	656	657	658				
0.5605510	1.4868835	1.4868835	0.4951532	0.4951532	0.2817883	0.2817883	1.4799169	1.0085654
1.0947482	0.5674608	0.5433038	0.2988455	1.4727497				
659	660	661	662	663	664	665	666	667
668	669	670	671	672				
1.0016248	1.0473431	0.7226668	0.7226668	0.3718242	0.3718242	0.2867255	0.2867255	1.3001196
1.3001196	1.0657209	1.0657209	0.3910976	0.3910976				
673	674	675	676	677	678	679	680	681
682	683	684	685	686				
1.2685099	1.1154207	1.1632461	1.2800555	1.2800555	0.5020594	0.5020594	0.3028990	0.6227004
0.3028990	0.6227004	0.3072968	0.3072968	0.2790762				
687	688	689	690	691	692	693	694	695
696	697	698	699	700				
0.2790762	0.7110409	0.7110409	0.7110409	0.5680042	0.5680042	0.5680042	0.2970251	0.2970251
0.2970251	0.7582879	0.9305170	0.9305170	0.2883007				
701	702	703	704	705	706	707	708	709
710	711	712	713	714				
0.9305170	0.5620200	0.5620200	0.2774317	0.5620200	1.2311908	1.2311908	1.2311908	0.5627555
0.5627555	0.5627555	0.3946616	0.3946616	0.3946616				
715	716	717	718	719	720	721	722	723
724	725	726	727	728				
0.6488535	0.6192891	0.6192891	0.6488535	0.6488535	0.5073680	0.5073680	0.4043124	0.4043124
1.0654185	1.0654185	1.0654185	0.9643477	0.9643477				
729	730	731	732	733	734	735	736	737
738	739	740	741	742				
0.4992413	0.9643477	0.4992413	0.4992413	0.4710725	0.4710725	0.2769048	0.4710725	0.2769048
0.2769048	0.3443465	0.3443465	0.3443465	1.4233973				
743	744	745	746	747	748	749	750	751
752	753	754	755	756				
1.4233973	1.4233973	0.6335580	0.6335580	0.6335580	0.4748554	0.4748554	0.4748554	0.6607043
0.6607043	0.6607043	0.5414132	0.5414132	0.5414132				
757	758	759	760	761	762	763	764	765
766	767	768	769	770				
0.4741922	0.4741922	0.4741922	0.5318540	0.5318540	0.5318540	0.5483224	0.5483224	0.5483224
0.7684794	0.7684794	0.7684794	0.9456722	0.9456722				
771	772	773	774	775	776	777	778	779
780	781	782	783	784				
0.9456722	0.7788086	0.7788086	0.7788086	0.3478652	0.3478652	1.2766378	1.2766378	1.2766378
0.3478652	0.7402198	0.5852710	0.5852710	0.5852710				
785	786	787	788	789	790	791	792	793
794	795	796	797	798				
0.7402198	0.7402198	0.3144402	1.0158899	1.0158899	1.0158899	0.3144402	0.3144402	0.3857837
0.3857837	0.3857837	1.2103050	1.2103050	1.2103050				

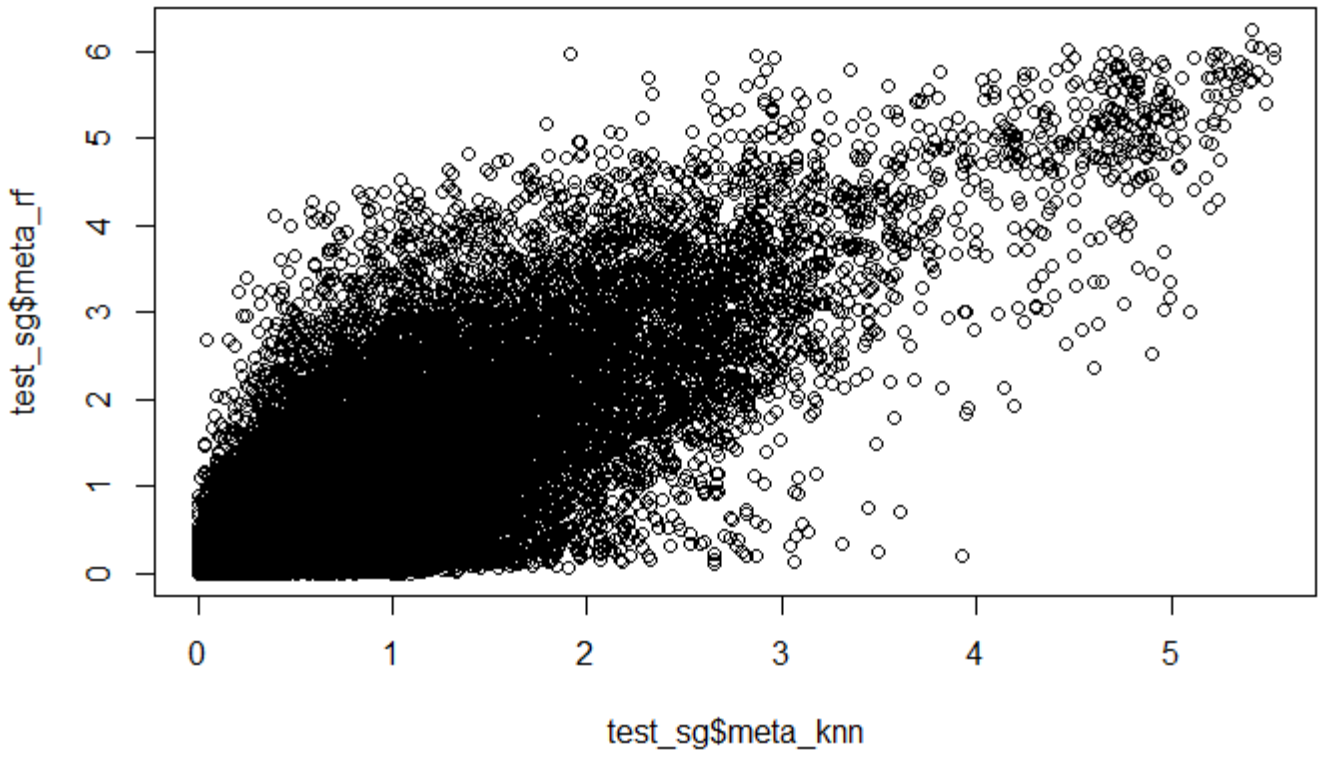
```
      799       800       801       802       803       804       805       806       807
808       809       810       811       812
0.8061464 0.8061464 0.8061464 0.5277604 0.5277604 0.5277604 0.8262910 0.8262910 0.8262910
0.7105980 0.7105980 0.3107651 0.7105980 0.3107651
      813       814       815       816       817       818       819       820       821
822       823       824       825       826
0.3107651 0.4774132 0.4774132 0.2761961 0.4774132 0.2761961 0.2761961 0.3737990 0.3737990
0.3737990 1.0239310 1.0239310 1.0239310 0.4313882
      827       828       829       830       831       832       833       834       835
836       837       838       839       840
0.4313882 0.4313882 0.4181429 0.4181429 0.4181429 1.4083494 1.2276490 1.4083494 1.2276490
1.2276490 1.4083494 0.3802402 0.3897470 0.3802402
      841       842       843       844       845       846       847       848       849
850       851       852       853       854
0.3897470 0.3897470 0.3802402 0.7194408 0.7194408 0.2806397 0.2810323 0.2806397 0.2810323
0.2810323 0.2806397 0.7194408 0.3676064 0.3676064
      855       856       857       858       859       860       861       862       863
864       865       866       867       868
0.3676064 1.4315501 0.8984611 0.8984611 1.4315501 0.8984611 1.4315501 0.7626967 0.7626967
0.7626967 0.4462400 0.4462400 0.4462400 0.9681043
      869       870       871       872       873       874       875       876       877
878       879       880       881       882
0.9681043 0.9681043 0.3119567 0.3119567 0.3119567 0.2860409 0.2860409 0.2860409 0.4735288
0.4735288 0.7120783 0.4735288 0.7120783 0.3035956
      883       884       885       886       887       888       889       890       891
892       893       894       895       896
0.3035956 0.8391177 0.3035956 0.8391177 0.3234187 0.3234187 0.6424920 0.3234187 0.6424920
0.7857599 0.7857599 0.8461574 0.7857599 0.8461574
      897       898       899       900       901       902       903       904       905
906       907       908       909       910
0.3341070 0.3341070 0.6439407 0.3341070 0.6439407 0.2891464 1.3307906 0.2891464 0.3220538
1.3307906 0.2891464 1.3307906 0.3220538 0.4747343
      911       912       913       914       915       916       917       918       919
920       921       922       923       924
1.6439975 1.6439975 0.4747343 0.4747343 1.6439975 0.3632812 0.5748626 0.5748626 0.3632812
0.3632812 0.5748626 0.4915821 0.4143955 0.4143955
      925       926       927       928       929       930       931       932       933
934       935       936       937       938
0.4915821 0.4143955 0.4915821 0.5483224 0.5483224 0.5483224 0.4317074 1.1877634 1.1877634
1.1877634 0.4317074 0.4317074 0.9685153 0.9685153
      939       940       941       942       943       944       945       946       947
948       949       950       951       952
0.9685153 0.6605113 0.3758420 0.3758420 0.6605113 0.3758420 0.6605113 0.5414809 0.5414809
0.5414809 0.3155347 0.3155347 0.3155347 1.1843323
      953       954       955       956       957       958       959       960       961
962       963       964       965       966
1.1843323 1.1843323 0.4017324 1.4799169 1.4799169 0.4017324 1.4799169 0.4017324 1.4799169
0.4045847 1.1573965 1.1573965 0.4045847 1.1573965
      967       968       969       970       971       972       973       974       975
976       977       978       979       980
0.4045847 1.1573965 0.9184454 0.9184454 1.1135490 0.9184454 1.1135490 1.1135490 0.9184454
0.7555947 0.5843720 0.3454799 0.7555947 0.5843720
      981       982       983       984       985       986       987       988       989
990       991       992       993       994
0.3454799 0.7555947 0.3454799 0.5843720 0.3587230 0.3006728 0.3632069 0.3587230 0.3006728
0.3632069 0.3587230 0.3632069 0.3006728 0.5918234
      995       996       997       998       999      1000
0.2991849 0.5918234 0.2991849 0.5918234 0.2991849 0.8226231
 [ reached getOption("max.print") -- omitted 51397 entries ]
```

```{r}
pred<-predict(mod)
train_sg$predicted = NA
train_sg$predicted = pred
```

```{r}
library(car)
dwt(mod)
```

```
Loading required package: carData

Attaching package: 'car'

The following object is masked from 'package:dplyr':

    recode

The following object is masked from 'package:purrr':

    some

 lag Autocorrelation D-W Statistic p-value
   1       0.5025952     0.9948056       0
 Alternative hypothesis: rho != 0
```

```{r}
plot(test_sg$meta_knn,test_sg$meta_rf)
```




```{r}
cor(test_sg$meta_knn,test_sg$meta_rf)
```

```
[1] 0.8271116
```

```{r}
mod<-lm(test_sg$meta_knn~test_sg$meta_rf)
summary(mod)
```

```
Call:
```

```
lm(formula = test_sg$meta_knn ~ test_sg$meta_rf)

Residuals:
    Min      1Q  Median      3Q     Max
-2.3747 -0.1925 -0.0864  0.1453  3.6019

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     0.192486   0.001987   96.89   <2e-16 ***
test_sg$meta_rf 0.627597   0.001741  360.53   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4031 on 60019 degrees of freedom
Multiple R-squared:  0.6841,     Adjusted R-squared:  0.6841
F-statistic: 1.3e+05 on 1 and 60019 DF,  p-value: < 2.2e-16
```

```{r}
predict(mod)
```

```
1         2         3         4         5         6         7         8         9        10
11        12        13        14
1.6768857 0.3257968 0.5600015 1.1282791 0.5714514 1.4265400 0.4043600 1.2640165 0.3694894
0.1930948 0.1952931 0.5708703 0.1987133 1.6067034
       15        16        17        18        19        20        21        22        23
24        25        26        27        28
1.3706135 0.5328935 1.7043914 0.3239579 0.3530788 0.7912737 0.2516433 0.1974026 1.0241489
0.4315357 0.6127015 0.1924858 0.1942172 0.3264853
       29        30        31        32        33        34        35        36        37
38        39        40        41        42
0.7126381 0.4332893 0.5247547 0.3390881 0.5755045 0.2183627 0.8157179 2.0013470 1.4629884
0.1924858 0.1924858 0.1924858 1.2217744 0.2264231
       43        44        45        46        47        48        49        50        51
52        53        54        55        56
0.5858116 0.8303414 1.7256304 0.3350930 1.2640165 0.2785981 1.1344977 0.2022399 0.1946609
0.9918400 0.2535709 0.3889377 0.2702175 1.2370788
       57        58        59        60        61        62        63        64        65
66        67        68        69        70
0.2428788 0.2033966 0.3628095 0.5383155 0.2378111 0.2047704 0.2065952 0.3238912 0.6665494
0.4306367 0.2944621 1.0089373 3.2397431 0.5076078
       71        72        73        74        75        76        77        78        79
80        81        82        83        84
0.1925728 0.2745588 0.1952931 1.4634619 0.1927816 1.7175660 0.4534757 0.7251364 0.2187825
1.3993269 0.4992631 0.1937547 0.1989772 1.5594632
       85        86        87        88        89        90        91        92        93
94        95        96        97        98
2.4299067 0.5356221 0.2586351 0.1964224 0.1924858 0.2274792 0.5182456 0.4557189 0.2154513
0.2129606 0.3184102 0.3591433 0.7506314 0.7265127
       99       100       101       102       103       104       105       106       107
108       109       110       111       112
0.2453856 0.5855801 1.7288771 0.2674698 0.1924858 1.2670825 0.3759930 0.2675429 0.2349028
0.3597381 0.2050836 0.2151251 1.4799165 0.1924858
      113       114       115       116       117       118       119       120       121
122       123       124       125       126
0.2992763 0.3670569 0.8282423 0.4920956 0.4254579 0.2584338 0.3699280 1.3222198 0.8384018
0.3334638 2.0707025 0.4530949 0.6973545 0.1925293
      127       128       129       130       131       132       133       134       135
136       137       138       139       140
0.1964039 0.3258645 0.1991541 0.6817188 0.7111099 0.2706005 0.8031777 0.8645525 0.2502896
0.2719863 0.1946000 0.5056822 0.8451736 0.4701043
      141       142       143       144       145       146       147       148       149
150       151       152       153       154
0.3401168 0.5531189 0.1924858 0.3073608 0.2738508 0.3036981 0.2952154 1.9888261 0.2987602
0.2193863 0.7490714 0.6650742 0.1924858 0.1924858
      155       156       157       158       159       160       161       162       163
164       165       166       167       168
0.1925902 1.9499371 0.8429415 0.1924858 1.8916924 0.2108536 0.3661399 0.2172756 0.8160754
0.4218249 0.9979410 2.4053500 0.2778506 0.5667614
      169       170       171       172       173       174       175       176       177
178       179       180       181       182
```

0.6572520 0.6973545 0.2308058 0.4285107 0.1965141 0.2835126 0.1943129 0.3765760 0.2620396
0.2085927 0.2675441 0.2507241 0.9967557 0.2891632
183 184 185 186 187 188 189 190 191
192 193 194 195 196
0.4172871 0.2048983 0.1930426 0.2475675 0.9886921 0.2191177 0.2367522 0.2053599 0.4469931
0.3268112 0.7621997 0.5379241 0.1959687 2.6050753
197 198 199 200 201 202 203 204 205
206 207 208 209 210
0.3092965 0.1940345 0.2720779 0.1964039 0.7806651 0.1933858 0.5709199 0.3384402 0.2057694
0.7797088 1.4219222 0.5853600 0.1935401 0.1991135
211 212 213 214 215 216 217 218 219
220 221 222 223 224
0.8052164 0.2775048 0.5306259 1.0648958 2.0786451 0.1958691 0.1924858 0.2128442 0.2633982
0.2302626 0.2087825 0.1930020 0.2561100 0.5569942
225 226 227 228 229 230 231 232 233
234 235 236 237 238
0.3670122 0.9631955 0.1937410 0.3544936 0.5590948 0.3199256 0.5747497 0.2584433 0.1924858
0.7207460 0.5569942 0.2422505 0.2398439 1.8813179
239 240 241 242 243 244 245 246 247
248 249 250 251 252
0.2117824 0.2939840 1.3682848 0.1980714 0.1927294 0.7332796 0.1924858 2.3050010 0.2351731
0.4668820 0.3045313 0.3624388 0.2871874 0.2029015
253 254 255 256 257 258 259 260 261
262 263 264 265 266
0.2224442 0.3027560 0.8246954 0.5472899 0.2918136 0.7153852 0.1924858 0.2491216 0.6933065
0.1992592 0.3156232 0.4260540 0.1928918 0.2603947
267 268 269 270 271 272 273 274 275
276 277 278 279 280
0.2388087 0.2972335 0.6985049 0.2470074 0.1959050 1.2246214 0.2381080 0.4225182 0.3751620
0.3125418 0.3745368 0.2318857 0.6583745 0.2887712
281 282 283 284 285 286 287 288 289
290 291 292 293 294
2.5945595 0.1926598 0.2269469 0.4334323 0.2815078 0.1925902 0.5216455 1.0605052 2.6926438
0.7231237 0.5843768 0.1924858 1.6367714 0.2017642
295 296 297 298 299 300 301 302 303
304 305 306 307 308
0.5598881 0.2953815 0.5251926 0.6398540 0.2468544 1.5681053 0.4450628 0.3153098 0.1935182
0.2087105 0.1975929 0.5834343 0.2043915 0.2080202
309 310 311 312 313 314 315 316 317
318 319 320 321 322
0.1963401 0.6902435 0.2726378 0.1932920 0.3435471 0.1928396 0.2446124 0.4137489 0.6011765
0.2653312 0.3143625 0.7285684 0.1924858 2.5844941
323 324 325 326 327 328 329 330 331
332 333 334 335 336
1.0924342 0.4368346 2.6157760 0.2648179 0.6312199 0.1929208 1.1367742 0.8741400 0.3094157
0.1996391 0.3569653 0.2263097 0.4926773 0.8768672
337 338 339 340 341 342 343 344 345
346 347 348 349 350
0.4134164 0.2596327 0.2144388 1.5361206 0.3319465 0.2284850 1.0934178 0.2194365 0.3268104
0.1931943 0.3191423 0.2849466 0.4497381 2.1562671
351 352 353 354 355 356 357 358 359
360 361 362 363 364
0.3076710 1.4255293 0.4166210 1.0934178 0.5230727 0.8717680 0.2475777 1.1477642 0.1925728
0.2065858 1.6453769 0.2377502 0.1927526 0.1924858
365 366 367 368 369 370 371 372 373
374 375 376 377 378
0.2452223 0.2035823 0.2403242 0.2125240 1.0889559 0.4836673 0.2293672 1.7090250 0.2743413
0.4981708 0.2281681 0.4141678 0.1940200 0.1924858
379 380 381 382 383 384 385 386 387
388 389 390 391 392
0.3952000 0.3086728 0.4789824 0.2197018 0.2438771 0.2853678 1.6507783 0.2030474 0.3435457
1.6310426 1.2432357 0.6108362 0.1924858 0.5001543
393 394 395 396 397 398 399 400 401
402 403 404 405 406
0.4748690 1.6810420 0.5024132 0.9803610 0.4422067 0.9344321 0.1924858 0.4882657 0.1926598
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407 408 409 410 411 412 413 414 415
416 417 418 419 420
0.3092716 0.3680922 0.4554895 1.6810420 0.4933928 0.2100459 0.1924858 1.2019955 0.9496682
0.2000030 0.1924858 0.2159266 0.1932804 0.3222050
421 422 423 424 425 426 427 428 429
430 431 432 433 434
0.1925438 0.6209178 0.3010659 0.3501332 0.1979492 0.1924858 0.5059054 1.5675561 0.3028148
0.1924858 0.2017241 0.9623999 0.7864176 1.5381186
435 436 437 438 439 440 441 442 443
444 445 446 447 448

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990       991       992       993       994
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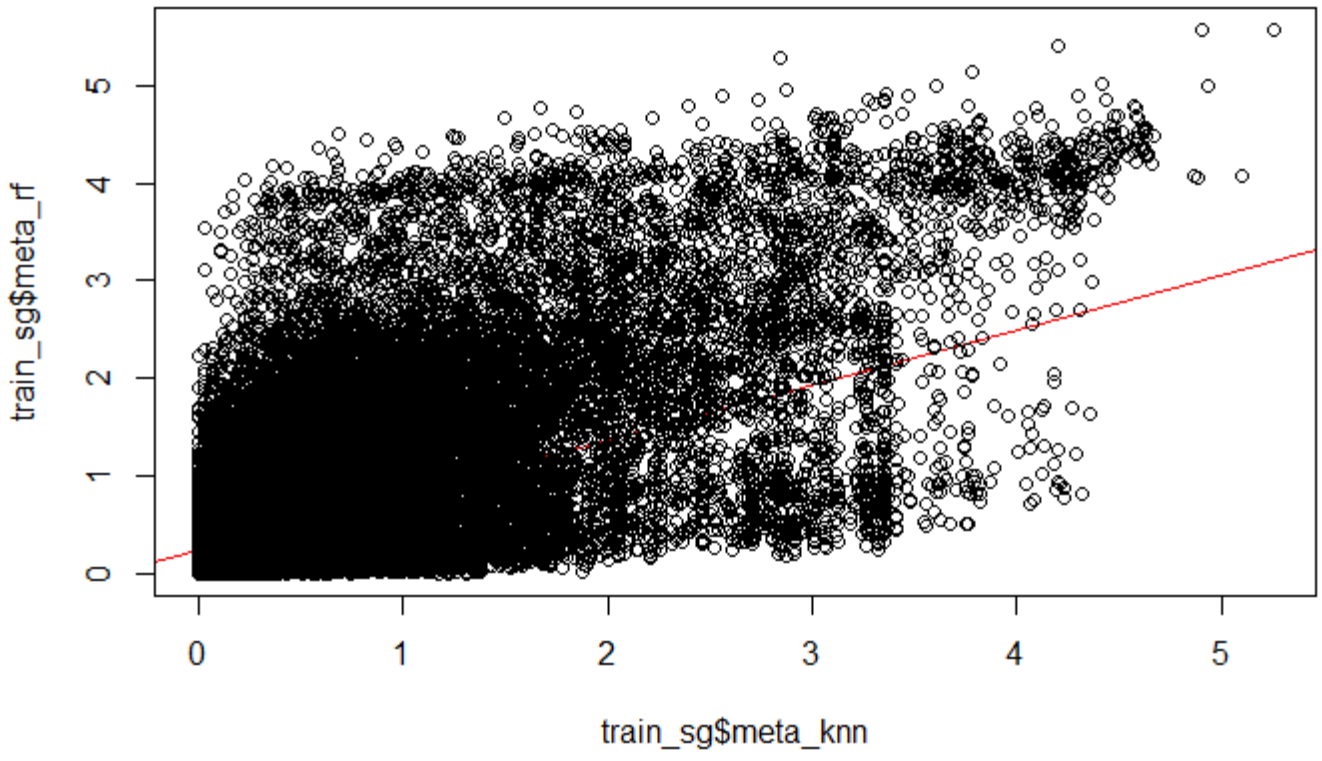
0.7315011 0.1924858 1.1049360 0.2038422 0.2012788
       995       996       997       998       999      1000
0.2012788 0.3514957 0.2237670 0.2012788 0.2012788 1.2228684
 [ reached getOption("max.print") -- omitted 59021 entries ]
```

```{r}
pred<-predict(mod)
test_sg$predicted = NA
test_sg$predicted = pred
```

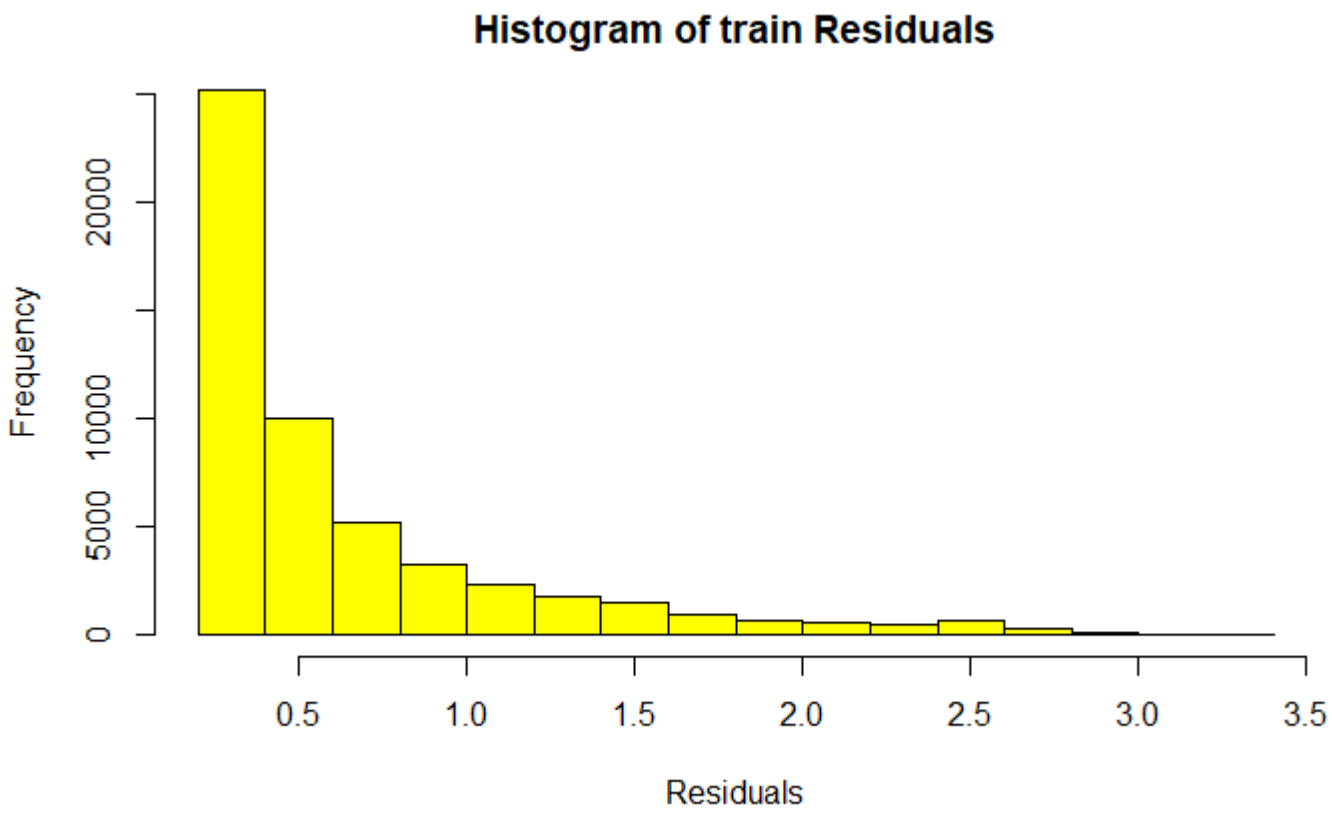
```{r}
library(car)
dwt(mod)
```

```
lag Autocorrelation D-W Statistic p-value
   1       0.3270891      1.345815       0
 Alternative hypothesis: rho != 0
```

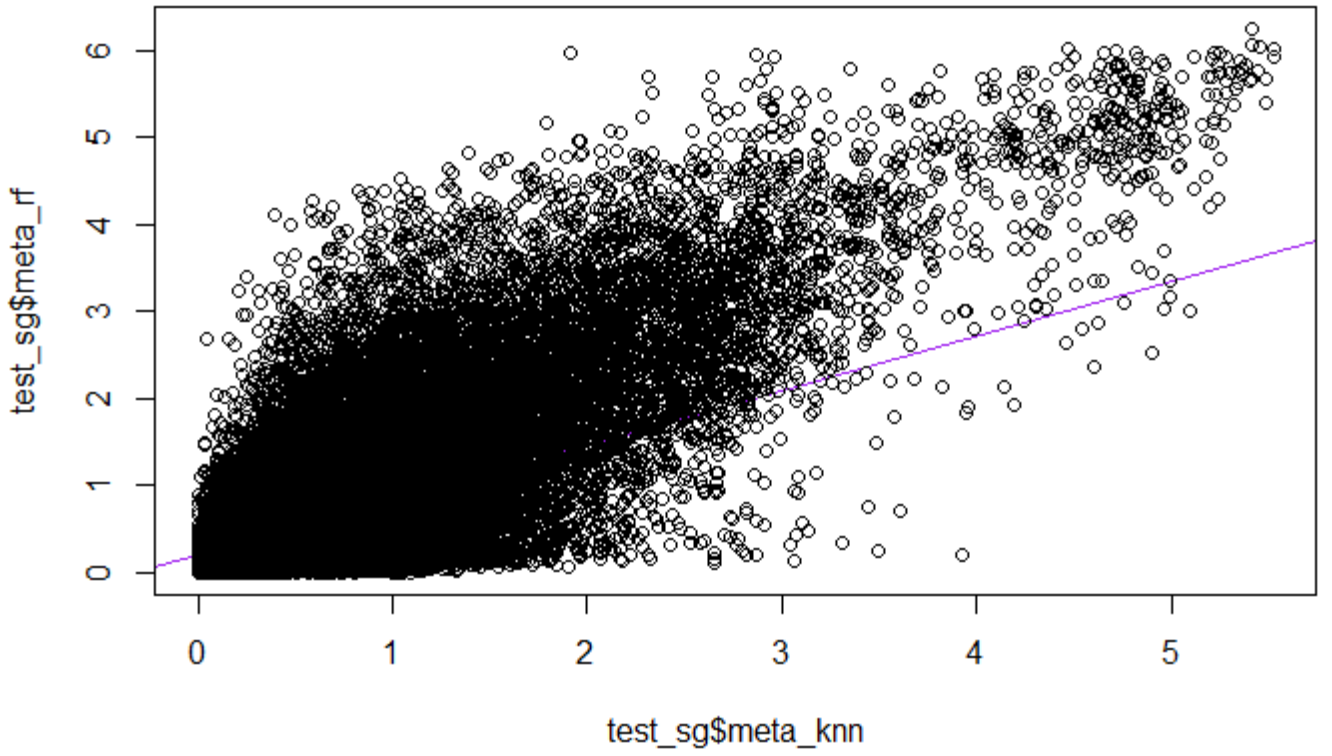
```{r}
plot(train_sg$meta_knn,train_sg$meta_rf,abline(lm(train_sg$meta_knn~train_sg$meta_rf), col="red"))
```



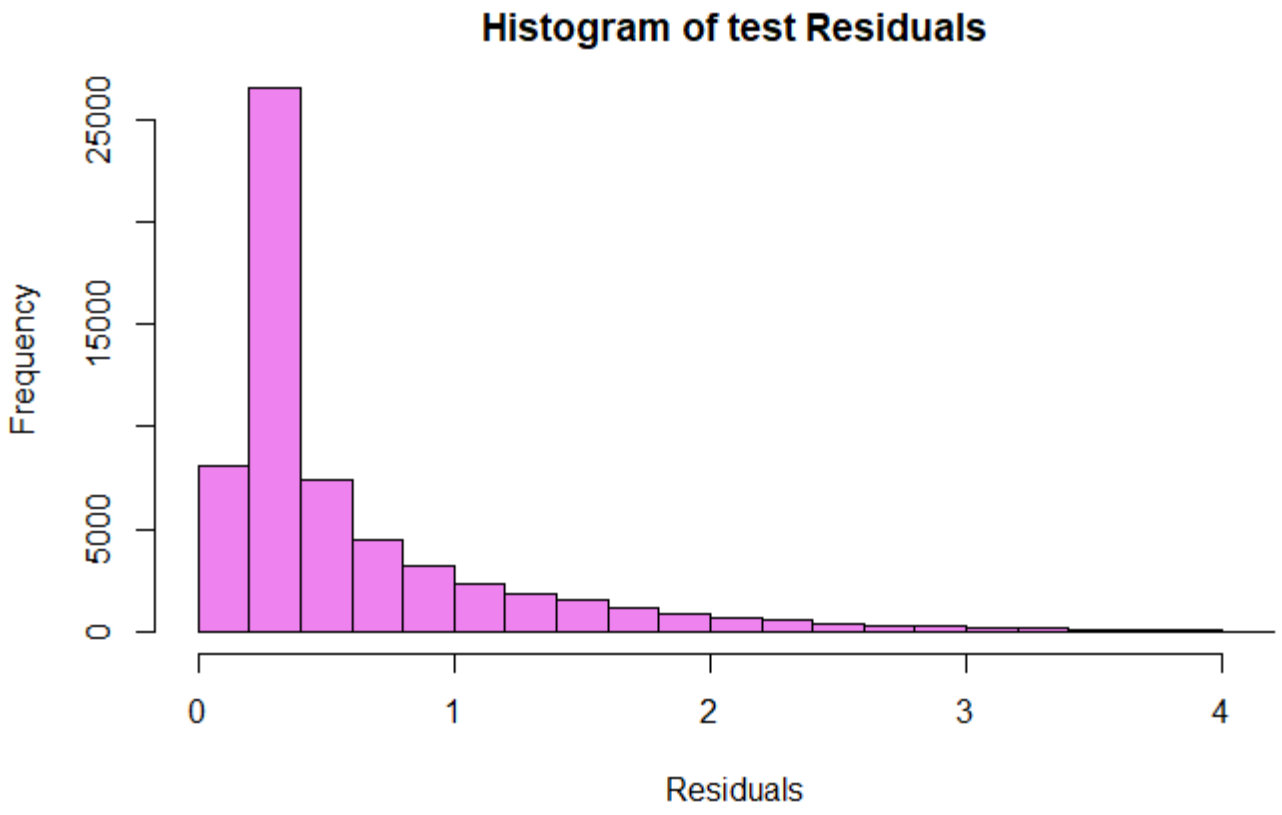

```{r}
hist(train_sg$predicted, xlab = "Residuals", main ='Histogram of train Residuals', col="yellow")
```




```{r}
plot(test_sg$meta_knn,test_sg$meta_rf,abline(lm(test_sg$meta_knn~test_sg$meta_rf), col="purple"))
```



```{r}
hist(test_sg$predicted, xlab = "Residuals", main ='Histogram of test Residuals', col="violet")
```



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.