Hotel Recommendations

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Import data

```
# Random 1% sample (241179 rows)
df_train_sample <- read.csv("data/train_sample.csv", header = TRUE)

# destination file
df_dest <- read.csv("data/destinations.csv", header = TRUE)
```

Review dataframe - Train

The data consists of the string variables 'date_time', 'srch_ci', and 'srch_co' which will not be usable by some machine learning algorithms so I'll need to break them apart if I want to use them.

```
head(df_train_sample)

##          X           date_time site_name posa_continent
user_location_country
## 1 32352134 2014-05-22 11:40:07         2              3
66
## 2 29796021 2013-06-29 12:24:37         2              3
66
## 3 15185156 2014-10-30 13:58:32         2              3
66
## 4  3301948 2014-08-22 20:14:34         2              3
66
## 5 25429119 2014-03-25 18:47:43         2              3
66
## 6 23257207 2014-07-16 08:33:24         2              3
66
##   user_location_region user_location_city orig_destination_distance
user_id
## 1                  174              24103                 2323.5232
802499
## 2                  311              25538                 2288.6121
85229
## 3                  294              40046                  587.6970
755217
## 4                  332              55121                 2234.4394
160733
## 5                  314              47869                  839.0087
```

```
1078493
## 6                   363          12346                 324.7167
380701
##   is_mobile is_package channel     srch_ci     srch_co srch_adults_cnt
## 1         0          1       9 2014-07-24 2014-07-24               2
## 2         0          0       9 2013-07-05 2013-07-09               3
## 3         0          1       9 2014-12-19 2014-12-22               2
## 4         0          1       9 2015-01-23 2015-01-30               2
## 5         0          0       9 2014-04-17 2014-04-20               4
## 6         0          0       1 2014-08-05 2014-08-11               2
##   srch_children_cnt srch_rm_cnt srch_destination_id
srch_destination_type_id
## 1                 0           1                1442
3
## 2                 1           1                8272
1
## 3                 0           1               11321
1
## 4                 0           1                1152
1
## 5                 0           1                8284
1
## 6                 0           1               11547
1
##   is_booking cnt hotel_continent hotel_country hotel_market hotel_cluster
## 1          0   1               4           125          177            44
## 2          0   1               2            50          659            59
## 3          0   1               2            50          642            22
## 4          1   1               4            47         1502            65
## 5          0   4               2            50          685             6
## 6          0   1               2            50          554            17
```

Review dataframe - Destinations

```
head(df_dest)
```

```
##   srch_destination_id        d1        d2        d3        d4        d5
## 1                   0 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2                   1 -2.181690 -2.181690 -2.181690 -2.082564 -2.181690
## 3                   2 -2.183490 -2.224164 -2.224164 -2.189562 -2.105819
## 4                   3 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5                   4 -2.189562 -2.187783 -2.194008 -2.171153 -2.152303
## 6                   5 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d6        d7        d8        d9       d10       d11       d12
## 1 -1.897627 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.165028 -2.181690 -2.181690 -2.031597 -2.181690 -2.181690 -2.181690
## 3 -2.075407 -2.224164 -2.118483 -2.140393 -2.224164 -2.209855 -2.224164
## 4 -2.115485 -2.177409 -2.177409 -2.177409 -2.177409 -2.161081 -2.177409
## 5 -2.056618 -2.194008 -2.194008 -2.145911 -2.194008 -2.089094 -2.194008
## 6 -2.155473 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##         d13       d14       d15       d16       d17       d18       d19
```

```
## 1 -2.198657 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.110723 -2.186008 -2.224164 -2.124474 -2.224164 -2.156467 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.130158 -2.177409 -2.177409 -2.177409
## 5 -2.155205 -2.070995 -2.194008 -2.074964 -2.185526 -2.194008 -2.189562
## 6 -2.174489 -2.174489 -2.174489 -2.155473 -2.174489 -2.174489 -2.174489
##          d20       d21       d22       d23       d24       d25       d26
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.224164 -2.224164 -2.224164 -2.224164 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.191779 -2.185032 -2.150215 -2.194008 -2.189233 -2.194008 -2.191631
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d27       d28       d29       d30       d31       d32       d33
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.224164 -2.153316 -2.186008 -2.224164 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.146025 -2.194008 -2.130263 -2.177813 -2.194008 -2.159651 -2.194008
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d34       d35       d36       d37       d38       d39       d40
## 1 -2.198657 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.043789 -2.181690 -2.181690 -2.181690
## 3 -2.128237 -2.158309 -2.059716 -1.910270 -2.224164 -2.123050 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.101291 -2.177409 -2.177409 -2.177409
## 5 -2.170700 -2.194008 -2.194008 -1.946523 -2.191779 -2.194008 -2.172218
## 6 -2.174489 -2.174489 -2.174489 -2.155473 -2.174489 -2.174489 -2.174489
##          d41       d42       d43       d44       d45       d46       d47
## 1 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.165028 -2.181690 -2.133508 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.154047 -2.197327 -1.945461 -2.224164 -2.224164 -2.197327 -2.166886
## 4 -2.177409 -2.177409 -2.145344 -2.177409 -2.177409 -2.177409 -2.145344
## 5 -2.188901 -2.194008 -2.109317 -2.181161 -2.175595 -2.194008 -2.180677
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d48       d49       d50       d51       d52       d53       d54
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.133508 -2.181690
## 3 -2.192009 -1.903782 -2.224164 -2.189562 -2.224164 -2.083104 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.092435 -2.194008 -2.172544 -2.194008 -2.145418 -2.194008
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d55       d56       d57       d58       d59       d60       d61
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.082564 -2.181690 -2.181690 -2.181690
## 3 -2.070096 -2.157745 -2.196379 -2.069813 -2.224164 -2.224164 -2.072953
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.115699 -2.120789 -2.188037 -2.149211 -2.194008 -2.194008 -2.191779
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d62       d63       d64       d65       d66       d67       d68
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
```

```
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.224164 -2.224164 -2.224164 -2.140393 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.185032 -2.194008 -2.194008 -2.169871 -2.194008 -2.194008
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##           d69        d70        d71        d72        d73        d74        d75
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.096550 -2.224164 -2.187529 -2.224164 -2.224164 -2.098667 -2.016373
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.167989 -2.194008 -2.158422 -2.194008 -2.191779 -2.174543 -2.180712
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##           d76        d77        d78        d79        d80        d81        d82
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.126123 -2.189562 -2.008317 -2.085827 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.177944 -2.188901 -2.165486 -2.191779 -2.145961 -2.194008 -2.187356
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##           d83        d84        d85        d86        d87        d88        d89
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.165028 -2.165028 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.218361 -2.219342 -2.224164 -2.224164 -2.160492 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.169871 -2.191715 -2.191110 -2.194008 -2.194008 -2.176134 -2.194008
## 6 -2.174489 -2.155473 -2.155473 -2.174489 -2.174489 -2.174489 -2.174489
##           d90        d91        d92        d93        d94        d95        d96
## 1 -2.198657 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.082564 -2.181690 -2.133508 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.076796 -2.224164 -1.975081 -2.166149 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.101291 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.194008 -2.194008 -1.964288 -2.176791 -2.191779 -2.191779
## 6 -2.174489 -2.174489 -2.174489 -2.155473 -2.174489 -2.174489 -2.174489
##           d97        d98        d99       d100       d101       d102       d103
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.082564 -2.181690 -2.181690 -2.181690 -2.181690 -2.165028
## 3 -2.224164 -2.224164 -2.224164 -2.163748 -2.224164 -2.072359 -2.100277
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.189562 -2.194008 -2.194008 -2.194008 -2.165889 -2.194008 -2.145988
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##          d104       d105       d106       d107       d108       d109       d110
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.148982 -2.181690 -2.181690
## 3 -2.224164 -2.203533 -2.224164 -2.224164 -2.094364 -2.224164 -2.140393
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.161081 -2.177409 -2.177409
## 5 -2.194008 -2.194008 -2.191779 -2.194008 -2.097420 -2.194008 -2.180027
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.155473 -2.174489 -2.174489
##          d111       d112       d113       d114       d115       d116       d117
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690 -2.181690
```

```
## 3 -2.224164 -2.164722 -2.224164 -2.154997 -2.197327 -2.224164 -2.197327
## 4 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.194008 -2.194008 -2.194008 -2.191779 -2.194008 -2.194008
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##        d118       d119       d120       d121       d122       d123       d124
## 1 -2.198657 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690 -2.133508 -2.181690 -2.181690
## 3 -2.224164 -2.224164 -2.197327 -2.187005 -2.026263 -2.224164 -2.224164
## 4 -2.177409 -2.177409 -2.177409 -2.115485 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.194008 -2.194008 -2.152740 -2.139178 -2.194008 -2.182305
## 6 -2.174489 -2.174489 -2.174489 -2.155473 -2.155473 -2.174489 -2.174489
##        d125       d126       d127       d128       d129       d130       d131
## 1 -2.198657 -2.198657 -2.198657 -1.897627 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.133508 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.223818 -2.224164 -2.049280 -2.189562 -2.118483 -2.145558
## 4 -2.177409 -2.177409 -2.177409 -2.161081 -2.177409 -2.177409 -2.161081
## 5 -2.194008 -2.194008 -2.194008 -2.157163 -2.194008 -2.174454 -2.139365
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##        d132       d133       d134       d135       d136       d137       d138
## 1 -1.897627 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.148982 -2.181690 -2.181690 -2.181690 -2.181690 -2.148982 -2.181690
## 3 -2.117811 -2.224164 -2.180182 -2.224164 -2.224164 -2.214572 -2.186008
## 4 -2.130158 -2.177409 -2.177409 -2.177409 -2.177409 -2.115485 -2.177409
## 5 -2.099302 -2.194008 -2.194008 -2.194008 -2.194008 -2.151470 -2.194008
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.155473 -2.174489
##        d139       d140       d141       d142       d143       d144       d145
## 1 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.165028 -2.181690 -2.165028 -2.181690 -2.181690 -2.165028
## 3 -2.191569 -2.224164 -2.224164 -2.196379 -2.224164 -2.192009 -2.224164
## 4 -2.161081 -2.161081 -2.177409 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.163242 -2.187356 -2.194008 -2.191779 -2.194008 -2.194008 -2.185161
## 6 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489 -2.174489
##        d146       d147       d148       d149
## 1 -2.198657 -2.198657 -2.198657 -2.198657
## 2 -2.181690 -2.181690 -2.181690 -2.181690
## 3 -2.224164 -2.224164 -2.224164 -2.057548
## 4 -2.177409 -2.177409 -2.177409 -2.177409
## 5 -2.194008 -2.194008 -2.194008 -2.188037
## 6 -2.174489 -2.174489 -2.174489 -2.174489
```

Review structure - Train

```
str(df_train_sample)
```

```
## 'data.frame':    241179 obs. of  25 variables:
##  $ X                       : int  32352134 29796021 15185156 3301948
25429119 23257207 7223820 8978014 35823442 7791597 ...
##  $ date_time               : Factor w/ 240445 levels "2013-01-07
00:08:30",..: 118546 34623 204954 167036 95596 144881 153396 118972 6482
68341 ...
##  $ site_name               : int  2 2 2 2 2 2 2 2 2 34 ...
```

```
##   $ posa_continent        : int   3 3 3 3 3 3 3 3 3 3 ...
##   $ user_location_country : int   66 66 66 66 66 66 66 66 66 205 ...
##   $ user_location_region  : int   174 311 294 332 314 363 184 442 314 135
...
##   $ user_location_city    : int   24103 25538 40046 55121 47869 12346
26602 12416 18442 27655 ...
##   $ orig_destination_distance: num   2324 2289 588 2234 839 ...
##   $ user_id               : int   802499 85229 755217 160733 1078493
380701 786061 77941 397526 1194667 ...
##   $ is_mobile             : int   0 0 0 0 0 0 0 0 0 0 ...
##   $ is_package            : int   1 0 1 1 0 0 0 0 0 0 ...
##   $ channel               : int   9 9 9 9 9 1 3 9 0 5 ...
##   $ srch_ci               : Factor w/ 1085 levels "2013-01-07","2013-01-
08",..: 564 180 712 747 466 576 576 503 44 360 ...
##   $ srch_co               : Factor w/ 1094 levels "2013-01-08","2013-01-
09",..: 563 183 714 753 468 581 576 504 46 360 ...
##   $ srch_adults_cnt       : int   2 3 2 2 4 2 5 2 2 4 ...
##   $ srch_children_cnt     : int   0 1 0 0 0 0 1 0 0 1 ...
##   $ srch_rm_cnt           : int   1 1 1 1 1 1 1 1 1 2 ...
##   $ srch_destination_id   : int   1442 8272 11321 1152 8284 11547 1901
8243 49086 26466 ...
##   $ srch_destination_type_id : int   3 1 1 1 1 1 1 1 6 6 ...
##   $ is_booking            : int   0 0 0 1 0 0 0 0 0 1 ...
##   $ cnt                   : int   1 1 1 1 4 1 4 1 1 1 ...
##   $ hotel_continent       : int   4 2 2 4 2 2 2 2 2 2 ...
##   $ hotel_country         : int   125 50 50 47 50 50 198 50 50 198 ...
##   $ hotel_market          : int   177 659 642 1502 685 554 401 409 685
1625 ...
##   $ hotel_cluster         : int   44 59 22 65 6 17 73 25 25 63 ...
```

Review structure - Destinations
```
str(df_dest)
```

```
## 'data.frame':    62106 obs. of  150 variables:
##   $ srch_destination_id: int   0 1 2 3 4 5 6 7 8 9 ...
##   $ d1                 : num   -2.2 -2.18 -2.18 -2.18 -2.19 ...
##   $ d2                 : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
##   $ d3                 : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
##   $ d4                 : num   -2.2 -2.08 -2.19 -2.18 -2.17 ...
##   $ d5                 : num   -2.2 -2.18 -2.11 -2.18 -2.15 ...
##   $ d6                 : num   -1.9 -2.17 -2.08 -2.12 -2.06 ...
##   $ d7                 : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
##   $ d8                 : num   -2.2 -2.18 -2.12 -2.18 -2.19 ...
##   $ d9                 : num   -1.9 -2.03 -2.14 -2.18 -2.15 ...
##   $ d10                : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
##   $ d11                : num   -2.2 -2.18 -2.21 -2.16 -2.09 ...
##   $ d12                : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
##   $ d13                : num   -2.2 -2.18 -2.11 -2.18 -2.16 ...
##   $ d14                : num   -2.2 -2.18 -2.19 -2.18 -2.07 ...
##   $ d15                : num   -2.2 -2.18 -2.22 -2.18 -2.19 ...
```

```
##  $ d16                 : num  -1.9 -2.18 -2.12 -2.13 -2.07 ...
##  $ d17                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d18                 : num  -2.2 -2.18 -2.16 -2.18 -2.19 ...
##  $ d19                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d20                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d21                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d22                 : num  -2.2 -2.18 -2.22 -2.18 -2.15 ...
##  $ d23                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d24                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d25                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d26                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d27                 : num  -2.2 -2.18 -2.22 -2.18 -2.15 ...
##  $ d28                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d29                 : num  -2.2 -2.18 -2.15 -2.18 -2.13 ...
##  $ d30                 : num  -2.2 -2.18 -2.19 -2.18 -2.18 ...
##  $ d31                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d32                 : num  -2.2 -2.18 -2.22 -2.18 -2.16 ...
##  $ d33                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d34                 : num  -2.2 -2.18 -2.13 -2.18 -2.17 ...
##  $ d35                 : num  -2.2 -2.18 -2.16 -2.18 -2.19 ...
##  $ d36                 : num  -2.2 -2.18 -2.06 -2.18 -2.19 ...
##  $ d37                 : num  -1.9 -2.04 -1.91 -2.1 -1.95 ...
##  $ d38                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d39                 : num  -2.2 -2.18 -2.12 -2.18 -2.19 ...
##  $ d40                 : num  -2.2 -2.18 -2.22 -2.18 -2.17 ...
##  $ d41                 : num  -2.2 -2.17 -2.15 -2.18 -2.19 ...
##  $ d42                 : num  -2.2 -2.18 -2.2 -2.18 -2.19 ...
##  $ d43                 : num  -1.9 -2.13 -1.95 -2.15 -2.11 ...
##  $ d44                 : num  -2.2 -2.18 -2.22 -2.18 -2.18 ...
##  $ d45                 : num  -2.2 -2.18 -2.22 -2.18 -2.18 ...
##  $ d46                 : num  -2.2 -2.18 -2.2 -2.18 -2.19 ...
##  $ d47                 : num  -2.2 -2.18 -2.17 -2.15 -2.18 ...
##  $ d48                 : num  -2.2 -2.18 -2.19 -2.18 -2.19 ...
##  $ d49                 : num  -2.2 -2.18 -1.9 -2.18 -2.09 ...
##  $ d50                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d51                 : num  -2.2 -2.18 -2.19 -2.18 -2.17 ...
##  $ d52                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d53                 : num  -2.2 -2.13 -2.08 -2.18 -2.15 ...
##  $ d54                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d55                 : num  -2.2 -2.18 -2.07 -2.18 -2.12 ...
##  $ d56                 : num  -2.2 -2.18 -2.16 -2.18 -2.12 ...
##  $ d57                 : num  -2.2 -2.18 -2.2 -2.18 -2.19 ...
##  $ d58                 : num  -2.2 -2.08 -2.07 -2.18 -2.15 ...
##  $ d59                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d60                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d61                 : num  -2.2 -2.18 -2.07 -2.18 -2.19 ...
##  $ d62                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d63                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d64                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d65                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
```

```
##  $ d66                 : num  -2.2 -2.18 -2.14 -2.18 -2.17 ...
##  $ d67                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d68                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d69                 : num  -2.2 -2.18 -2.1 -2.18 -2.17 ...
##  $ d70                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d71                 : num  -2.2 -2.18 -2.19 -2.18 -2.16 ...
##  $ d72                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d73                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d74                 : num  -2.2 -2.18 -2.1 -2.18 -2.17 ...
##  $ d75                 : num  -2.2 -2.18 -2.02 -2.18 -2.18 ...
##  $ d76                 : num  -2.2 -2.18 -2.22 -2.18 -2.18 ...
##  $ d77                 : num  -2.2 -2.18 -2.13 -2.18 -2.19 ...
##  $ d78                 : num  -2.2 -2.18 -2.19 -2.18 -2.17 ...
##  $ d79                 : num  -2.2 -2.18 -2.01 -2.18 -2.19 ...
##  $ d80                 : num  -2.2 -2.18 -2.09 -2.18 -2.15 ...
##  $ d81                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d82                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d83                 : num  -2.2 -2.18 -2.22 -2.18 -2.17 ...
##  $ d84                 : num  -2.2 -2.17 -2.22 -2.18 -2.19 ...
##  $ d85                 : num  -2.2 -2.17 -2.22 -2.18 -2.19 ...
##  $ d86                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d87                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d88                 : num  -2.2 -2.18 -2.16 -2.18 -2.18 ...
##  $ d89                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d90                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d91                 : num  -2.2 -2.08 -2.08 -2.18 -2.19 ...
##  $ d92                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d93                 : num  -1.9 -2.13 -1.98 -2.1 -1.96 ...
##  $ d94                 : num  -2.2 -2.18 -2.17 -2.18 -2.18 ...
##  $ d95                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d96                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d97                 : num  -2.2 -2.18 -2.22 -2.18 -2.19 ...
##  $ d98                 : num  -2.2 -2.08 -2.22 -2.18 -2.19 ...
##   [list output truncated]
```

Histogram of 'hotel_cluster'

```r
hist(df_train_sample$hotel_cluster,
     main = "Distribution of 'hotel_cluster'",
     xlab = "Hotel Cluster",
     col = "lightblue"
     )
```

Distribution of 'hotel_cluster'