Almost Famous

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1 Complete Web Data

Load variable names and types:

```
nameTypeDataFile  <- "../../data/raw_variables.csv"
variableNames <- read.csv(nameTypeDataFile, header=TRUE, stringsAsFactors=FALSE)
variableNames

##          name      type
## 1    visit_id    factor
## 2         uid    factor
## 3    campaign    factor
## 4      tstamp character
## 5 experiments    factor
## 6      action    factor
## 7       query    factor

factorIdx <- which(variableNames$type=="factor")
factorNames <- variableNames$name[factorIdx]
```

Read the complete web.log data:

```
webFile <- "../../data/web.csv"
webData <- read.csv(webFile, stringsAsFactors=FALSE, col.names=variableNames$name,
                    colClasses=variableNames$type, na.strings=c("NA",""))
webData$tstamp <- as.POSIXct(webData$tstamp)
str(webData)

## 'data.frame': 1723198 obs. of  7 variables:
##  $ visit_id   : Factor w/ 1482602 levels "10000024498",..: 126058 35633 1476965 180008 350306 392666
##  $ uid        : Factor w/ 1064214 levels "100000493","100000682",..: 875323 929856 13447 732794 4784
##  $ campaign   : Factor w/ 10 levels "103","127","14",..: 10 8 1 9 7 8 3 1 10 7 ...
##  $ tstamp     : POSIXct, format: "2014-09-15 00:00:01" "2014-09-15 00:00:02" ...
##  $ experiments: Factor w/ 4 levels "[1 3]","[1 4]",..: 3 1 1 2 4 1 2 3 2 3 ...
##  $ action     : Factor w/ 4 levels "adclick","landed",..: 2 2 2 2 2 2 2 2 2 2 ...
##  $ query      : Factor w/ 5 levels "advanced analytics",..: 4 5 5 1 1 5 2 5 4 1 ...
```

Look at a summary for the complete web data:

```
summary(webData)

##         visit_id                uid              campaign          tstamp
##  10005995241:      4   150912145:     21   558     :324872   Min.   :2014-09-15 00:00:01
##  10007093336:      4   102486699:     20   103     :324027   1st Qu.:2014-09-18 16:27:55
##  10022577884:      4   119422118:     20   59      :232002   Median :2014-09-22 16:44:39
##  10028728616:      4   114505409:     19   31      :231685   Mean   :2014-09-22 20:28:52
##  10033932695:      4   115511329:     18   127     : 92681   3rd Qu.:2014-09-26 19:36:53
##  10035022625:      4   143033896:     18   (Other):277335   Max.   :2014-09-30 23:57:08
##  (Other)    :1723174   (Other)  :1723082   NA's    :240596
##  experiments        action                                 query
##  [1 3]:430493   adclick: 103896   advanced analytics        :463687
##  [1 4]:431589   landed :1482602   building predictive models: 92454
##  [2 3]:431090   order  :  47348   data science              : 92445
##  [2 4]:430026   signup :  89352   data science training     :185117
##                                   predictive modeling       :648899
##                                   NA's                      :240596
##
```

2 Reduced Web Data

Now reduce the web log data to the top 2000 entries just to get an impression.

```
rm(webData)
webFile <- "../../data/head2000.csv"
webData <- read.csv(webFile, stringsAsFactors=FALSE, col.names=variableNames$name,
                    colClasses=variableNames$type, na.strings=c("NA",""))
webData$tstamp <- as.POSIXct(webData$tstamp)
str(webData)

## 'data.frame': 2000 obs. of  7 variables:
##  $ visit_id   : Factor w/ 1719 levels "10040801398",..: 158 43 1712 223 433 477 37 69 176 590 ...
##  $ uid        : Factor w/ 1719 levels "100007286","100049500",..: 1417 1513 31 1183 773 1222 1468 159
##  $ campaign   : Factor w/ 10 levels "103","127","14",..: 10 8 1 9 7 8 3 1 10 7 ...
##  $ tstamp     : POSIXct, format: "2014-09-15 00:00:01" "2014-09-15 00:00:02" ...
##  $ experiments: Factor w/ 4 levels "[1 3]","[1 4]",..: 3 1 1 2 4 1 2 3 2 3 ...
##  $ action     : Factor w/ 4 levels "adclick","landed",..: 2 2 2 2 2 2 2 2 2 2 ...
##  $ query      : Factor w/ 5 levels "advanced analytics",..: 4 5 5 1 1 5 2 5 4 1 ...
```

Caution: Running the following analysis with all web.log data locally will kill the Mac! Add variable with the total time spent per visit, `total_time_spent`, and `time_diff` indicating the seconds that passed inbetween the logged entries within a visit:

```
require(plyr)
library(doMC)
registerDoMC(cores=detectCores())
webData <- ddply(webData, .(visit_id), mutate,
                 total_time_spent=max(tstamp)-min(tstamp),
                 time_diff=c(NA,diff(tstamp)),
                 .parallel=TRUE)
viewExample(webData,"web")
```

```
##       visit_id       uid campaign              tstamp experiments action
## 850 4789307146 179647219      103 2014-09-15 00:07:53       [2 4] landed
## 851 4789307146 179647219     <NA> 2014-09-15 00:09:33       [2 4] signup
##                  query total_time_spent time_diff
## 850 predictive modeling    1.666667 secs        NA
## 851                <NA>    1.666667 secs  1.666667
```

Look at a summary per visit for the web data:

```
webAggVisits <- aggregatePerVisit(webData)
summary(webAggVisits)
```

```
##         visit_id      nb_entries           uid          campaign   nb_experiments
##  10040801398:   1   Min.   :1.000   100007286:   1   103    :384   [1 3]:409
##  10060610948:   1   1st Qu.:1.000   100049500:   1   558    :373   [1 4]:424
##  10109427525:   1   Median :1.000   100181847:   1   31     :264   [2 3]:460
##  10278786916:   1   Mean   :1.163   100307194:   1   59     :260   [2 4]:426
##  10296243639:   1   3rd Qu.:1.000   100323489:   1   127    :107
##  10342204026:   1   Max.   :4.000   100340661:   1   94     :107
##  (Other)    :1713                   (Other)  :1713   (Other):224
##                             actions                             queries    median_time_diff
##  landed                         :1491   advanced analytics          :524   Min.   :  1.000
##  landed,signup                  : 101   building predictive models:113   1st Qu.:  2.533
##  landed,order                   :  50   data science                :111   Median :  4.075
##  landed,adclick                 :  40   data science training       :214   Mean   : 10.335
##  landed,adclick,adclick         :  18   predictive modeling         :757   3rd Qu.:  8.000
##  landed,adclick,adclick,adclick:  16                                       Max.   :114.000
##  (Other)                        :   3                                      NA's   :1491
```

```
viewAggExample(webAggVisits, "web", "visit")
```

```
##        visit_id nb_entries      uid campaign nb_experiments      actions
## 1492 8786064200          2 17968217      103          [2 4] landed,order
##                   queries median_time_diff
## 1492 predictive modeling              2.4
```

Look at a summary per uid (supposedly user) for the web data:

```
webAggUids <- aggregatePerUid(webData)
summary(webAggUids)
```

```
##         uid          nb_entries           visit_ids       campaign   nb_experiments
##  100007286:   1   Min.   :1.000   10040801398:   1   103    :384   [1 3]:409
##  100049500:   1   1st Qu.:1.000   10060610948:   1   558    :373   [1 4]:424
##  100181847:   1   Median :1.000   10109427525:   1   31     :264   [2 3]:460
##  100307194:   1   Mean   :1.163   10278786916:   1   59     :260   [2 4]:426
##  100323489:   1   3rd Qu.:1.000   10296243639:   1   127    :107
##  100340661:   1   Max.   :4.000   10342204026:   1   94     :107
##  (Other)  :1713                   (Other)    :1713   (Other):224
##                            actions                           queries    median_time_diff
##  landed                        :1491   advanced analytics        :524   Min.   :  1.000
##  landed,signup                 : 101   building predictive models:113   1st Qu.:  2.533
##  landed,order                  :  50   data science              :111   Median :  4.075
##  landed,adclick                :  40   data science training     :214   Mean   : 10.335
##  landed,adclick,adclick        :  18   predictive modeling       :757   3rd Qu.:  8.000
##  landed,adclick,adclick,adclick:  16                                    Max.   :114.000
##  (Other)                       :   3                                    NA's   :1491
```

```
viewAggExample(webAggUids, "web", "uid")
```

```
##           uid nb_entries  visit_ids campaign nb_experiments
## 110 110827261          4 9909532485       31          [2 3]
##                            actions            queries median_time_diff
## 110 landed,adclick,adclick,adclick advanced analytics                9
```

3 Spam Data

Read spam data:

```
spamFile <- "../../data/spam.csv"
spamData <- read.csv(spamFile, stringsAsFactors=FALSE, col.names=variableNames$name,
                     colClasses=variableNames$type, na.strings=c("NA",""))
spamData$tstamp <- as.POSIXct(spamData$tstamp)
str(spamData)
```

```
## 'data.frame': 4404 obs. of  7 variables:
##  $ visit_id   : Factor w/ 1482 levels "10199862810",..: 146 146 130 130 130 602 602 602 602 1409 ...
##  $ uid        : Factor w/ 1060 levels "100191","100547",..: 1038 1038 238 238 238 9 9 9 9 320 ...
##  $ campaign   : Factor w/ 10 levels "103","127","14",..: 6 NA 6 NA NA 1 NA NA NA 1 ...
##  $ tstamp     : POSIXct, format: "2014-09-15 00:06:27" "2014-09-15 00:06:33" ...
##  $ experiments: Factor w/ 4 levels "[1 3]","[1 4]",..: 3 3 4 4 4 2 2 2 2 3 ...
##  $ action     : Factor w/ 2 levels "adclick","landed": 2 1 2 1 1 2 1 1 1 2 ...
##  $ query      : Factor w/ 5 levels "advanced analytics",..: 3 NA 3 NA NA 5 NA NA NA 5 ...
```

I again add a variable `time_spent` and
look at a summary of the spam data:

```
summary(spamData)
```

```
##         visit_id          uid          campaign         tstamp
##  1097758223 :   4   180718 :  14   103     : 339   Min.   :2014-09-15 00:06:27
##  1101067381 :   4   152118 :  12   558     : 303   1st Qu.:2014-09-18 22:06:23
##  11428883192:   4   23119  :  12   31      : 221   Median :2014-09-23 03:00:47
##  1191433828 :   4   8235   :  12   59      : 217   Mean   :2014-09-23 00:33:30
##  12119332951:   4   86179  :  12   127     : 106   3rd Qu.:2014-09-27 04:53:49
##  12160456931:   4   12204  :  11   (Other): 296   Max.   :2014-09-30 23:52:15
##  (Other)     :4380  (Other):4331   NA's    :2922
##  experiments      action                              query      total_time_spent
##  [1 3]:1135   adclick:2922   advanced analytics        : 438   Min.   : 1.00
##  [1 4]:1153   landed :1482   building predictive models:  96   1st Qu.: 8.00
##  [2 3]:1054                  data science              : 102   Median :12.00
##  [2 4]:1062                  data science training     : 204   Mean   :12.32
##                              predictive modeling       : 642   3rd Qu.:17.00
##                              NA's                      :2922   Max.   :29.00
##
##    time_diff
##  Min.   : 1.000
##  1st Qu.: 3.000
##  Median : 6.000
##  Mean   : 5.636
##  3rd Qu.: 8.000
##  Max.   :10.000
##  NA's   :1482
```

Look at a summary per visit for the spam data:

```
spamAggVisits <- aggregatePerVisit(spamData)
summary(spamAggVisits)

##         visit_id      nb_entries         uid          campaign   nb_experiments
##  10199862810:   1   Min.   :2.000   152118 :   4   103    :339   [1 3]:382
##  10219041924:   1   1st Qu.:2.000   176470 :   4   558    :303   [1 4]:384
##  10346637545:   1   Median :3.000   180718 :   4   31     :221   [2 3]:353
##  10427993218:   1   Mean   :2.972   62370  :   4   59     :217   [2 4]:363
##  10441154073:   1   3rd Qu.:4.000   86179  :   4   127    :106
##  10485842186:   1   Max.   :4.000   93067  :   4   94     : 98
##  (Other)    :1476                   (Other):1458   (Other):198
##                             actions                          queries    median_time_diff
##  landed,adclick                :509   advanced analytics        :438   Min.   : 1.000
##  landed,adclick,adclick        :506   building predictive models: 96   1st Qu.: 4.000
##  landed,adclick,adclick,adclick:467   data science              :102   Median : 6.000
##                                       data science training     :204   Mean   : 5.659
##                                       predictive modeling       :642   3rd Qu.: 7.500
##                                                                        Max.   :10.000
##

viewAggExample(spamAggVisits, "spam", "visit")

##        visit_id nb_entries    uid campaign nb_experiments                        actions
## 754 54864188974          4 193279       59          [2 4] landed,adclick,adclick,adclick
##                 queries median_time_diff
## 754 advanced analytics                3
```

Look at a summary per uid (supposedly user) for the spam data:

```
spamAggUids <- aggregatePerUid(spamData)
summary(spamAggUids)

##       uid         nb_entries                       visit_ids       campaign
##  100191 :   1   Min.   : 2.000   10199862810            :   1   103    :180
##  100547 :   1   1st Qu.: 3.000   10219041924            :   1   558    :158  
##  10060  :   1   Median : 4.000   10346637545,9973480327 :   1   31     :112  
##  101345 :   1   Mean   : 4.155   10427993218            :   1   59     :112  
##  101493 :   1   3rd Qu.: 5.000   10441154073,62074161015:   1   94     : 52  
##  101645 :   1   Max.   :14.000   10485842186            :   1   127    : 49  
##  (Other):1054                    (Other)                :1054   (Other):397  
##  nb_experiments                                            actions   
##  [1 3]:265      landed,adclick                                 :245  
##  [1 4]:275      landed,adclick,adclick                         :245  
##  [2 3]:256      landed,adclick,adclick,adclick                 :234  
##  [2 4]:264      landed,adclick,landed,adclick,adclick          : 36  
##                 landed,adclick,adclick,adclick,landed,adclick: 35  
##                 landed,adclick,adclick,landed,adclick,adclick: 32  
##                 (Other)                                        :233  
##                                       queries    median_time_diff
##  predictive modeling                      :373   Min.   : 1.000  
##  advanced analytics                       :236   1st Qu.: 4.000  
##  data science training                    :104   Median : 6.000  
##  data science                             : 51   Mean   : 5.694  
##  building predictive models               : 48   3rd Qu.: 7.500  
##  predictive modeling,advanced analytics: 44   Max.   :10.000  
##  (Other)                                  :204
```

```
viewAggExample(spamAggUids, "spam", "uid")
```

```
##        uid nb_entries                           visit_ids campaign nb_experiments
## 539 188071          8 44678193401,45541719747,73898419674   31,558          [1 4]
##                                                          actions
## 539 landed,adclick,landed,adclick,landed,adclick,adclick,adclick
##                                       queries median_time_diff
## 539 advanced analytics,predictive modeling                5
```

Write out a file which can be processed by Spark, meaning all factors as numeric values. Also `unclass` factors with digits as levels to have resulting variables on roughly the same scale:

```
numericSpamVisits <- data.frame(visit_id=spamAggVisits$visit_id,
                                nb_actions=spamAggVisits$nb_entries,
                                uid=unclass(spamAggVisits$uid),
                                campaign=unclass(spamAggVisits$campaign),
                                actions=unclass(spamAggVisits$actions),
                                queries=unclass(spamAggVisits$queries),
                                median_time_diff=spamAggVisits$median_time_diff)
head(numericSpamVisits)
```

```
##      visit_id nb_actions  uid campaign actions queries median_time_diff
## 1 10199862810          2 1053        1       1       5              8.0
## 2 10219041924          3  244        8       2       5              7.5
## 3 10346637545          2  745       10       1       4              7.0
## 4 10427993218          3   95        6       2       3              4.5
## 5 10441154073          3  324        8       2       5              4.0
## 6 10485842186          3  431        7       2       1              4.5
```

```
write.csv(numericSpamVisits, file="out/visits/spam_visits_numeric.csv", row.names=FALSE)
```

Also write the level mapping in to files:

```
writeLevelMappingToFile(spamAggVisits, "uid", getMapFileName("uid","spam"))
writeLevelMappingToFile(spamAggVisits, "campaign", getMapFileName("campaign","spam"))
writeLevelMappingToFile(spamAggVisits, "actions", getMapFileName("actions","spam"))
writeLevelMappingToFile(spamAggVisits, "queries", getMapFileName("queries","spam"))
```