Guessing the Washington Michelin stars

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Executive Summary

Objective: Predict the result of the newly created Michelin guide for the Washington, DC area. The outcome will include a) the number of restaurants stared, the name of restaurants with their corresponding stars (1, 2 or 3)

Approach: Collect data for Restaurants in the other US cities where a Michelin guide already exist, explore for each of them the publicly available information, select the most relevant dataset and come up with a predictive algorithm (FYI no personal opinion just data science).

Tech stack Used R and Knit Markdown (Rmd extension) with R libraries (httr, jsonlite & XML) to integrate documentation with code and generate the pdf doc.

The multi-step process is described below:

Base Geo. Dataset

1. Enter General area demographic in csv file with the following data point: Number of Restaurants in city, Number of Restaurants in the metro area, City Population, Metro population, Average Income and number of stared restaurants.
2. Run simple model to predict number of stars to be awared in the Washington DC area.

Enriching the 2 datasets

1. Collect the names of currently awarded restaurants along with the number of stars for New-York, Chicago and San-Francisco.
2. To better predict a sample of non-awarded restaurants are randomly selected. They were labeled as 0 stared restaurants. All restaurants of existing Michelin US areas are saved in a .csv file and will be mentionned as "training" data.
3. Collect restaurants widely selected that are potential candidates for a Michelin award in the Washington DC area
4. Collect in the preeminent local press the professional gastronomy reviews. We will collect the number of review along with the year of the review and the number of time the restaurants was mention in the dailies archives. The news organism selected were the New-York Times, the Chicago Tribunes and the San-Francisco Chronicle.
5. Collect customers reviews and rating from the Yelp web site.

Polishing the DC dataset

1. Removing the bib gourmand from the test dataset.
2. Removing entries with no reviews

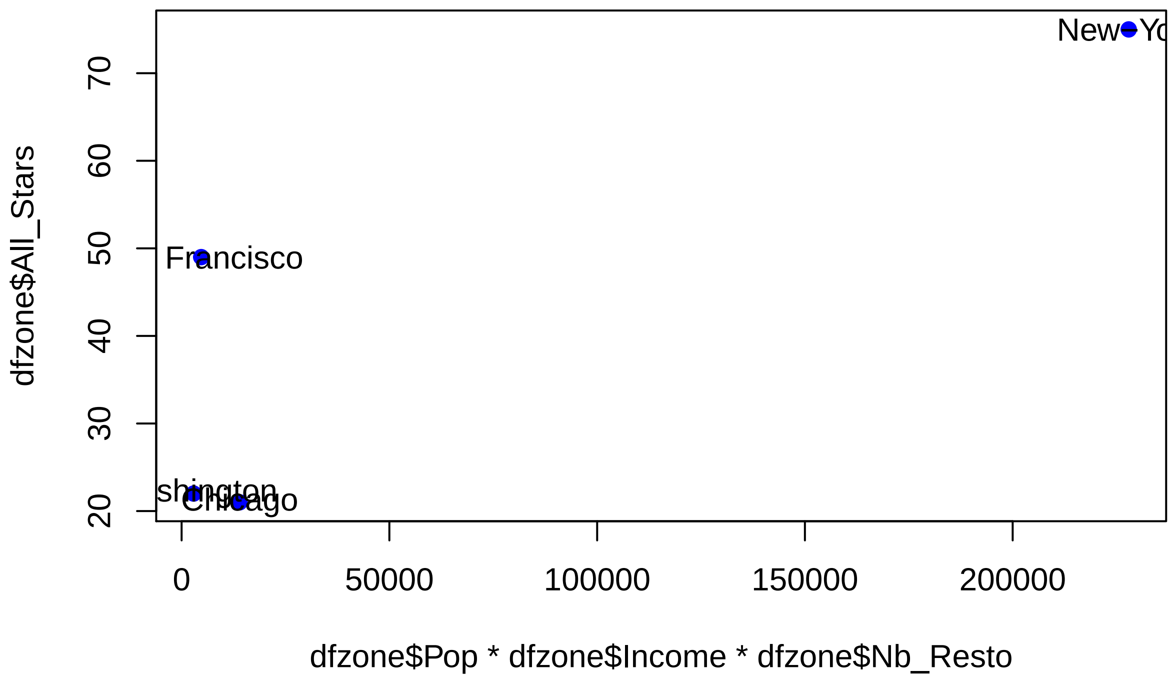
Analysing the Data

1. Use linear regression to determine a model based on the data collected above.
2. Collect restaurants from the Washington area.
3. Run the model selected and order the restaurants.
4. Using demographic information and number of restaurant in each collective area weight by the average customer rating estimate the number of 3,2 and 1 stars restaurant to be anticipated.
5. Give an arbitrary value to the Restaurant type based on occurence in training dataset
6. Assign a "novelty factor" to the Washington DC area as less restaurant can be expected the first year a guide is publish
7. Ranked list and determine the "winners"…

Detail and code

Base Geo Dataset

The simple plot below, shows the correlation between stared restaurants with the selected multiple criteria that are: City Population, Metro Population, Income and Number of "Quality" restaurants. San Francisco appears at an outlier in several ways (not for this discussion)



(code hidden)

Collect other local restaurants in Existing US Michelin guide areas, and save as training dataset

```r
name = paste( c( "/Users/bdolimier/persodev/michelinDC/output/usa2016_result.csv" )  )
usadata <- read.csv( name , header=TRUE, stringsAsFactors=FALSE , sep = ",")
dfusa <- as.data.frame( usadata )
dfusa <- dfusa[ -c(1) ]
myIndex <- length( dfusa[[1]])

# Take zz pages sample...
for ( zz in 1:4) {
  if (zz==1) zone <- "New-York"
  if (zz==2) zone <- "Chicago"
  if (zz==3) zone <- "San Francisco"
  if (zz==4) zone <- "Washington"
  zoneEncode <- URLencode(  toString( zone ) )

  # Get sorted by rating the 2 price points 4 and 3
  for ( price in 3:4) {
    for ( page in 0:15 ) {
      start <- page * 10
      YcacheName <- paste0( "/Users/bdolimier/persodev/michelinDC/cache/" , "YELP_COLLECT_", zone,"_", p

      # Reading the cache
      html.raw<-htmlTreeParse( YcacheName, useInternalNodes=T )
      nbc <- nchar( as( html.raw , "character") )
      nbc
      # Not cached let's ask Yelp
      if ( nbc < 300 ) {
         query=paste0( "https://www.yelp.com/search?find_desc=Restaurants+&find_loc=",zoneEncode,"&start
         download.file( query , destfile = YcacheName , method="curl")
         html.raw<-htmlTreeParse( YcacheName, useInternalNodes=T )
      }

      bizName <- xpathSApply(html.raw , "//span[@class='indexed-biz-name']", xmlValue)
      bizName <- gsub( "Restaurant" , "" , bizName  )
      bizName <- gsub( "\n" , "" , bizName  )
      bizName <- gsub( "\\." , "" , bizName  )
      bizName <- gsub( "  " , "" , bizName  )
      nb <- length( bizName )
      if ( nb > 0 ) {
        for ( jj in 1:nb) {
          bizName[jj] <- gsub( paste0(start+jj," ") , "" , bizName[jj]  )
          myIndex = myIndex + 1
          dfusa[ myIndex ,] <- c("","","",0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0)
          dfusa$Restaurant[myIndex] <- bizName[jj]
          dfusa$Zone[myIndex] <- zone
          dfusa$Ypricing[myIndex] <- price
          print ( bizName[jj] )
        }
      }
    }
  }
}
View( dfusa )
write.csv( as.data.frame(dfusa) , file = "/Users/bdolimier/persodev/michelinDC/output/michelin2016_trai
```

Collect restaurants in the targetted area Washington DC and save as target dataset

```
name = paste( c( "/Users/bdolimier/persodev/michelinDC/output/michelin2016_washington.csv" )  )
usadata <- read.csv( name , header=TRUE, stringsAsFactors=FALSE , sep = ",")
dfusa <- as.data.frame( usadata )
dfusa <- dfusa[ -c(1) ]
myIndex <- length( dfusa[[1]])

zone <- "Washington"
zoneEncode <- URLencode(  toString( zone ) )

# Get sorted by rating the 2 price points 4 and 3
for ( price in 3:4) {
  for ( page in 0:15 ) {
    start <- page * 10
    YcacheName <- paste0( "/Users/bdolimier/persodev/michelinDC/cache/" , "YELP_COLLECT_", zone,"_", pr

    # Reading the cache
    html.raw<-htmlTreeParse( YcacheName, useInternalNodes=T )
    nbc <- nchar( as( html.raw , "character") )
    nbc
    # Not cached let's ask Yelp
    if ( nbc < 300 ) {
       query=paste0( "https://www.yelp.com/search?find_desc=Restaurants+&find_loc=",zoneEncode,"&start=
       download.file( query , destfile = YcacheName , method="curl")
       html.raw<-htmlTreeParse( YcacheName, useInternalNodes=T )
    }

    bizName <- xpathSApply(html.raw , "//span[@class='indexed-biz-name']", xmlValue)
    bizName <- gsub( "Restaurant" , "" , bizName  )
    bizName <- gsub( "\n" , "" , bizName  )
    bizName <- gsub( "\\." , "" , bizName  )
    bizName <- gsub( "  " , "" , bizName  )
    nb <- length( bizName )
    if ( nb > 0 ) {
      for ( jj in 1:nb) {
        bizName[jj] <- gsub( paste0(start+jj," ") , "" , bizName[jj]  )
        myIndex = myIndex + 1
        dfusa[ myIndex ,] <- c("","","",0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0)
        dfusa$Restaurant[myIndex] <- bizName[jj]
        dfusa$Zone[myIndex] <- zone
        dfusa$Ypricing[myIndex] <- price
        print ( bizName[jj] )
      }
    }
  }
}

View( dfusa )
write.csv( as.data.frame(dfusa) , file = "/Users/bdolimier/persodev/michelinDC/output/michelin2016_wash
```

Get Restaurant press review from NewYork Times, Chicago Tribunes & SanFrancisco Chronicle

Using google apis Populating the fields: dfusa$art2016, art2015, art2014, artBefore (older than 2014), dateUNKNOWN

```
## Engine id:
dcId  <- "faxe8adyxke" # - Washington Post = 017019937838437061749:faxe8adyxke
nyId  <- "uspap9gs9vq" # - New York Times = 017019937838437061749:uspap9gs9vq
chiId <- "duuro39maos" # - Chicago Tribunes = 017019937838437061749:duuro39maos
sfId  <- "navjubg8x6w" # - San Francisco Chronicle = 017019937838437061749:navjubg8x6w

name = paste( c( "/Users/bdolimier/persodev/michelinDC/output/usa2016_training.csv")  )
usadata <- read.csv( name , header=TRUE, stringsAsFactors=FALSE, sep = ",")
dfusa <- as.data.frame( usadata )
dfusa <- dfusa[ -c(1) ]

iimin = 1
iimax = nrow( dfusa )

for(ii in iimin:iimax ) {
    resto <- toString(dfusa$Restaurant[ii])
    restoEncode <- URLencode(  toString( paste("Restaurant",resto ) ) )
    zone = toString(dfusa[ii,3])
    if ( zone == "New-York" )      engineId = nyId
    if ( zone == "Chicago" )       engineId = chiId
    if ( zone == "San Francisco" ) engineId = sfId
    print( paste( restoEncode, zone) )
    ns <- 70 # init to large than we will query for / 7 pages

    for ( page in 0:6) {
      cacheName5 <- paste0( "/Users/bdolimier/persodev/michelinDC/cache/" , "C5_", zone,"_", ii , "_" ,
      cacheName6 <- paste0( "/Users/bdolimier/persodev/michelinDC/cache/" , "C6_", zone,"_", ii , "_" ,
      cf <- NULL
      cf5 <- NULL
      tryCatch( cf <- fromJSON(file( cacheName6 )) ,  error = function(e) cacheFlg <- FALSE , warning =
      tryCatch( cf5 <- fromJSON(file( cacheName5 )) ,  error = function(e) cacheFlg <- FALSE , warning =

      ## If not already cached got ask google
      if ( is.null(cf) == TRUE || is.null(cf5) == TRUE ) {
        start = (page*10)+1
        if ( start < ns) {
          print( paste("reading a new query", ii, page) )
          query=paste0("https://www.googleapis.com/customsearch/v1?key=AIzaSyAZBzP3NEFa7Fq76ElQW5PZaIKu
          res <- GET(query)

          cf5 <- do.call("rbind", content(res)[5] ) # a dataframe
          write( toJSON(cf5) , file=cacheName5) # write in cache
          cf5 <- fromJSON(toJSON(cf5))

          cf <- do.call("rbind", content(res)[6] ) # a dataframe
          write( toJSON(cf) , file=cacheName6) # write in cache
          cf <- fromJSON(toJSON(cf))
        }
      }

      # If still null skip it
      if ( toString(cf) != "" && ( !is.null(nrow(cf[[1]])) ) ) {
          nc <- nrow(cf[[1]])
          if ( is.null(nc) ) nc = 0
          ns <- as.numeric( cf5[[3]] )
          if ( length(ns) == 0 ) ns = 0
          dfusa$artTotal[ii] = ns
          if ( ns>10000 ) ns = 10000
          dfusa$artTotalCap[ii] = ns

          if ( nc > 0 ) {
            for ( jj in 1:nc ) {
              titre <- cf[[1]]$title[[jj]]
              # Date method 1
              datum <- cf[[1]]$pagemap$metatags[[jj]]$ptime
              # Date method 2
              if ( is.null(datum) ) datum <- cf[[1]]$pagemap$metatags[[jj]]$date
              # Date method 3
              if ( is.null(datum) ) datum <- cf[[1]]$pagemap$metatags[[jj]]$sailthru.date
              # Date giving up
              if ( is.null(datum) ) {
                print ( paste("no date for ", ii, page, jj))
                datum = -1
              }

              dd <- substr( toString( gsub("-", "", datum) ), 0, 4)
              print ( paste( ii , page , jj ,datum)  )
              if ( dd == 2016 ) dfusa[ii,5] <- dfusa$art2016[ii]+1
              if ( dd == 2015)  dfusa[ii,6] <- dfusa$art2015[ii]+1
              if ( dd == 2014)  dfusa[ii,7] <- dfusa$art2014[ii]+1
              if ( dd < 2014 )  dfusa[ii,8] <- dfusa$artBefore[ii]+1 # older than 2014
              if ( dd == -1  )  dfusa[ii,9] <- dfusa$dateUNKNOWN[ii]+1 # date unknown
            }
          }
      }
    }
}
View( dfusa )
write.csv( as.data.frame(dfusa) , file = "/Users/bdolimier/persodev/michelinDC/output/michelin2016_trai
```

Get Restaurant press review from the Washington Post.

Populating the fields: dfusa$art2016, art2015, art2014, artBefore (older than 2014), dateUNKNOWN (code hidden)

Yelp review and Classification

Populating Yreview, Yrating, Ypricing (code hidden)

Get google rating and neighborhood

Populating: Zreview, Zrating, Neighborhood (code hidden)

Zagat review through google apis

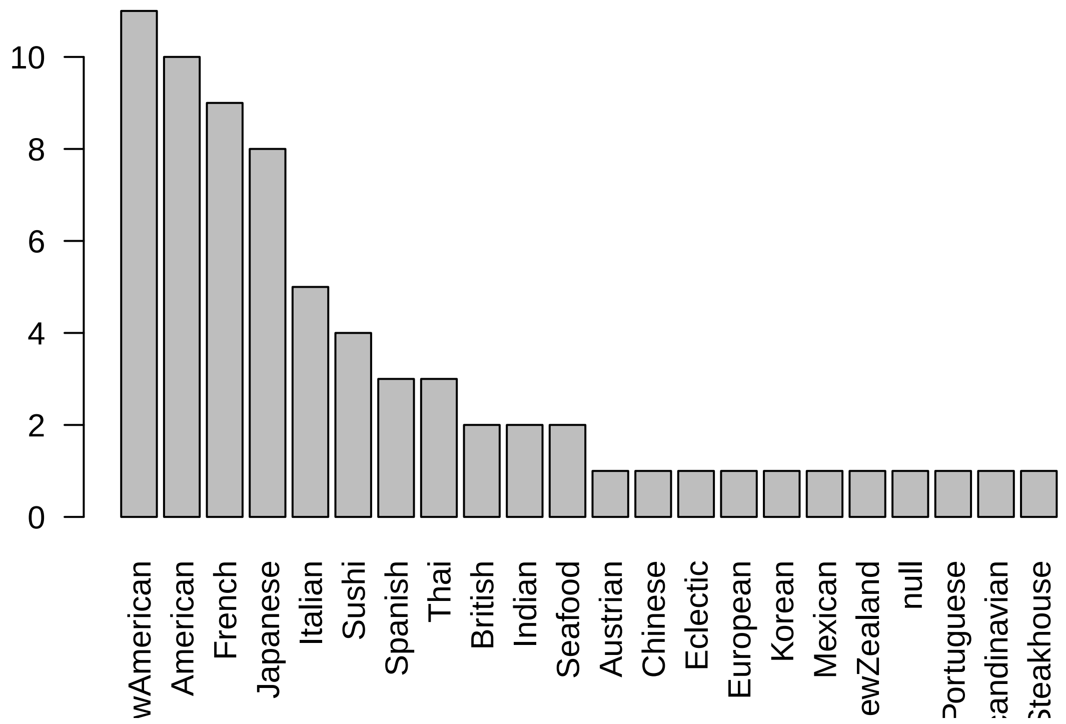
Populating fields: Fscore, Dscore, Sscore, type, buzz, buzz2, Neighorhood (code hidden)

Analyse the data

Fields collected are:

1. Restaurant: Name of the Restaurant
2. Chef: Name of the Chef (not always present)
3. Zone: New-York, Chicago, SF and DC
4. Etoile: 0 to 3 Stars
5. art2016: Number of mention in select press for the zone in 2016
6. art2015: Number of mention in select press for the zone in 2015
7. art2014: Number of mention in select press for the zone in 2014
8. artBefore: Number of mention in select press for the zone before 2014
9. dateUNKNOWN: Number of mention in select press for the zone date unknown
10. artTotal: Number of mention in select press for the zone (all dates)
11. Yreview: Number of Yelp reviews
12. Yrating: Aggregated Yelp review
13. Ypricing: Yelp pricing level ("$" to "$$$$")
14. Zrating: Zagat rating
15. Zpricing: Zagat pricing level
16. Zbuzz: Zagat buzz indicator
17. Zbuzz: Zagat buzz indicator 2
18. Neighborhood: Restaurant Neignborhood

Create Mode / Plot Linear Regression



(code hidden)

Storing results

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