source

January 22, 2022

1 Data pre-processing

1.1 Import data

[1]:
```
setwd("/media/miray/projects/Gas Ai/data/1")
data.base <- read.csv("base.csv")
data.masraf <- read.csv("masraf.csv")

print(head(data.base))
cat('\n\n')
print(head(data.masraf))
```

```
  CITYNAME CITYID NAHIE       KEYNO ADDRESS_CODE FREQ TYPEOFUSE ZARFIAT ZIRBANA
1             1      1 23000334787  10105660007    C        40       6      60
2             1      1 23000294966  10105130000    C        40       6     100
3             1      1 23000326971  10105660002    C        40       6      60
4             1      1 23000330109  10105660004    C        40       6      60
5             1      1 23000325483  10105660001    C        40       6     110
6             1      1 23000328337  10105660003    C        40       6      60
  TEDADVAHED SHAHRROSTA MAXMASRAFSAAT
1          1       1021             6
2          1       1021             6
3          1       1021             6
4          1       1021             6
5          1       1021             6
6          1       1021             6


       BUL_ID   FROMDATE     TODATE CONSUMPTION
1 23000330109 1399/03/24 1399/05/06          55
2 23000330109 1399/02/08 1399/03/24         220
3 23000330109 1398/12/20 1399/02/08         230
4 23000330109 1398/11/06 1398/12/20         375
5 23000330109 1398/09/20 1398/11/06         390
6 23000330109 1398/08/08 1398/09/20         260
```

1.2 Find duplicate data in data.base and data with irrational area properties

[2]:
```
# data.multikeno = data that more than one in datasheet
data.noise <- c(data.base$KEYNO[ave(data.base$KEYNO,data.base$KEYNO,FUN =␣
↪length) > 1 | data.base$ZIRBANA < 10])
# data = data that only one in datasheet
data.keyno <- data.base$KEYNO[!(data.base$KEYNO %in% data.noise)]
# data.base = data that in data.keyno
data.base <- data.base[data.base$KEYNO %in% data.keyno,]
# data.masraf = data that in data.keyno
data.masraf <- data.masraf[data.masraf$BUL_ID %in% data.keyno,]
# print noise data
print(data.noise)
```

```
  [1] 23000465965 23000604518 23002953616 23004282855 23004514194 23004613800
  [7] 23004725630 23004726901 23004743137 23004693850 23005032817 23004989520
 [13] 23005037420 23004871982 23005395028 23005340118 23005427907 23005522239
 [19] 23005509119 23005378145 23005722504 23005582395 23005552288 23005710347
 [25] 23005983609 23005997800 23006077274 23006148690 23006065017 23006002175
 [31] 23006240580 23006403547 23006294649 23006223186 23006513911 23006567401
 [37] 23006711200 23006862678 23006872360 23006920280 23006875440 23006917431
 [43] 23007002630 23006969782 23007143963 23007185060 23007252034 23007291150
 [49] 23007149839 23007162664 23007246910 23007259408 23007269484 23007337594
 [55] 23007340912 23007622558 23007626547 23007556787 23007937096 23007806555
 [61] 23007804737 23008141679 23008017628 23008009754 23008192079 23008228426
 [67] 23008363136 23008395414 23008509152 23008505979 23008522851 23008576568
 [73] 23008621751 23008779266 23008693191 23008878687 23008727957 23008851830
 [79] 23009047032 23009170980 23009115958 23009357909 23009540177 23009680206
 [85] 23009702393 23009557006 23009686987 23009591156 23009856103 23009894990
 [91] 23010158369 23010030098 23010179525 23010223162 23010276549 23010304850
 [97] 23010255440 23010398886 23010368837 23010481187 23010626931 23011435914
[103] 23011498403 23011682522 23011785127 23011822800 23012130307 23012604913
[109] 23012423359 23012806123 23013048154 23013074409 23013080554 23013105505
[115] 23013609403 23013730080 23013953556 23013994322 23014737840 23014214652
[121] 23017295261 23016924686 23014800600 23014322040 23015206723 23016906668
[127] 23014781524 23014987765 23015013590 23016310461 23014470564 23015108380
[133] 23017767244 23018521317 23019474702 23018431200 23018774311 23017934901
[139] 23019783433 23021102548 23023929662 23024095437 23023387230 23023957509
[145] 23024156414 23023495897 23026173807 23025119002 23026540082 23026378107
[151] 23026275376 23027844543 23028202663 23026939161 23028594367 23028970120
[157] 23029627805 23030080460 23030663373 23033245052 23032459575 23032064906
[163] 23033269230 23032500190 23034722452 23034366651 23033920434 23034122145
[169] 23043120278
```

1.3 Categorizing each subscriber data

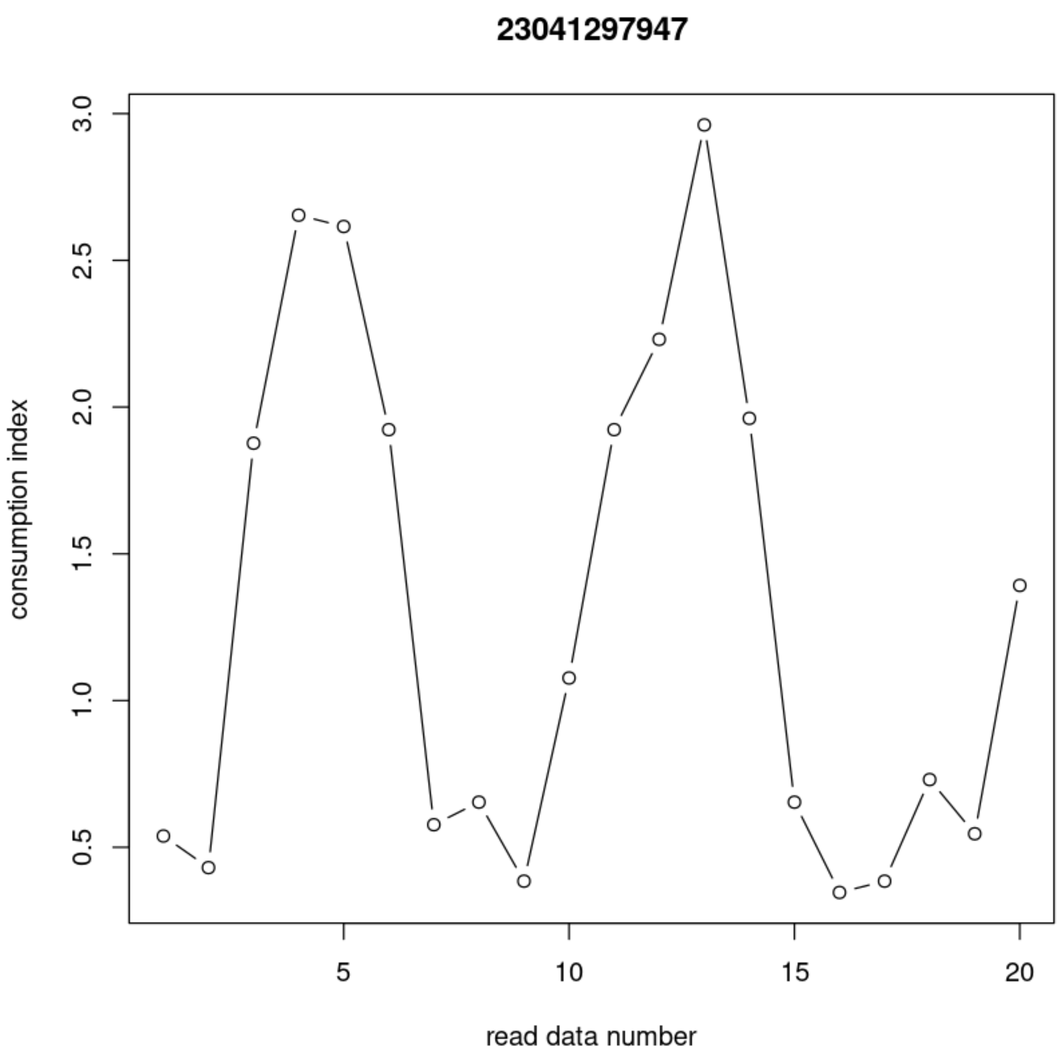
[3]:
```
datasheet <- list()
for(o in 1:length(data.base$KEYNO)){
    # Subscribers' consumption in readings divided by their area add to
    datasheet[o] <- list(data.masraf$CONSUMPTION[data.masraf$BUL_ID == data.
  ↪base$KEYNO[o]]/data.base$ZIRBANA[o])
}

print(datasheet[1:6])
```

```
[[1]]
 [1] 1.750000 1.483333 7.516667 9.416667 8.666667 7.500000 2.250000 1.333333
 [9] 1.500000 2.583333 8.000000 7.416667 9.583333 6.500000 3.083333 1.500000
[17] 2.166667 2.833333 2.483333 7.283333

[[2]]
 [1]  3.00  5.70  9.80 10.70  7.40  2.30  1.20  0.55  1.15  7.05  6.45  8.30
[13]  5.40  1.70  0.40  0.45  0.70  1.74  3.25

[[3]]
 [1] 0.6666667 0.8666667 4.6333333 4.4166667 5.1666667 4.6666667 1.5000000
 [8] 1.2500000 0.5833333 1.5000000 4.9166667 4.5000000 5.4166667 3.3333333
[15] 1.6666667 0.5833333 0.5833333 1.5833333 2.0166667 4.6333333

[[4]]
 [1] 0.9166667 3.6666667 3.8333333 6.2500000 6.5000000 4.3333333 1.4166667
 [8] 0.7500000 0.8333333 1.3333333 4.8333333 4.0833333 4.9166667 2.9166667
[15] 1.3333333 0.4166667 0.6666667 1.0000000 0.2833333 3.0666667

[[5]]
 [1] 0.8181818 2.5909091 4.7727273 6.3636364 6.8636364 5.0454545 2.1363636
 [8] 0.9090909 0.6818182 1.7272727 6.0909091 4.6818182 6.4090909 5.0000000
[15] 2.5000000 0.7727273 0.8636364 1.4545455 1.5181818 3.4272727

[[6]]
 [1] 2.583333 5.316667 5.016667 7.583333 8.166667 6.166667 2.666667 2.166667
 [9] 2.250000 2.916667 5.833333 6.250000 7.750000 5.583333 3.250000 1.000000
[17] 1.166667 2.250000 1.616667 3.400000
```

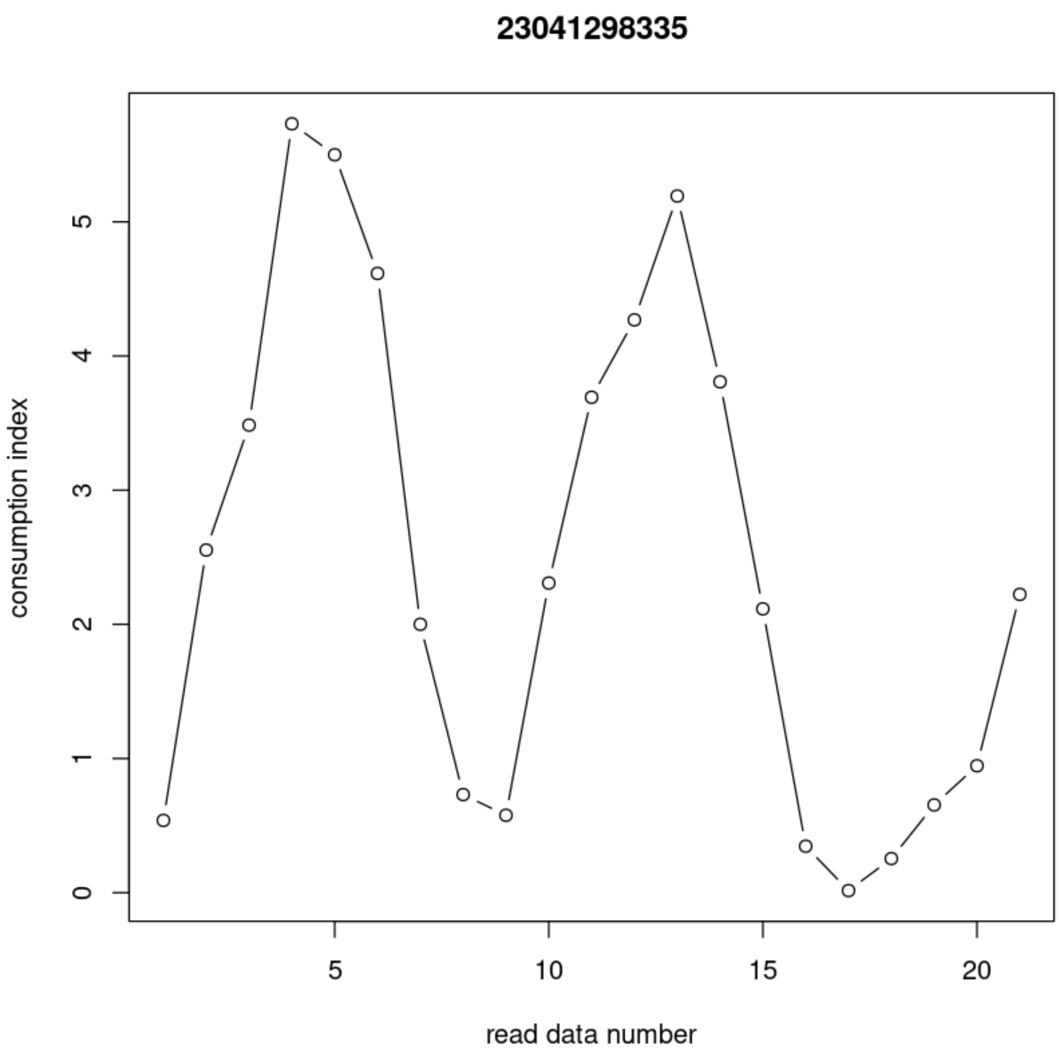
2 Processing

2.1 See last data on graph

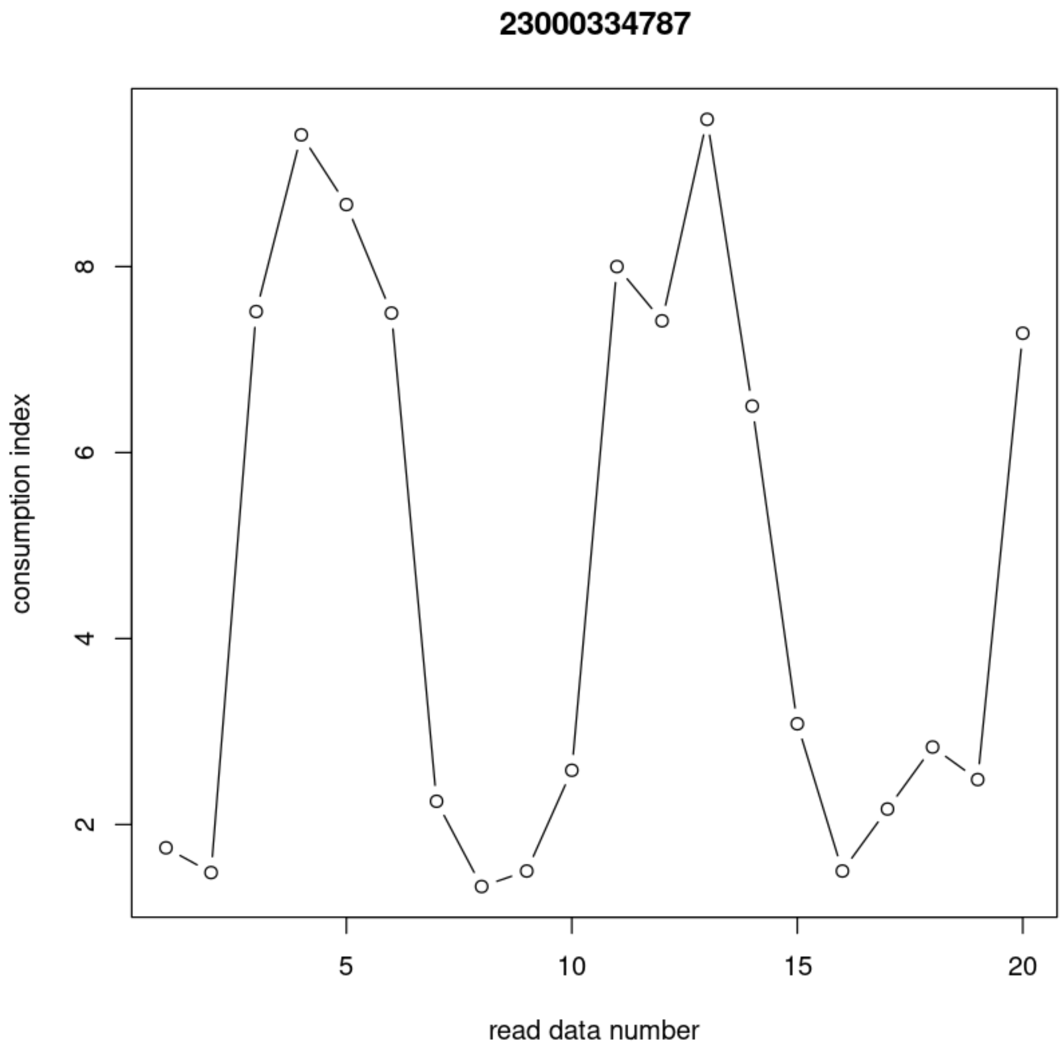
[4]:
```
plot(unlist(datasheet[776]),type = 'b',
     main = data.base$KEYNO[776],ylab = 'consumption index',xlab = 'read data␣
↪number',

    )
```



[5]:
```
plot(unlist(datasheet[758]),type = 'b',
     main = data.base$KEYNO[758],ylab = 'consumption index',xlab = 'read data␣
↪number')
```




```
[6]: plot(unlist(datasheet[1]),type = 'b',
          main = data.base$KEYNO[1],ylab = 'consumption index',xlab = 'read data␣
       ↪number')
```



note : Because the data are not temperature dependent, the plotted graphs show sinusoidal motions, and the amount of these motions is entirely dependent on the local temperature. If we divide this data by temperature, all the data will tend to be an average and will be more accurate. However, a relative index can be created by using the distance between people's locations that In this relative index, the deviation of the data compared to the previous data can be predicted

2.2 A function that turns history into the day of the year

[7]:
```
calc.date <- function(date){
    fun <- matrix(as.integer(unlist(strsplit(date,'/'))),nrow = 3)
    return((fun[2,]-1)*31+fun[3,])
```

```
}

print(calc.date('1399/01/01'))
```

```
[1] 1
```

2.3 Input Data

[8]:
```
# (ToDate, FromDate, KEYNO, Usage, PreUsage)
sample <- c('1397/06/02','1397/05/01',data.base$KEYNO[1],2,5)
```

2.4 How much has a person consumed per day from previous years?

In terms of mean and standard deviation

[9]:
```
f <- calc.date(data.masraf[which(data.masraf$BUL_ID == sample[3]),]$FROMDATE)
t <- calc.date(data.masraf[which(data.masraf$BUL_ID == sample[3]),]$TODATE)

pass.mean <-
mean(d <- ((calc.date(sample[2])-f)[z <- which(f<= calc.date(sample[2]) & calc.
 ↪date(sample[2]) < t)]*
abs(f[z] - f[z+1])/ (x <- data.masraf[which(data.masraf$BUL_ID ==␣
 ↪sample[3]),]$CONSUMPTION[z]) + x)/
data.base$ZIRBANA[data.base$KEYNO == sample[3]])
pass.sd <- sd(d)

print(pass.sd)
print(pass.mean)
```

```
[1] 0.2516247
[1] 2.087844
```

2.5 Calculate the Unoli coefficient in a person's history

[10]:
```
pass.un <-
exp(-((as.double(sample[4])-pass.mean)^2))/((2*pass.sd^2))/(pass.sd*(2*pi)^(1/
 ↪2))

print(pass.un)
```

```
[1] 12.42422
```

2.6 A function that turns history into days from the beginning

[11]:
```
calc.datey <- function(date){
    fun <- matrix(as.integer(unlist(strsplit(date,'/'))),nrow = 3)
    return(fun[1,]*365+(fun[2,]-1)*31+fun[3,])
```

```
}

print(calc.date('1399/01/01'))
```

```
[1] 1
```

2.7 How much persons consumed in this date?

In terms of mean and standard deviation

[12]:
```
r <- c()
for(o in 1:length(datasheet)){
ds <- datasheet[[o]][calc.datey(data.masraf$FROMDATE[which(data.masraf$BUL_ID␣
↪== data.base$KEYNO[o])])<
    calc.datey(sample[1])& calc.datey(data.masraf$TODATE[which(data.
↪masraf$BUL_ID == data.base$KEYNO[o])])>
        calc.datey(sample[2])]
r <- c(r,(ds[2]-ds[1])[!is.na(ds[2]-ds[1])])}

other.mean <- mean(r)
other.sd <- sd(r)

print(other.mean)
print(other.sd)
```

```
[1] -0.004091392
[1] 2.467675
```

2.8 Calculate the Unoli coefficient of other people

[13]:
```
other.un <-
exp(-(((as.double(sample[4])-as.double(sample[5]))-other.mean)^2))/((2*other.
↪sd^2))/(other.sd*(2*pi)^(1/2))

print(other.un)
```

```
[1] 1.67888e-06
```

2.9 Is the input data correct?

[14]:
```
print(!(other.un*pass.un < 0.01))
```

```
[1] FALSE
```