

DP First Laboratory

2023-03-07

```
library(sdcMicro)
```

```
# we can use the instruction data() to show the available datasets  
data("free1") # loads the dataset  
#we use <- to assign a value to a variable  
newdataset<-free1 # newdataset is a copy of the free1 dataset
```

```
newdataset<-as.data.frame(newdataset)  
class(newdataset)  
str(newdataset) #new structure therefore, new attributes  
attributes(newdataset)  
# ?data.frame # you can use a question mark before a command to obtain some help
```

```
names(newdataset)[1:4]
```

Checking the output of the previous commands we can see the first 4 variables of the dataset being: Region, Sex, Age, Marstat. So that, Region, Sex and Marital Status are Categorical while Age would be continuous.

```
newdataset$REGION<-as.factor(newdataset$REGION)  
newdataset$SEX<-as.factor(newdataset$SEX)  
newdataset$AGE<-as.factor(newdataset$AGE)  
newdataset$MARSTAT<-as.factor(newdataset$MARSTAT)
```

```
# Levels of the region parameter  
r = levels(newdataset$REGION)  
# Levels of the sex parameter  
s = levels(newdataset$SEX)  
# Levels of the age parameter  
a = levels(newdataset$AGE)  
# Levels of the marital status parameter  
m = levels(newdataset$MARSTAT)
```

```
length(r)*length(s)*length(a)*length(m)
```

Easy to disclose.

```
contable = table(newdataset$REGION,newdataset$SEX)
```

```
print(contable)
```

```
sum(contable[contable < 2])
sum(contable[contable < 3])
```

```
contable4 = table(newdataset$REGION,newdataset$SEX,newdataset$AGE,newdataset$MARSTAT)
```

```
sum(contable4[contable4 < 2])
sum(contable4[contable4 < 3])
```

```
freqCalc(newdataset,keyVars = c("REGION","SEX"))
```

```
##
## -----

## 15 obs. violate 2-anonymity

## 49 obs. violate 3-anonymity

## -----
```

```
freqCalc(newdataset,keyVars = c("REGION","SEX","AGE","MARSTAT"))
```

```
##
## -----

## 3014 obs. violate 2-anonymity

## 3738 obs. violate 3-anonymity

## -----
```

```
dataset32<-free1
```

```
dataset32<-as.data.frame(dataset32)
```

```
sdc <- createSdcObj(
  dat = dataset32,
  keyVars = c("REGION","SEX","AGE","MARSTAT")
)
sdc <- varToFactor(sdc, "REGION")
sdc <- varToFactor(sdc, "SEX")
sdc <- varToFactor(sdc, "AGE")
sdc <- varToFactor(sdc, "MARSTAT")
```

```
print(sdc, type="risk")
```

```
## Risk measures:
##
## Number of observations with higher risk than the main part of the data: 0
## Expected number of re-identifications: 3450.00 (86.25 %)
```

```
print(sdc, type="kAnon")
```

```
## Infos on 2/3-Anonymity:
##
## Number of observations violating
##   - 2-anonymity: 3014 (75.350%)
##   - 3-anonymity: 3738 (93.450%)
##   - 5-anonymity: 3943 (98.575%)
##
## -----
```

```
slotNames(sdc)
```

```
sdc@risk
```

4 SDC methods:

4.1 Recoding:

a) First of all, we create a list with all the regions, and a list with the different values of the regions list defined. This two lists will be used later on to recode the regions values.

```
regions <- sdc@manipKeyVars$REGION
diff_regions <- levels(regions)
```

Now, we construct a list with the different categories: North(45), South(45), Est(45) and West(total-135) following the instructions in the statement.

```
groups <- c(rep("NORTH",45), rep("SOUTH",45), rep("EST",45), rep("WEST", length(diff_regions)-135))
```

Then we just need to use the `groupAndRename` function specifying the previous values, being the numbers from 1 to 182, and the new ones we want to convert to being the cardinal directions defined above. The `groupAndRename` function will swap each element from the before list for the value in the after list in the region column in the sdc object.

```
nRegions <- groupAndRename(obj = sdc, var = c("REGION"), before = c(diff_regions), after = c(groups))
```

Now we can construct a table to count how many different cardinal points we have.

```
table(nRegions@manipKeyVars$REGION)
```

Now, just to check that everything worked properly we do the following checks:

```
checkCorrectness <- table(sdc@manipKeyVars$REGION)
sum(checkCorrectness[1:45])
sum(checkCorrectness[46:90])
sum(checkCorrectness[91:135])
sum(checkCorrectness[136:length(diff_regions)])
```

b) We can now check the values of 2/3 anonymity and see how they have been modified when applying our changes.

```
print(nRegions, type="kAnon")
```

```
## Infos on 2/3-Anonymity:
##
## Number of observations violating
## - 2-anonymity: 282 (7.050%) | in original data: 3014 (75.350%)
## - 3-anonymity: 538 (13.450%) | in original data: 3738 (93.450%)
## - 5-anonymity: 1090 (27.250%) | in original data: 3943 (98.575%)
##
## -----
```

c) Since in the previous exercises we swap the variable type of “AGE” to factor we now need to convert it back to numeric.

```
sdc <- varToNumeric(obj = sdc, var = "AGE")
```

Since we now want to change the variable “AGE” for a category, like: Children, Young, Adults and Senior, here we define the interval of each category being the followings: * (0-14) * (15-25) * (25-64) * (65-Inf)

```
intervals <- c(0,14,25,64,Inf)
```

Now we can to the recode in a similar way as we did before, specifying the intervals above and the values that will get swapped, being: * Children. * Young. * Adults. * Senior.

```
nAge <- globalRecode(obj = sdc, column = c("AGE"), intervals, labels = c("Children","Young","Adults","S
```

After recoding we can check how many persons do we have for each interval of age.

```
table(nAge@manipKeyVars$AGE)
```

```
??
```

d) We can now check the new values of k-anonymity after applying the previous transformation.

```
print(nAge, type="kAnon")
```

```
## Infos on 2/3-Anonymity:
##
## Number of observations violating
## - 2-anonymity: 566 (14.150%) | in original data: 3014 (75.350%)
## - 3-anonymity: 1012 (25.300%) | in original data: 3738 (93.450%)
## - 5-anonymity: 1805 (45.125%) | in original data: 3943 (98.575%)
##
## -----
```

4.2 Local Suppression:

a) Before starting the GUI we just check if the dataset is a data.frame and it actually is, so we do not need to modify it.

```
class(newdataset)
```

Now we can open the GUI and start doing the exercise.

```
#sdcApp()
```

b) c) d)

```
#b)
```

```
library(sdcMicro)
```

```
obj <- NULL
```

```
if (!exists("newdataset")) {
```

```
  stop('object "newdataset" is missing; make sure it exists.`', call. = FALSE)
```

```
}
```

```
obj$inputdata <- readMicrodata(path="newdataset", type="rdf", convertCharToFac=FALSE, drop_all_missings=
```

```
inputdataB <- obj$inputdata
```

```
## Set up sdcMicro object
```

```
sdcObj <- createSdcObj(dat=inputdata,
```

```
  keyVars=c("REGION","SEX","AGE","MARSTAT"),
```

```
  numVars=NULL,
```

```
  weightVar=NULL,
```

```
  hhId=NULL,
```

```
  strataVar=NULL,
```

```
  pramVars=NULL,
```

```
  excludeVars=NULL,
```

```
  seed=0,
```

```
  randomizeRecords=FALSE,
```

```
  alpha=c(1))
```

```
## Store name of uploaded file
```

```
opts <- get.sdcMicroObj(sdcObj, type="options")
```

```
opts$filename <- "newdataset"
```

```
sdcObj <- set.sdcMicroObj(sdcObj, type="options", input=list(opts))
```

```
#c)
```

```
## Local suppression to obtain k-anonymity
```

```
sdcObj <- kAnon(sdcObj, importance=c(4,1,3,2), combs=NULL, k=c(3))
```

```
sdcObj <- undolast(sdcObj)
```

```
## Local suppression to obtain k-anonymity
```

```
sdcObj <- kAnon(sdcObj, importance=c(4,1,3,2), combs=NULL, k=c(5))
```

```
sdcObj <- undolast(sdcObj)
```

```
#d)
```

```
## Local suppression to obtain k-anonymity
```

```

sdcObj <- kAnon(sdcObj, importance=c(1,4,2,3), combs=NULL, k=c(3))
sdcObj <- undolast(sdcObj)
## Local suppression to obtain k-anonymity
sdcObj <- kAnon(sdcObj, importance=c(1,4,2,3), combs=NULL, k=c(5))

```

4.2 e)

```

library(sdcMicro)

obj <- NULL
if (!exists("newdataset")) {
  stop('object "newdataset" is missing; make sure it exists.', call. = FALSE)
}
obj$inputdata <- readMicrodata(path="newdataset", type="rdf", convertCharToFac=FALSE, drop_all_missings=
inputdataB <- obj$inputdata

## Convert a numeric variable to factor (each distinct value becomes a factor level)
inputdata <- varToFactor(obj=inputdata, var=c("RECBEN"))
## Set up sdcMicro object
sdcObj <- createSdcObj(dat=inputdata,
  keyVars=c("SEX", "AGE", "MARSTAT", "RECBEN"),
  numVars=NULL,
  weightVar=NULL,
  hhId=NULL,
  strataVar=NULL,
  pramVars=NULL,
  excludeVars=NULL,
  seed=0,
  randomizeRecords=FALSE,
  alpha=c(1))

## Store name of uploaded file
opts <- get.sdcMicroObj(sdcObj, type="options")
opts$filename <- "newdataset"
sdcObj <- set.sdcMicroObj(sdcObj, type="options", input=list(opts))

## Adding linked (ghost)-Variables
sdcObj <- addGhostVars(sdcObj, keyVar="RECBEN", ghostVars=c("REGION"))
## Local suppression to obtain k-anonymity
sdcObj <- kAnon(sdcObj, importance=c(3,1,2,4), combs=NULL, k=c(10))
sdcObj <- undolast(sdcObj)
## Local suppression to obtain k-anonymity
sdcObj <- kAnon(sdcObj, importance=c(3,1,2,4), combs=NULL, k=c(10))

```