統計學實習課 HW9

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1.

(1) 請寫出一個函式以計算變方（不可使用var()）

(2) 利用你寫的函示計算以下的資料變方。

(a) 20, 50, 48, 62, 15, 30, 44, 27

(b) 3, 56, 965, 8475, 32657

- 程式碼：

```
calvar = function(sequence) {
  m = mean(sequence)
  total = 0
  for (i in 1:length(sequence))
    total = total + (sequence[i] - m) ** 2
  return (total / length(sequence))
}
s1 = c(20, 50, 48, 62, 15, 30, 44, 27)
s2 = c(3, 56, 965, 8475, 32657)
calvar(s1)
calvar(s2)
```

- 輸出結果：

```
> calvar(s1)
[1] 235.75
> calvar(s2)
[1] 156762795
```

2. 請依照以下步驟進行練習。

(1)請使用classmate.xlsx資料，並且在classmate2.txt有7個新同學，請將兩資料合併

(2)請用你的體重、身高資料當作第50位同學資料（如不想公布，則請自己隨意想個合理數字）

(3)BMI值的公式為 BMI = $\frac{weight*10000}{height^2}$ 請計算所有學生的BMI，並將其與原始資料合併

(4)利用學生BMI值將其分類,低於22為normal、22-25為fat、超過25為very fat,並將此結果與原始資料合併

(5)重新命名column names 與 row names

(6)將你的資料存為txt檔

(7)打開你的txt檔案,並如下方截圖後放於作業檔案中

- 程式碼:

```r
rm(list = ls())
# 讀取兩個檔案
cla = read.csv(file.choose(), header = T, fileEncoding = 'utf8')
cla2 = read.table(file.choose(), header = T, fileEncoding = 'utf8')
# 將兩資料合併
alldata = rbind(cla, cla2)
# 將row names重新命名
row.names(alldata) <- 1:50
# 修正No.欄位的值
for (i in 44:50)
  alldata[i, 1] <- i
# 將自己的身高體重當作第50位同學的資料
alldata[50, 2] <- 'F'
alldata[50, 3] <- 151
alldata[50, 4] <- 40
# 命名column names,計算所有學生的BMI並與原始資料合併
alldata["BMI"] <- NA
alldata$BMI <- (alldata$weight * 10000) / (alldata$height ** 2)
# 命名column names,將學生BMI值分類並與原始資料合併
alldata["type"] <- NA
AssignType = function(df) {
  for (i in 1:nrow(df)) {
    if (df$BMI[i] < 22)
      df$type[i] = "normal"
    else if (22 <= df$BMI[i] && df$BMI[i] <= 25)
      df$type[i] = "fat"
    else
      df$type[i] = "very fat"
  }
  return (df)
}
alldata = AssignType(alldata)
# 將資料存為txt檔
write.table(alldata, file = "~/Desktop/data.txt", sep = "\t")
```

- txt檔截圖

"No."	"gender"		"height"		"weight"	"BMI"	"type"
"1"	1	"F"	151	53	23.2445945353274		"fat"
"2"	2	"M"	163	68	25.5937370619895		"very fat"
"3"	3	"F"	142	49	24.3007339813529		"fat"
"4"	4	"F"	155	50	20.8116545265349		"normal"
"5"	5	"M"	174	78	25.7629805786762		"very fat"
"6"	6	"F"	162	60	22.8623685413809		"fat"
"7"	7	"M"	158	63	25.2363403300753		"very fat"
"8"	8	"M"	162	66	25.148605395519	"very fat"	
"9"	9	"M"	168	85	30.1162131519274		"very fat"
"10"	10	"F"	165	55	20.2020202020202		"normal"
"11"	11	"M"	172	81	27.3796646836128		"very fat"
"12"	12	"F"	154	64	26.986001011975	"very fat"	
"13"	13	"F"	165	57	20.9366391184573		"normal"
"14"	14	"F"	168	55	19.4869614512472		"normal"
"15"	15	"M"	164	62	23.051754907793	"fat"	
"16"	16	"F"	159	61	24.1287923737194		"fat"
"17"	17	"F"	165	57	20.9366391184573		"normal"
"18"	18	"M"	162	80	30.4831580551745		"very fat"
"19"	19	"M"	170	75	25.9515570934256		"very fat"
"20"	20	"F"	160	61	23.828125	"fat"	
"21"	21	"M"	152	74	32.0290858725762		"very fat"
"22"	22	"F"	158	50	20.0288415318058		"normal"
"23"	23	"F"	164	54	20.0773349196907		"normal"
"24"	24	"F"	161	52	20.0609544384862		"normal"
"25"	25	"F"	159	60	23.7332384003797		"fat"
"26"	26	"F"	157	48	19.4734066290722		"normal"
"27"	27	"M"	169	59	20.6575400021008		"normal"
"28"	28	"M"	173	73	24.3910588392529		"fat"
"29"	29	"F"	169	58	20.307412205455	"normal"	
"30"	30	"F"	158	51	20.4294183624419		"normal"
"31"	31	"F"	160	57	22.265625	"fat"	
"32"	32	"M"	170	82	28.3737024221453		"very fat"
"33"	33	"M"	169	74	25.9094569517874		"very fat"
"34"	34	"M"	164	71	26.3979773944081		"very fat"
"35"	35	"M"	163	62	23.3354661447552		"fat"
"36"	36	"F"	159	58	22.9421304537004		"fat"
"37"	37	"M"	160	59	23.046875	"fat"	
"38"	38	"M"	166	67	24.3141239657425		"fat"
"39"	39	"F"	155	49	20.3954214360042		"normal"
"40"	40	"F"	159	55	21.7554685336814		"normal"
"41"	41	"F"	163	57	21.4535737137265		"normal"
"42"	42	"M"	171	66	22.5710475017954		"fat"
"43"	43	"M"	172	83	28.0557057869118		"very fat"
"44"	44	"F"	152	58	25.1038781163435		"very fat"
"45"	45	"M"	168	63	22.3214285714286		"fat"
"46"	46	"F"	169	55	19.2570288155177		"normal"
"47"	47	"F"	166	55	19.9593554942662		"normal"
"48"	48	"M"	181	49	14.956808400232	"normal"	
"49"	49	"F"	159	76	30.0621019738143		"very fat"
"50"	50	"F"	151	40	17.5430902153414		"normal"