

Codes 1 and 2 are for R.
Code 3 is for Microsoft Excel.

1. Comorbidities Identification

```
library(PEIP)
library(readxl)
library(gdata)
library(writexl)

#Combined<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\Covid-
19 Sig Datasets\\Less than 0.05\\10, 30, 11\\Up-Down regulated\\.01.xlsx")
#Combined<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\Covid-
19 Sig Datasets\\Less than 0.05\\19, 30, 79\\Up-Down regulated\\.05.xlsx")
#Combined<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\Covid-
19 Sig Datasets\\Less than 0.05\\19, 30, 79\\Up-regulated\\.05.xlsx")
Combined<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity
Detection\\Diseases\\GSE (Covid19) Up-Down\\.05.xlsx")

Counts <- lengths(strsplit(Combined$Genes, ","))
Combined<-data.frame(Combined$'Term',Combined$'P-value',Combined$'Genes',Counts)
Combined<-Combined[order(-Combined$Counts),]
#Combined<-Combined[1:50,]
Combined <- rename.vars(Combined, from = "Combined.Term", to = "Term")
Combined <- rename.vars(Combined, from = "Combined..P.value.", to = "P-value")
Combined <- rename.vars(Combined, from = "Combined.Genes", to = "Genes")
write_xlsx(Combined,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity
Detection\\Diseases\\GSE (Covid19) Up-Down\\Final Comorbidities .05.xlsx")
#out <- split( Combined,Combined$Counts)
```

2. Shared Differentially Expressed Genes (DEGs) Identification

```
library(readxl)
library(writexl)

Upregulated<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up
and Down Comorbidity Datasets\\All up-regulated.xlsx")
Downregulated<- read_excel("C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All
Up and Down Comorbidity Datasets\\All down-regulated.xlsx")

a<-Upregulated$Covid19
b<-Upregulated$Hypertension
c<-Upregulated$Diabetes
d<-Upregulated$Obesity
e<-Upregulated$LungCancer2
#f<-Upregulated$Lung

a[a%in%b]#Hypertension
```

```

a[a%in%c]#Diabetes
a[a%in%d]#Obesity
a[a%in%e]#Lung Cancer
#a[a%in%f]#Lung

a[a%in%b]#Hypertension
df1<-data.frame(a[a%in%b])
write_xlsx(df1,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Up-hypertension.xlsx")

a[a%in%c]#Diabetes
df2<-data.frame(a[a%in%c])
write_xlsx(df2,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Up-diabetes.xlsx")

a[a%in%d]#Obesity
df3<-data.frame(a[a%in%d])
write_xlsx(df3,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Up-obesity.xlsx")

a[a%in%e]#Lung Cancer
df4<-data.frame(a[a%in%e])
write_xlsx(df4,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Up-lungCancer2.xlsx")

# #a[a%in%f]#Lung
# #df5<-data.frame(a[a%in%f])
# #write_xlsx(df5,"D:\\Research For Paper\\MSc thesis\\RNASeq Data(GREIN)\\Up-
Lung.xlsx")

# -----
A<-Downregulated$Covid19
B<-Downregulated$Hypertension
C<-Downregulated$Diabetes
D<-Downregulated$Obesity
E<-Downregulated$LungCancer2
#F<-Downregulated$Lung

A[A%in%B]#Hypertension
A[A%in%C]#Diabetes
A[A%in%D]#Obesity
A[A%in%E]#Lung Cancer
#A[A%in%F]#Lung

A[A%in%B]#Hypertension
DF1<-data.frame(A[A%in%B])

```

```
write_xlsx(DF1,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Down-hypertension.xlsx")
```

```
A[A%in%C]#Diabetes
DF2<-data.frame(A[A%in%C])
write_xlsx(DF2,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Down-diabetes.xlsx")
```

```
A[A%in%D]#Obesity
DF3<-data.frame(A[A%in%D])
write_xlsx(DF3,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Down-obesity.xlsx")
```

```
A[A%in%E]#Lung Cancer
DF4<-data.frame(A[A%in%E])
write_xlsx(DF4,"C:\\Users\\OMIT SEN\\Dropbox\\Comorbidity Detection\\All Up and Down
Comorbidity Datasets\\Down-lungCancer2.xlsx")
```

```
# #A[A%in%F]#Lung
# #DF5<-data.frame(A[A%in%F])
# #write_xlsx(DF5,"D:\\Research For Paper\\MSc thesis\\RNASeq Data(GREIN)\\Down-
Lung.xlsx")
# -----
```

3. Linking DEGs Identification

Procedure:

1. Select the column of values that you want to highlight duplicates with difference colors, then hold down the ALT + F11 keys to open the Microsoft Visual Basic for Applications window.
2. Click Insert > Module, and paste the following code in the Module Window.
3. And then press F5 key to run this code, and a prompt box will remind you to select the data range that you want to highlight the duplicate values.
4. Then click OK button, all the duplicate values have been highlighted in different colors.

```
-----
Sub ColorCompanyDuplicates()
'Updateby Extendoffice
Dim xRg As Range
Dim xTxt As String
Dim xCell As Range
Dim xChar As String
Dim xCellPre As Range
Dim xCIndex As Long
Dim xCol As Collection
Dim I As Long
On Error Resume Next
If ActiveWindow.RangeSelection.Count > 1 Then
xTxt = ActiveWindow.RangeSelection.AddressLocal
```

```

Else
xTxt = ActiveSheet.UsedRange.AddressLocal
End If
Set xRg = Application.InputBox("please select the data range:", "Kutools for Excel", xTxt, , ,
, 8)
If xRg Is Nothing Then Exit Sub
xCIndex = 2
Set xCol = New Collection
For Each xCell In xRg
On Error Resume Next
If xCell.Value <> "" Then
xCol.Add xCell, xCell.Text
If Err.Number = 457 Then
xCIndex = xCIndex + 1
Set xCellPre = xCol(xCell.Text)
If xCellPre.Interior.ColorIndex = xlNone Then xCellPre.Interior.ColorIndex = xCIndex
xCell.Interior.ColorIndex = xCellPre.Interior.ColorIndex
ElseIf Err.Number = 9 Then
MsgBox "Too many duplicate companies!", vbCritical, "Kutools for Excel"
Exit Sub
End If
On Error GoTo 0
End If
Next
End Sub

```