13 ExpoStatLink module

13.1 Application domain

ExpoStatLink module is designed to find the statistical relationships between exposure factors and health outcome.

13.2 Theory

13.3 Work pipeline

Users can easily get the modeling results and their visualization plots with high quality by following the detailed instructions in each step. The statistical interpretations from the perspectives of subjects and whole dataset are both provided.

```
# The following two packages should be installed in advance
# devtools::install_github("ExposomeX/exstat", force = TRUE)
# devtools::install_github("ExposomeX/extidy", force = TRUE)

# library(exstat)
# library(extidy)
library(tidyverse)

# devtools::install_github("ExposomeX/exposomex", force = TRUE)
library(exposomex)
```

```
res = InitStatLink()

res1 = LoadStatLink(PID=res$PID,
                    UseExample="example#1")
res1$Expo$Data
```

```
## # A tibble: 20 x 14
##    SampleID Subjec~1    Y1    Y2    X1    X2    X3    X4    X5    X6    X7    X8
##    <chr>    <chr>    <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
##  1 Tr1      S1           1  -101  7.76 10.2  24.2   1.47  1.06  1.43  2.00  1.87
##  2 Tr2      S2           0   -51 10.1  11.6   3.39  1.03  1.46  1.32  1.69  1.18
##  3 Tr3      S3           0   -37  8.54  9.52 15.8   1.23  1.42  1.64  1.52  1.95
##  4 Tr4      S4           1   -61 14.2  14.9  11.3  NA     1.75  1.23  1.91  1.29
##  5 Tr5      S5           0   -28 11.0  16.4   1.43  1.31  1.70  1.69  1.04  1.68
##  6 Tr6      S6           0    -8 11.3  12.7   8.37  1.29  1.25  1.38  1.26  1.17
##  7 Tr7      S7           1   -63  7.66  7.73 17.1   1.49  1.19  1.83  1.46  1.08
##  8 Tr8      S8           0   -35 11.3   8.25 13.3   1.48  1.91  1.07  1.30  1.09
##  9 Tr9      S9           0   -14 14.5  11.1  11.4   1.29 NA     1.30  1.46  1.23
## 10 Tr10     S10          1   -99  6.26  6.04  8.03  1.92  1.53  1.08  1.92  1.85
## 11 Tr11     S11          0   -60  3.43 10.3   8.45  1.76  1.79  1.13  1.73  1.07
## 12 Tr12     S12          0   -32  6.75  6.86 28.0   1.03  1.10  1.58  1.98  1.06
## 13 Tr13     S13          0   -73  7.71  9.47 22.3  NA     1.20  1.34  1.45  1.53
## 14 Tr14     S14          0   -18 12.6   8.97  9.23  1.23  1.13 NA     1.62  1.58
## 15 Tr15     S15          0   -48 11.7   8.60  9.31  1.20  1.33  1.99  1.85  1.94
## 16 Tr16     S16          0   -20  7.10 12.5   2.52  1.83  1.19  1.65  1.47  1.48
## 17 Tr17     S17          0    -9  6.32 49.1   8.52  1.26  1.94  1.53  1.95  1.18
## 18 Tr18     S18          1   -98  4.66  8.49 24.2   1.07  1.25  1.35  1.70  1.98
## 19 Tr19     S19          0   -70  2.44 -2.27 16.0   1.43  1.77  1.21  1.87  1.48
## 20 Tr20     S20          0   -36 10.6   7.07 10.0   1.99  1.61  1.65  1.84  1.94
## # ... with 2 more variables: X9 <dbl>, X10 <dbl>, and abbreviated variable name
```

```
## #   1: SubjectID
```

```
res1$Expo$Voca
```

```
## # A tibble: 12 x 5
##    SerialNo SerialNo_Raw FullName GroupName   Lod
##    <chr>    <chr>        <chr>    <chr>     <dbl>
##  1 Y1       Y1           Y_disc   Outcome    NA
##  2 Y2       Y2           Y_cont   Outcome    NA
##  3 X1       X1           TE_1     Chemical    0.5
##  4 X2       X2           TE_2     Chemical    0.5
##  5 X3       X3           TE_3     Chemical    0.5
##  6 X4       X4           TE_4     Chemical    0.5
##  7 X5       X5           TE_5     Chemical    0.5
##  8 X6       X6           TE_6     Chemical    0.5
##  9 X7       X7           TE_7     Chemical    0.5
## 10 X8       X8           TE_8     Chemical    0.5
## 11 X9       X9           CH1      Chemical    5
## 12 X10      X10          CH2      Chemical    5
```

```
res2 = StatLinkCros(PID=res$PID,
                    OutPath = "default",
                    VarsY = "Y1" ,
                    VarsX = "all.x" ,
                    LinkModel = "ranger",
                    ObsrPartType = "raw" ,
                    ObsrPartNum  = "50",
                    ObsrProfType  = "partial" ,
                    ObsrProfNum  = "100",
                    ObsrProfVars = "all.x" ,
                    ObsrProfGeom  = "profiles",
                    SubjPredSeq = "S1,S2,S3",
                    SubjPartType = "break_down")
res2$CrosVipPlot
```

```
## $Y1_importance_ranger_raw
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
```

```
res2$CrosProfPlot
```

```
## $Y1_ranger_partial_profiles_by_X1
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X2
```

```
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X3
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X4
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X5
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X6
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X7
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X8
```

```
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X9
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
##
## $Y1_ranger_partial_profiles_by_X10
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
```

```
res2$CrosSubjPlot$Y1_ranger_break_down_S1
```

```
## [[1]]
## TableGrob (1 x 1) "arrange": 1 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
##
## attr(,"class")
## [1] "arrangelist" "list"
```

```
FuncExit(PID = res$PID)
```

```
## [1] "Success to exit. Thanks for using ExposomeX platform!"
```