varbvs-grid-search-analysis

```r
library(covdepGE)
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.1.1
```

```r
library(latex2exp)
```

```
## Warning: package 'latex2exp' was built under R version 4.1.1
```

```r
library(varbvs)
```

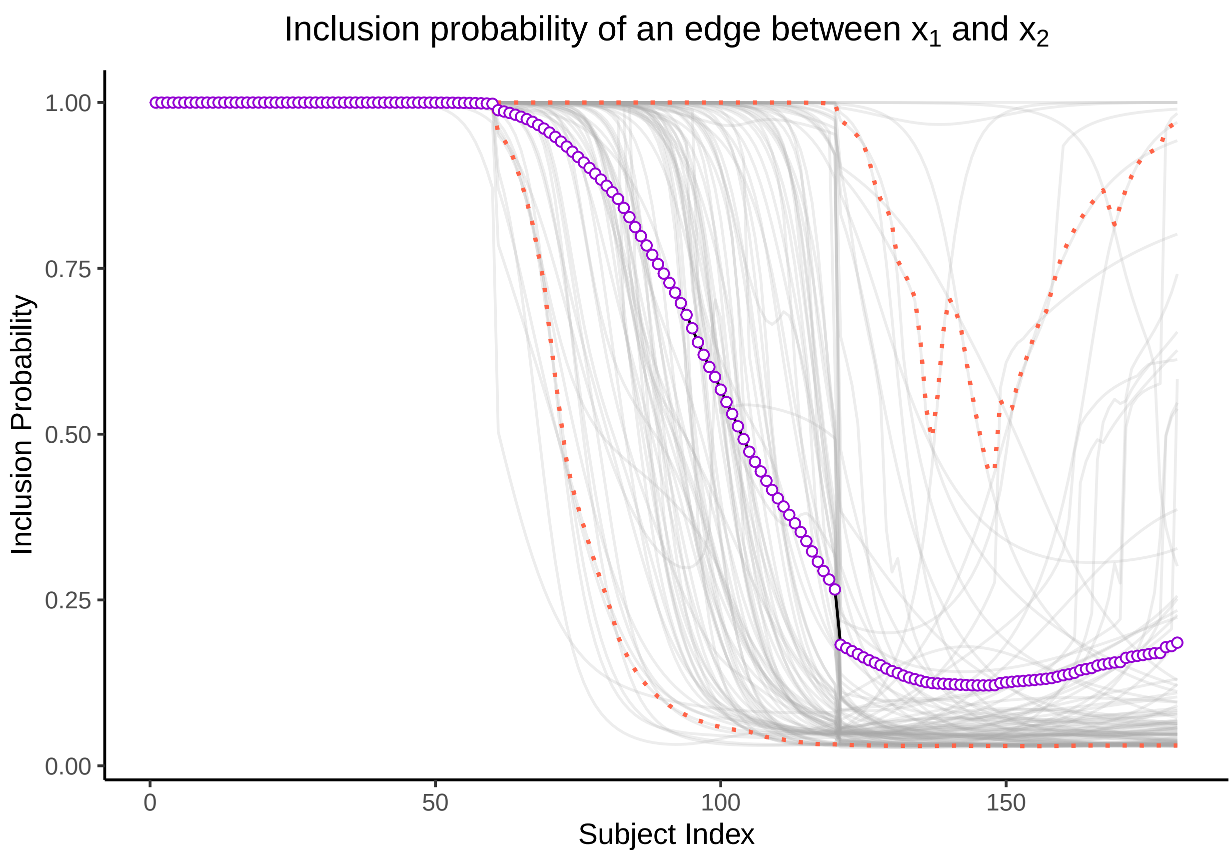
```
## Warning: package 'varbvs' was built under R version 4.1.1
```

```r
setwd("~/covdepGE")
source("generate_data.R")

# number of trials
trials <- 100

# number of individuals
n <- nrow(generate_continuous()$data)

# matrices for storing inclusion probabilities
prob_mat12 <- matrix(NA, trials, n)
prob_mat13 <- matrix(NA, trials, n)

# generate the pi-grid using CS

# generate the data
cont <- generate_continuous()

data_mat <- cont$data
X <- data_mat[, -1]
y <- data_mat[, 1]
Z <- cont$covts

# use CS to get log-odds
logit.CS <- varbvs(X = X, Z = NULL, y = y, verbose = F)$logodds

# convert the log-odds to probabilities
(probs.CS <- 1/(1 + 10^-logit.CS))
```

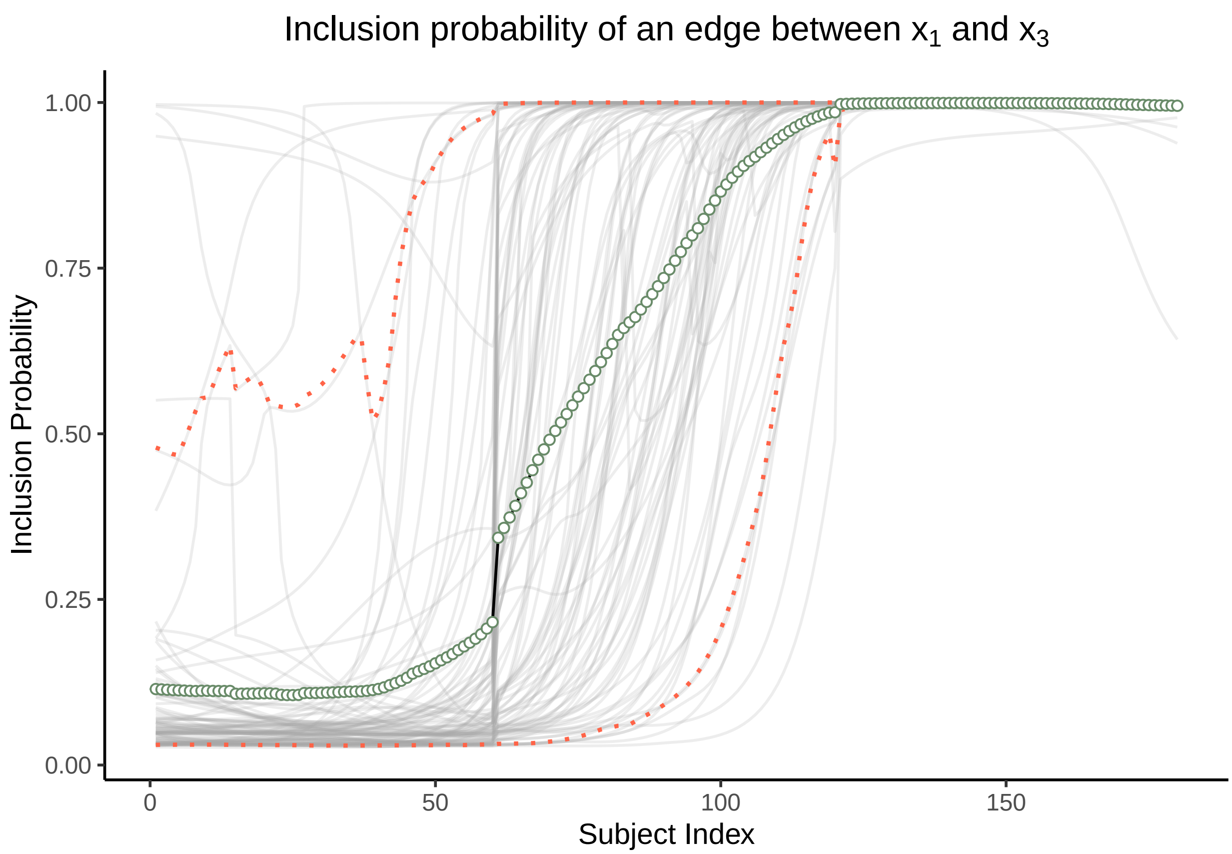
```
## [1] 0.20000000 0.19239536 0.18501301 0.17785154 0.17090914 0.16418362
## [7] 0.15767243 0.15137269 0.14528125 0.13939466 0.13370928 0.12822124
## [13] 0.12292649 0.11782083 0.11289993 0.10815936 0.10359460 0.09920105
## [19] 0.09497411 0.09090909
```

```r
# matrix for storing optimal pi values
pi_values <- matrix(NA, trials, 3)
colnames(pi_values) <- paste("response", 1:3)
rownames(pi_values) <- paste("trial", 1:trials)

# generate the data 'trials' times
for (j in 1:trials) {

    # generate the data
    cont <- generate_continuous(seed = j)

    data_mat <- cont$data
    X <- data_mat[, -1]
    y <- data_mat[, 1]
    Z <- cont$covts

    # estimate the graphs
    out <- covdepGE(data_mat = cont$data, Z = cont$covts, tau = 0.56,
        sigmavec = c(0.01, 0.05, 0.1, 0.5, 1, 3, 7, 10), pi_vec = probs.CS)

    # get probabilities of inclusion
    incl.probs <- out$inclusion_probs

    # get continuous probabilities of inclusion for x_1 to x_2
    # and x_1 to x_3
    probs12 <- as.numeric(lapply(incl.probs, function(x) x[1, 2]))
    probs13 <- as.numeric(lapply(incl.probs, function(x) x[1, 3]))

    # add them to the probs matrices
    prob_mat12[j, ] <- probs12
    prob_mat13[j, ] <- probs13

    # save the optimal pi_values for each response
    pi_values[j, ] <- as.numeric(lapply(out$ELBO[paste("Response",
        1:3)], `[[`, 2))
}

# get the mean probabilities for each individual
mean_probs12 <- colMeans(prob_mat12)
mean_probs13 <- colMeans(prob_mat13)

# find the 5% and 95% quantiles
CI12 <- apply(prob_mat12, 2, quantile, c(0.05, 0.95))
CI13 <- apply(prob_mat13, 2, quantile, c(0.05, 0.95))

# visualize them
graphs12 <- ggplot() + theme_classic() + xlab("Subject Index") + ylab("Inclusion Probability") +
    ggtitle(TeX("Inclusion probability of an edge between $x_1$ and x_2")) +
    theme(plot.title = element_text(hjust = 0.5))
```

```r
graphs13 <- ggplot() + theme_classic() + xlab("Subject Index") + ylab("Inclusion Probability") +
    ggtitle(TeX("Inclusion probability of an edge between $x_1$ and x_3")) +
    theme(plot.title = element_text(hjust = 0.5))

# add each of the instances to the plot
for (j in 1:trials) {
    graphs12 <- graphs12 + geom_line(data = data.frame(subj = 1:length(mean_probs12),
        prob = prob_mat12[j, ]), color = "gray66", alpha = 0.2, aes(subj,
        prob))

    graphs13 <- graphs13 + geom_line(data = data.frame(subj = 1:length(mean_probs13),
        prob = prob_mat13[j, ]), color = "gray66", alpha = 0.2, aes(subj,
        prob))
}

# add error bars to the plot
for (j in 1:2) {
    graphs12 <- graphs12 + geom_line(data = data.frame(subj = 1:length(mean_probs12),
        prob = CI12[j, ]), color = "tomato", linetype = "dotted",
        size = 0.75, aes(subj, prob))
    graphs13 <- graphs13 + geom_line(data = data.frame(subj = 1:length(mean_probs13),
        prob = CI13[j, ]), color = "tomato", linetype = "dotted",
        size = 0.75, aes(subj, prob))
}

# add the mean lines and display
graphs12 + geom_line(data = data.frame(subj = 1:length(mean_probs12),
    prob = mean_probs12), aes(subj, prob)) + geom_point(data = data.frame(subj = 1:length(mean_probs12)
    prob = mean_probs12), color = "darkviolet", fill = "white", shape = 21,
    aes(subj, prob))
```




```
graphs13 + geom_line(data = data.frame(subj = 1:length(mean_probs13),
    prob = mean_probs13), aes(subj, prob)) + geom_point(data = data.frame(subj = 1:length(mean_probs13)
    prob = mean_probs13), color = "darkseagreen4", fill = "white",
    shape = 21, aes(subj, prob))
```




```
# show optimal pi values
pi_values
```

```
##            response 1 response 2 response 3
## trial 1     0.2000000        0.2        0.2
## trial 2     0.2000000        0.2        0.2
## trial 3     0.2000000        0.2        0.2
## trial 4     0.2000000        0.2        0.2
## trial 5     0.2000000        0.2        0.2
## trial 6     0.2000000        0.2        0.2
## trial 7     0.2000000        0.2        0.2
## trial 8     0.2000000        0.2        0.2
## trial 9     0.2000000        0.2        0.2
## trial 10    0.2000000        0.2        0.2
## trial 11    0.2000000        0.2        0.2
## trial 12    0.2000000        0.2        0.2
## trial 13    0.2000000        0.2        0.2
## trial 14    0.2000000        0.2        0.2
## trial 15    0.2000000        0.2        0.2
## trial 16    0.2000000        0.2        0.2
## trial 17    0.2000000        0.2        0.2
## trial 18    0.2000000        0.2        0.2
## trial 19    0.2000000        0.2        0.2
## trial 20    0.2000000        0.2        0.2
## trial 21    0.2000000        0.2        0.2
## trial 22    0.2000000        0.2        0.2
```

```
## trial 23   0.2000000         0.2         0.2
## trial 24   0.2000000         0.2         0.2
## trial 25   0.2000000         0.2         0.2
## trial 26   0.2000000         0.2         0.2
## trial 27   0.2000000         0.2         0.2
## trial 28   0.2000000         0.2         0.2
## trial 29   0.2000000         0.2         0.2
## trial 30   0.2000000         0.2         0.2
## trial 31   0.2000000         0.2         0.2
## trial 32   0.2000000         0.2         0.2
## trial 33   0.2000000         0.2         0.2
## trial 34   0.2000000         0.2         0.2
## trial 35   0.2000000         0.2         0.2
## trial 36   0.2000000         0.2         0.2
## trial 37   0.1923954         0.2         0.2
## trial 38   0.2000000         0.2         0.2
## trial 39   0.2000000         0.2         0.2
## trial 40   0.2000000         0.2         0.2
## trial 41   0.2000000         0.2         0.2
## trial 42   0.2000000         0.2         0.2
## trial 43   0.2000000         0.2         0.2
## trial 44   0.2000000         0.2         0.2
## trial 45   0.2000000         0.2         0.2
## trial 46   0.2000000         0.2         0.2
## trial 47   0.2000000         0.2         0.2
## trial 48   0.2000000         0.2         0.2
## trial 49   0.2000000         0.2         0.2
## trial 50   0.2000000         0.2         0.2
## trial 51   0.2000000         0.2         0.2
## trial 52   0.2000000         0.2         0.2
## trial 53   0.2000000         0.2         0.2
## trial 54   0.2000000         0.2         0.2
## trial 55   0.2000000         0.2         0.2
## trial 56   0.2000000         0.2         0.2
## trial 57   0.2000000         0.2         0.2
## trial 58   0.2000000         0.2         0.2
## trial 59   0.2000000         0.2         0.2
## trial 60   0.2000000         0.2         0.2
## trial 61   0.2000000         0.2         0.2
## trial 62   0.2000000         0.2         0.2
## trial 63   0.2000000         0.2         0.2
## trial 64   0.2000000         0.2         0.2
## trial 65   0.2000000         0.2         0.2
## trial 66   0.2000000         0.2         0.2
## trial 67   0.2000000         0.2         0.2
## trial 68   0.2000000         0.2         0.2
## trial 69   0.2000000         0.2         0.2
## trial 70   0.2000000         0.2         0.2
## trial 71   0.2000000         0.2         0.2
## trial 72   0.2000000         0.2         0.2
## trial 73   0.2000000         0.2         0.2
## trial 74   0.2000000         0.2         0.2
## trial 75   0.2000000         0.2         0.2
## trial 76   0.2000000         0.2         0.2
```

```
## trial 77   0.2000000         0.2         0.2
## trial 78   0.2000000         0.2         0.2
## trial 79   0.2000000         0.2         0.2
## trial 80   0.2000000         0.2         0.2
## trial 81   0.2000000         0.2         0.2
## trial 82   0.2000000         0.2         0.2
## trial 83   0.2000000         0.2         0.2
## trial 84   0.2000000         0.2         0.2
## trial 85   0.2000000         0.2         0.2
## trial 86   0.2000000         0.2         0.2
## trial 87   0.2000000         0.2         0.2
## trial 88   0.2000000         0.2         0.2
## trial 89   0.2000000         0.2         0.2
## trial 90   0.2000000         0.2         0.2
## trial 91   0.2000000         0.2         0.2
## trial 92   0.2000000         0.2         0.2
## trial 93   0.2000000         0.2         0.2
## trial 94   0.2000000         0.2         0.2
## trial 95   0.2000000         0.2         0.2
## trial 96   0.2000000         0.2         0.2
## trial 97   0.2000000         0.2         0.2
## trial 98   0.2000000         0.2         0.2
## trial 99   0.2000000         0.2         0.2
## trial 100  0.2000000         0.2         0.2
```