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## User's guide to the Package *dcoex* 0.9

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## Abstract

This is the vignette of the package *dcoex*. Motivation: Standard analysis routines for microarray data aim at differentially expressed genes. In this package an algorithm for finding sets of differentially co-expressed genes is implemented.

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# Chapter 1

## Introduction

For detection and interpretation of molecular disease mechanisms it is of great interest to identify the genes involved. Common Microarray analysis strategies look for up- or down-regulated genes. Not all changes in gene expression are detectable by this approach. In contrast to differential expression, differential co-expression aims to detect groups of genes with changes in their covariance structure. This cannot be done in a gene-wise fashion, one (in principle) needs to take into account all possible subsets of genes. To screen this large number of candidate groups effectively, an additive model for scoring differential co-expression is employed. `dcoex` implements an algorithm for finding differentially co-expressed groups.

## Chapter 2

# Finding groups of differentially expressed genes

### 2.1 Basic functionality

```
> set.seed(12342324)
> library(dcoex)
```

R Package to provide an algorithm to find groups of differentially co-expressed genes

```
> data("normal", "bcrabl", package = "dcoex")
> normal = normal[sample(1:dim(normal)[1], 500), ]
> bcrabl = bcrabl[sample(1:dim(normal)[1], 500), ]
> res <- dcoex(bcrabl, normal)

> paste(res$dcoex.genes)

[1] "69" "84" "98" "131" "170" "177" "212" "224" "252" "260" "286" "348"
[13] "369" "493"
```

### 2.2 Tuning the set size

```
> for (al in c(0.1, 0.6, 0.9)) {
+   res = dcoex(normal, bcrabl, NULL, al)
+   cat(paste("alpha: ", al, "\t#genes: ", length(res$dcoex.genes),
+           "\tscore: ", round(res$residual, 4), "\n"), sep = "")
+ }
```

|        |     |         |    |        |        |
|--------|-----|---------|----|--------|--------|
| alpha: | 0.1 | #genes: | 49 | score: | 0.3482 |
| alpha: | 0.6 | #genes: | 12 | score: | 0.1751 |
| alpha: | 0.9 | #genes: | 6  | score: | 0.1318 |

### 2.3 Starting point heuristic

```
> for (al in c(0.1, 0.6, 0.9)) {
+   start = dcoex.kmeans(normal, , subsample = 500)
+   res = dcoex(normal, bcrabl, as.matrix(as.numeric(start)),
+     al)
+   cat(paste("alpha: ", al, "\t#genes: ", length(res$dcoex.genes),
+     "\ttscore: ", round(res$residual, 4), "\n"), sep = "")
+ }
```

|        |     |         |    |        |        |
|--------|-----|---------|----|--------|--------|
| alpha: | 0.1 | #genes: | 49 | score: | 0.3482 |
| alpha: | 0.6 | #genes: | 12 | score: | 0.1751 |
| alpha: | 0.9 | #genes: | 2  | score: | 0.0607 |