Analysis of Multi-Omics Data with Multiple Co-Inertia Analysis via Nonlinear Iterative Partial Least Squares (NIPALS)

Maximilian Mattessich

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Quick Start

The package can be installed directly from Github via the `devtools` package:

```
install.packages("devtools",repos = "http://cran.us.r-project.org") # required for install_github
library(devtools)

install_github("Muunraker/NIPALS-MCIA")
library(nipalsMCIA)
```

A test dataset of NCI60 cancer cell line data with 3 blocks (mRNA, proteins, and micro-RNA) is included to illustrate how the main MCIA function works with multi-omics data:

```
data(NCI60) # loads data as data_blocks
summary(data_blocks)
```

```
##       Length Class      Mode
## mrna  12895  data.frame list
## miRNA   537  data.frame list
## prot   7016  data.frame list
```

The preprocessing function and main NIPALS iteration can then be applied to the data, including some plots

```
data_blocks_norm <- lapply(data_blocks,omicadeInitialization) # preprocessed data
results <- nipals_multiblock(data_blocks_norm,num_PCs = 2, tol=1e-12,
                             deflationMethod = 'block',plots="true")
```

```
## [1] "Computing order 1 scores"
## [1] "Iteration number: 1 , Resisual error: 0.0099370992917334"
## [1] "Iteration number: 2 , Resisual error: 0.00453609015500628"
## [1] "Iteration number: 3 , Resisual error: 0.00278776739876724"
## [1] "Iteration number: 4 , Resisual error: 0.00158241048888345"
## [1] "Iteration number: 5 , Resisual error: 0.00114924597616266"
## [1] "Iteration number: 6 , Resisual error: 0.000857017149693967"
## [1] "Iteration number: 7 , Resisual error: 0.000584078018324108"
## [1] "Iteration number: 8 , Resisual error: 0.000362641936806761"
```

```
## [1] "Iteration number: 9 , Resisual error: 0.000210571934500196"
## [1] "Iteration number: 10 , Resisual error: 0.000117263327335162"
## [1] "Iteration number: 11 , Resisual error: 6.37339875301131e-05"
## [1] "Iteration number: 12 , Resisual error: 3.41731678609979e-05"
## [1] "Iteration number: 13 , Resisual error: 1.81877004980617e-05"
## [1] "Iteration number: 14 , Resisual error: 9.64118938917569e-06"
## [1] "Iteration number: 15 , Resisual error: 5.09976153429195e-06"
## [1] "Iteration number: 16 , Resisual error: 2.69444709637828e-06"
## [1] "Iteration number: 17 , Resisual error: 1.42272993098463e-06"
## [1] "Iteration number: 18 , Resisual error: 7.50987067945491e-07"
## [1] "Iteration number: 19 , Resisual error: 3.96338162910598e-07"
## [1] "Iteration number: 20 , Resisual error: 2.0915013184547e-07"
## [1] "Iteration number: 21 , Resisual error: 1.10364176221511e-07"
## [1] "Iteration number: 22 , Resisual error: 5.82352554581722e-08"
## [1] "Iteration number: 23 , Resisual error: 3.07282041200896e-08"
## [1] "Iteration number: 24 , Resisual error: 1.62137946020657e-08"
## [1] "Iteration number: 25 , Resisual error: 8.55519800488369e-09"
## [1] "Iteration number: 26 , Resisual error: 4.514132082023e-09"
## [1] "Iteration number: 27 , Resisual error: 2.38186829287779e-09"
## [1] "Iteration number: 28 , Resisual error: 1.25678449591771e-09"
## [1] "Iteration number: 29 , Resisual error: 6.63137576101258e-10"
## [1] "Iteration number: 30 , Resisual error: 3.49901871365965e-10"
## [1] "Iteration number: 31 , Resisual error: 1.84624263793731e-10"
## [1] "Iteration number: 32 , Resisual error: 9.74162382705313e-11"
## [1] "Iteration number: 33 , Resisual error: 5.14012096775041e-11"
## [1] "Iteration number: 34 , Resisual error: 2.71216972491661e-11"
## [1] "Iteration number: 35 , Resisual error: 1.43105735594951e-11"
## [1] "Iteration number: 36 , Resisual error: 7.55094597959527e-12"
## [1] "Iteration number: 37 , Resisual error: 3.98422961289668e-12"
## [1] "Iteration number: 38 , Resisual error: 2.10229403330153e-12"
## [1] "Iteration number: 39 , Resisual error: 1.1091370877292e-12"
## [1] "Iteration number: 40 , Resisual error: 5.85392845309229e-13"
## [1] "Computing order 2 scores"
## [1] "Iteration number: 1 , Resisual error: 0.00690059674791539"
## [1] "Iteration number: 2 , Resisual error: 0.00257034348084945"
## [1] "Iteration number: 3 , Resisual error: 0.00349991198589512"
## [1] "Iteration number: 4 , Resisual error: 0.00213216362977424"
## [1] "Iteration number: 5 , Resisual error: 0.000740609559744823"
## [1] "Iteration number: 6 , Resisual error: 0.00021747395733162"
## [1] "Iteration number: 7 , Resisual error: 6.37849467994903e-05"
## [1] "Iteration number: 8 , Resisual error: 1.93682174347218e-05"
## [1] "Iteration number: 9 , Resisual error: 6.09200270657376e-06"
## [1] "Iteration number: 10 , Resisual error: 1.97361103041957e-06"
## [1] "Iteration number: 11 , Resisual error: 6.55115805853201e-07"
## [1] "Iteration number: 12 , Resisual error: 2.21993150806288e-07"
## [1] "Iteration number: 13 , Resisual error: 7.6623952842414e-08"
## [1] "Iteration number: 14 , Resisual error: 2.69088341192658e-08"
## [1] "Iteration number: 15 , Resisual error: 9.61011056149763e-09"
## [1] "Iteration number: 16 , Resisual error: 3.4899006289002e-09"
## [1] "Iteration number: 17 , Resisual error: 1.28863106643728e-09"
## [1] "Iteration number: 18 , Resisual error: 4.83724171829181e-10"
## [1] "Iteration number: 19 , Resisual error: 1.84514473144937e-10"
## [1] "Iteration number: 20 , Resisual error: 7.14661420320173e-11"
## [1] "Iteration number: 21 , Resisual error: 2.80769574256823e-11"
```

```
## [1] "Iteration number: 22 , Resisual error: 1.11743149455723e-11"
## [1] "Iteration number: 23 , Resisual error: 4.49868614582627e-12"
## [1] "Iteration number: 24 , Resisual error: 1.82943243887124e-12"
## [1] "Iteration number: 25 , Resisual error: 7.50295658935585e-13"
```