sparseWeightBasedPCA Package

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sparseWeightBasedPCA: A package for Regularized weight based Simultaneous Component Analysis (SCA) and Principal Component Analysis (PCA)

Theoretical background

Principal Components Analysis (PCA) allows performing dimensionality reduction via matrix factorization.

While there are several ways to express a PCA model, in what follows will we consider the formulation

$$\mathbf{X} = \mathbf{XWP}^T + \mathbf{E}$$

where X is a $I \times J$ data matrix (I is the number of units; J the number of continuous variables); W is a $J \times D$ weight matrix ($D \leq J$ is the rank of the reduced matrix); P is the orthogonal loading matrix, such that $P^T P = I$; and E is an $I \times J$ error matrix.

The `sparseWeightBasedPCA` package performs the following tasks:

1. Task 1
2. Task 2
3. Task 3

The `sparseWeightBasedPCA` package

```
set.seed(1)
X <- matrix(rnorm(100), 20, 5)
print(X)
```

```
##              [,1]        [,2]       [,3]         [,4]       [,5]
##  [1,] -0.62645381  0.91897737 -0.1645236  2.401617761 -0.5686687
##  [2,]  0.18364332  0.78213630 -0.2533617 -0.039240003 -0.1351786
##  [3,] -0.83562861  0.07456498  0.6969634  0.689739362  1.1780870
##  [4,]  1.59528080 -1.98935170  0.5566632  0.028002159 -1.5235668
##  [5,]  0.32950777  0.61982575 -0.6887557 -0.743273209  0.5939462
##  [6,] -0.82046838 -0.05612874 -0.7074952  0.188792300  0.3329504
##  [7,]  0.48742905 -0.15579551  0.3645820 -1.804958629  1.0630998
##  [8,]  0.73832471 -1.47075238  0.7685329  1.465554862 -0.3041839
##  [9,]  0.57578135 -0.47815006 -0.1123462  0.153253338  0.3700188
## [10,] -0.30538839  0.41794156  0.8811077  2.172611670  0.2670988
## [11,]  1.51178117  1.35867955  0.3981059  0.475509529 -0.5425200
## [12,]  0.38984324 -0.10278773 -0.6120264 -0.709946431  1.2078678
## [13,] -0.62124058  0.38767161  0.3411197  0.610726353  1.1604026
## [14,] -2.21469989 -0.05380504 -1.1293631 -0.934097632  0.7002136
## [15,]  1.12493092 -1.37705956  1.4330237 -1.253633400  1.5868335
## [16,] -0.04493361 -0.41499456  1.9803999  0.291446236  0.5584864
```

```
## [17,] -0.01619026 -0.39428995 -0.3672215 -0.443291873 -1.2765922
## [18,]  0.94383621 -0.05931340 -1.0441346  0.001105352 -0.5732654
## [19,]  0.82122120  1.10002537  0.5697196  0.074341324 -1.2246126
## [20,]  0.59390132  0.76317575 -0.1350546 -0.589520946 -0.4734006
```