

# Package ‘FSDAM’

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**LazyLoad** yes

**LazyData** yes

**Version** 2024.1-30

**Title** Forward Stepwise Deep Autoencoder-Based Monotone NLDR

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**Depends** R (>= 3.5.0)

**Suggests** R.rsp, RUnit

**Imports** kyotil, reticulate (>= 1.10)

**VignetteBuilder** R.rsp

**Description** FS-DAM performs feature extraction through latent variables identification. Implementation is based on autoencoders with monotonicity and orthogonality constraints.

**License** GPL (>= 2)

**NeedsCompilation** no

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**Repository** CRAN

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cc.505

*Select Biomarkers from the HVTN 505 Correlates Analysis*

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**Description**

See reference.

**Usage**

```
data("cc.505")
```

**Format**

A data frame with 189 observations on the following 27 variables.

ptid a character vector  
trt a numeric vector  
case a numeric vector  
control a numeric vector  
perprot a numeric vector  
last\_uninfec\_immun\_vst a numeric vector  
racefull a numeric vector  
racefulltxt a character vector  
bmi a numeric vector  
bmicat a numeric vector  
bmicattxt a character vector  
earliest\_pos\_vst a numeric vector  
level a character vector  
matchlevel a character vector  
samplingfraction a numeric vector  
vst9subcohort a numeric vector  
HIVwk28preunbl a numeric vector  
age a numeric vector  
racecc a character vector  
bhvrisk a numeric vector  
BMI a numeric vector  
stratuminds\_vaccs a numeric vector  
stratuminds a numeric vector  
cd4.env.poly a numeric vector  
cd8.env.poly a numeric vector  
mfounders a numeric vector  
wei a numeric vector

## References

Fong, Y, Xu, J. Multi-Stage Simultaneous Deep Autoencoder-based Monotone (MSS-DAM) Non-linear Dimensionality Reduction Methods, Journal of Computational and Graphical Statistics, in press.

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 fsdam

*FS-DAM NLDR*


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## Description

Forward stepwise deep autoencoder-based monotone nonlinear dimension reduction.

## Usage

```
fsdam(dat, opt_numCode = ncol(dat), opt_seed = 1, opt_model = "n", opt_gpu = 0,
      opt_k = 100, opt_nEpochs = 10000,
      opt_constr = c("newpenalization", "constrained", "none"),
      opt_tuneParam = 10, opt_penfun = "mean", opt_ortho = 1, opt_earlystop = "no",
      verbose = FALSE)
```

```
## S3 method for class 'fsdam'
plot(x, which=c("mse", "history", "decoder.func", "scatterplot"),
     k=NULL, dim.1=NULL, dim.2=NULL, col.predict=2, ...)
```

## Arguments

dat	data frame.
opt_numCode	number of components to extract
opt_seed	seed for torch
opt_model	n for newpenalization
opt_gpu	zero-based index of gpu to be used among all gpus. If negative, then no gpu is used
opt_k	number of nodes in the coding/decoding layers
opt_nEpochs	number of epochs for training
opt_constr	constraint string
opt_tuneParam	tuning parameter for monotonicity penalty
opt_penfun	penalize sum or mean
opt_ortho	tuning parameter for orthogonality penalty
opt_earlystop	whether to stop early
verbose	verbose
x	fsdam object
which	which

k	the component to plot
dim.1	index of the first variable
dim.2	index of the second variable
col.predict	color of the predicted curve when which = scatterplot
...	plotting arguments

### Details

If the torch python package is not available, this function will stop.

To make sure the right python installation is used, run `reticulate::use_python("/app/easybuild/software/Python/3.7.4-foss-2016b/bin/python")` in R before running this function for the first time.

It is recommended that `dat` is scaled before calling `fsdam`.

### References

Fong, Y, Xu, J. Multi-Stage Simultaneous Deep Autoencoder-based Monotone (MSS-DAM) Non-linear Dimensionality Reduction Methods, Journal of Computational and Graphical Statistics, in press.

### Examples

```
## Not run:

fit=fsdam(hvtn505tier1[1:100,-1], opt_numCode=2, verbose=TRUE)
fit
plot(fit,which="mse")
plot(fit,which="history")

## End(Not run)
```

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hvtn505tier1

*HVTN 505 Immune Correlates Tier 1 Dataset*

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### Description

Contains eight immune response variables from the vaccine arm of the HVTN 505 trial.

### Usage

```
data("hvtn505tier1")
```

**Format**

A data frame with 150 observations on the following 9 variables.

ptid a character vector

CD8\_ANYVRCENV\_PolyfunctionalityScore\_score a numeric vector

IgGw28\_env\_mdw a numeric vector

IgGw28\_V1V2\_mdw a numeric vector

IgGw28\_gp41\_mdw a numeric vector

ADCP1 a numeric vector

R2aConSgp140CFI a numeric vector

IgAw28\_env\_mdw a numeric vector

IgG3w28\_env\_mdw a numeric vector

**References**

Fong, Y, Xu, J. Multi-Stage Simultaneous Deep Autoencoder-based Monotone (MSS-DAM) Non-linear Dimensionality Reduction Methods, *Journal of Computational and Graphical Statistics*, in press.

Janes, H.E., Cohen, K.W., Frahm, N., De Rosa, S.C., Sanchez, B., Hural, J. et al (2017), Higher T-cell responses induced by DNA/rAd5 HIV-1 preventive vaccine are associated with lower HIV-1 infection risk in an efficacy trial, *The Journal of infectious diseases*, 215, 1376-1385.

Fong, Y., Shen, X., Ashley, V.C., Deal, A., Seaton, K.E., Yu, C. et al (2018), Vaccine-induced antibody responses modify the association between T-cell immune responses and HIV-1 infection risk in HVTN 505, *The Journal of Infectious Diseases*, 217, 1280–1288.

Neidich, S.D., Fong, Y., Shen, X., Ashley, V.C., Deal, A., Seaton, K.E. et al (2019), Antibody Fc-effector Functions and IgG3 Associates with Decreased HIV-1 Acquisition Risk, *The Journal of Infectious Diseases*, 129, 4838-4849.

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