Package ‘LilRhino’

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Type Package

Title For Implementation of Feed Reduction, Learning Examples, NLP and Code Management

Version 1.2.2

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Description This is for code management functions, NLP tools, a Monty Hall simulator, and for implementing my own variable reduction technique called Feed Reduction. The Feed Reduction technique is not yet published, but is merely a tool for implementing a series of binary neural networks meant for reducing data into N dimensions, where N is the number of possible values of the response variable.

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Encoding UTF-8

Suggests textclean

Imports FNN, stringi, beeper, ggplot2, keras, dplyr, readr, parallel, tm, e1071, SnowballC, data.table, fastmatch, neuralnet

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Description

Used as a function of Feed_Reduction, Binary_Network uses a 3 layer neural network with an adam optimizer, leaky RELU for the first two activation functions, followed by a softmax on the last layer. The loss function is binary_crossentropy. This is a keras wrapper, and uses tensorflow in the backend.

Usage

\[
\text{Binary}_\text{Network}(X, Y, X_{\text{test}}, \text{val}_\text{split}, \text{nodes}, \text{epochs}, \text{batch}_\text{size}, \text{verbose} = 0)
\]

Arguments

- **X**  
  Training data.
- **Y**  
  Training Labels. These must be binary.
- **X_{\text{test}}**  
  The test Data
- **val\_split**  
  The validation split for keras.
- **nodes**  
  The number of nodes in the hidden layers.
- **epochs**  
  The number of epochs for the network
- **batch\_size**  
  The batch size for the network
- **verbose**  
  Whether or not you want details about the run as its happening. 0 = silent, 1 = progress bar, 2 = one line per epoch.

Details

This function is a subset for the larger function Feed_Network. The output is the list containing the training and testing data converted into an approximation of probability space for that binary decision.

Value

- **Train**  
  The training data in approximate probability space
- **Test**  
  The testing data in 'double' approximate probability space
**Bootstrap_Data_Frame**

A function for bootstrapping textual data so that all levels have the same number of entries.

**Description**

This function takes a corpus and a set of labels and uses Bootstrap_Vocab to increase the size of each label until they are all the same length. Stop words are not bootstrapped.
Usage

`Bootstrap_Data_Frame(text, tags, stopwords, min_length = 7, max_length = 15)`

Arguments

- **text**: text is the collection of textual data to bootstrap up.
- **tags**: tags are the collection of tags that will be used to bootstrap. There should be one for every entry in `text`. They do not have to be unique.
- **stopwords**: stopwords to make sure are not apart of the bootstrapping process. It is advised to eliminate the most common words. See `Stop_Word_Maker()`
- **min_length**: The shortest length allowable for bootstrapped words
- **max_length**: The longest length allowable for bootstrapped words

Details

Most of the bootstrapped words will be nonseneical. The intention of this package is not to create new sentences, but to instead trick your model into thinking it has equal lengthed levels. This method is meant for bag of words style models.

Value

A data frame of your original documents along with the bootstrapped ones (column 1) along with their tags (column 2).

Author(s)

Travis Barton

Examples

```r
test_set = c("I like cats", "I like dogs", "we love animals", "I am a vet", 
           "US politics bore me", "I dont like to vote", 
           "The rainbow looked nice today dont you think tommy")
test_tags = c("animals", "animals", "animals", "animals", 
             "politics", "politics", 
             "misc")

Bootstrap_Data_Frame(test_set, test_tags, c("I", "we"), min_length = 3, max_length = 8)
```
**Description**

This function takes a selection of documents and bootstraps words from said sentences until there are \( N \) total sentences (both sudo and original).

**Usage**

\[
\text{Bootstrap\_Vocab(vocab, } N, \text{ stopwds, min\_length } = 7, \text{ max\_length } = 15)\]

**Arguments**

- **vocab**: The collection of documents to bootstrap.
- **N**: The total amount of sentences to end up with.
- **stopwds**: A list of stopwords to not include in the bootstrapping process.
- **min\_length**: The shortest allowable bootstrapped document.
- **max\_length**: The longest allowable bootstrapped document.

**Details**

The min and max length arguments to not guarantee that a sentence will reach that length. These sentences will be nonsensical.

**Value**

A vector of bootstrapped sentences.

**Author(s)**

Travis Barton

**Examples**

```R
testing\_set = \text{c(paste('this is test', as.character(seq(1, 10, 1))))}
Bootstrap\_Vocab(testing\_set, 20, c('this'))
```
Codes_done

For announcing when code is done.

Description

for alerting you when your code is done.

Usage

Codes_done(title, msg, sound = FALSE, effect = 1)

Arguments

title The title of the notification
msg The message to be sent
sound Optional sound to blurt as well
effect If sound it blurted, what should it be? (check beeper package for sound options)

Details

Only for Linix (as far as I know)

Author(s)

smacdonald (stack overflow) with modification by Travis Barton

References

https://stackoverflow.com/questions/3365657/is-there-a-way-to-make-r-beep-play-a-sound-at-the-end-of-a-script

Examples

Codes_done("done", "check it", sound = TRUE, effect = 1)
Cross_val_maker

For Creating a test and train set from a whole set

Description

for making one dataset into two (test and train)

Usage

Cross_val_maker(data, alpha)

Arguments

data matrix of data you want to split
alpha the percent of data to split

Value

returns a list with accessible with the 'S' sign. Test and Train are labeled as such.

Author(s)

Travis Barton

Examples

dat <- Cross_val_maker(iris, .1)
train <- dat$Train
test <- dat$Test

Feed_Reduction

A Function for converting data into approximations of probability space.

Description

It takes the number of unique labels in the training data and tries to predict a one vs all binary neural network for each unique label. The output is an approximation of the probability that each individual input does not match the label. Travis Barton (2018) http://wbbpredictions.com/wp-content/uploads/2018/12/Redditbot_Paper.pdf

Usage

Feed_Reduction(X, Y, X_test, val_split = .1,
              nodes = NULL, epochs = 15,
              batch_size = 30, verbose = 0)
**Arguments**

- **X**
  - Training data
- **Y**
  - Training labels
- **X_test**
  - Testing data
- **val_split**
  - The validation split for the keras, binary, neural networks
- **nodes**
  - The number nodes for the hidden layers, default is 1/4 of the length of the training data.
- **epochs**
  - The number of epochs for the fitting of the networks
- **batch_size**
  - The batch size for the networks
- **verbose**
  - Whether or not you want details about the run as it's happening. 0 = silent, 1 = progress bar, 2 = one line per epoch.

**Details**

This is a new technique for dimensionality reduction of my own creation. Data is converted to the same number of dimensions as there are unique labels. Each dimension is an approximation of the probability that the data point is inside the a unique label. The return value is a list the training and test data with their dimensionality reduced.

**Value**

- **Train**
  - The training data in the new probability space
- **Test**
  - The testing data in the new probability space

**Author(s)**

Travis Barton.

**References**


**See Also**

Binary_Network

**Examples**

```r
## Not run:
if(8 * .Machine$sizeof.pointer == 64){
  # Feed Network Testing
  library(keras)

  install_keras()
  dat <- keras::dataset_mnist()
  X_train = array_reshape(dat$train$x/255, c(nrow(dat$train$x/255), 784))
```
y_train = dat$train$y
X_test = array_reshape(dat$test$x/255, c(nrow(dat$test$x/255), 784))
y_test = dat$test$y

Reduced_Data2 = Feed_Reduction(X_train, y_train, X_test,
val_split = .3, nodes = 350, 30, 50, verbose = 1)

library(e1071)
names(Reduced_Data2$test) = names(Reduced_Data2$train)
nnewdat = as.data.frame(cbind(rbind(Reduced_Data2$train, Reduced_Data2$test), c(y_train, y_test)))
colnames(newdat) = c(paste("V", c(1:11), sep = ""))
mod = svm(V11~, data = newdat, subset = c(1:60000),
kernel = 'linear', cost = 1, type = 'C-classification')
preds = predict(mod, newdat[60001:70000,-11])
sum(preds == y_test)/10000

## End(Not run)

---

**Load_Glove_Embeddings**  
*Function for loading in pre-trained or personal word embedding softwares.*

---

**Description**

Loads in GloVe’s pretrained 42 billion token embeddings, trained on the common crawl.

**Usage**

Load_Glove_Embeddings(path = 'glove.42B.300d.txt', d = 300)

**Arguments**

- **path**: The path to the embeddings file.
- **d**: The dimension of the embeddings file.

**Details**

The embeddings file should be the word, followed by numeric values, ending with a carriage return.

**Value**

The embeddings matrix.

**Author(s)**

Travis Barton
Examples

    #This code only works if you have the 5g file found here: <https://nlp.stanford.edu/projects/glove/>
    
    ## Not run: emb = Load_Glove_Embeddings()
Nearest_Centroid

For performing the nearest centroid problem (with modifications) on MNST data specifically (general to come)

Description

For Chen’s homework, I’ll change this when I generalize it.

Usage

Nearest_Centroid(X_train, X_test, Y_train)

Arguments

X_train Training data
X_test data to be tested
Y_train training labels

Note

Based on homework from Guangling Chen’s M251 class at SJSU

Author(s)

Travis Barton

Num_Al_Sep

Number/alpha numeric separator for strings.

Description

A Function for the separating of numbers from letters. ’b4’ for example would be converted to ’b 4’.

Usage

Num_Al_Sep(vec)

Arguments

vec The string vector in which you wish to separate the numbers from the letters.

Value

output The separated vector.
Note

This is a really simple function really used inside other functions.

Author(s)

Travis Barton

Examples

test_vec = 'The most iconic American weapon has to be the AR15'
res = Num_Al_Sep(test_vec)
print(res)

<table>
<thead>
<tr>
<th>Percent</th>
<th>Percent of confusion matrix</th>
</tr>
</thead>
</table>

Description

For finding the accuracy of confusion matrices with true/pred values

Usage

Percent(true, test)

Arguments

ttrue   | The true values
Parameter.test   | the test values

details

Make sure your strings have the right values and create a square matrix.

Value

the percent acc.

Author(s)

Travis Barton

Examples

true <- rep(1:10, 10)
test <- rep(1:10, 10)
test[c(2, 22, 33, 89)] = 1
Percent(true, test)

#or

#percent(table(true, test))
Pretreatment

Pretreatment of textual documents for NLP.

Description

This function goes through a number of pretreatment steps in preparation for vectorization. These steps are designed to help the data become more standard so that there are fewer outliers when training during NLP. The following effects are applied: 1. Non-alpha/numerics are removed. 2. Numbers are separated from letters. 3. Numbers are replaced with their word equivalents. 4. Words are stemmed (optional). 5. Words are lowercased (optional).

Usage

Pretreatment(title_vec, stem = TRUE, lower = TRUE, parallel = FALSE)

Arguments

title_vec Vector of documents to be pre-treated.
stem Boolean variable to decide whether to stem or not.
lower Boolean variable to decide whether to lowercase words or not.
parallel Boolean variable to decide whether to run this function in parallel or not.

Details

This function returns a list. It should be able to accept any format that the function lapply would accept. The parallelization is done with the function Mcapply from the package 'parallel' and will only work on systems that allow forking (Sorry windows users). Future updates will allow for socketing.

Value

output The list of character strings post-pretreatment

Author(s)

Travis Barton

Examples

## Not run: # for some reason it takes longer than 5 seconds on CRAN's computers
test_vec = c('This is a test', 'Ahoy!', 'my battle-ship is on... b6!')
res = Pretreatment(test_vec)
print(res)

## End(Not run)
Random_Brains

Random Brains: Neural Network Implementation of Random Forest

Description

Creates a random forest style collection of neural networks for classification

Usage

Random_Brains(data, y, x_test,
variables = ceiling(ncol(data)/10),
brains = floor(sqrt(ncol(data))),
hiddens = c(3, 4))

Arguments

data  The data that holds the predictors ONLY.
y  The response variable
x_test  The testing predictors
variables  The number of predictors to select for each brain in 'data'. The default is one tenth of the number of columns in 'data'.
brains  The number of neural networks to create. The default is the square root of the number of columns in 'data'.
hiddens  The is a vector with length equal to the desired number of hidden layers. Each entry in the vector corresponds to the number of nodes in that layer. The default is c(3, 4) which is a two layer network with 3 and 4 nodes in the layers respectively.

Details

This function is meant to mirror the classic random forest function exactly. The only difference being that it uses shallow neural networks to build the forest instead of decision trees.

Value

predictions  The predictions for x_test.
num_brains  The number of neural networks used to decide the predictions.
predictors_per_brain  The number of variables used for the neural networks used to decide the predictions.
hidden_layers  The vector describing the number of layers, as well as how many there were.
preds_per_brain  This matrix describes which columns were selected by each brain. Each row is a new brain, each column describes the index of the column used.
raw_results  The matrix of raw predictions from the brains. Each row is the cumulative predictions of all the brains. Which prediction won by majority vote can be seen in 'predictions'
Note

The neural networks are created using the neuralnet package!

Author(s)

Travis Barton

Examples

```r
dat = Cross_val_maker(iris, .2)
train = dat$Train
test = dat$Test

Final_Test = Random_Brains(train[, -5],
  train$Species, as.matrix(test[, -5]),
  variables = 3, brains = 2)
table(Final_Test$predictions, as.numeric(test$Species))
```

---

**Sentence_Vector**

*Function for extracting the sentence vector from an embeddings matrix.*

**Description**

Function for extracting the sentence vector from an embeddings matrix in a fast and convenient manner.

**Usage**

```
Sentence_Vector(Sentence, emb_matrix, dimension, stopwords)
```

**Arguments**

- **Sentence** The sentence to find the vector of.
- **emb_matrix** The embeddings matrix to search.
- **dimension** The dimension of the vector to return.
- **stopwords** Words that should not be included in the averaging process.

**Details**

The function splits the sentence into words, eliminates all stopwords, finds the vectors of each word, then averages the word vectors into a sentence vector.
**Value**

The sentence vector from an embeddings matrix.

**Author(s)**

Travis Barton

**Examples**

```r
emb <- data.frame(matrix(c(1, 2, 3, 4, 5, 5,
4, 3, 2, 1, 1, 5, 3, 2, 4), nrow = 3),
row.names = c('sentence', 'in', 'question'))

Sentence_Vector(c('this is the sentence in question'), emb, 5, c('this', 'is', 'the'))
```

---

**Stopword_Maker**

*For the finding of the $N$ most populous words in a corpus.*

**Description**

This function finds the $N$ most used words in a corpus. This is done to identify stop words to better prune data sets before training.

**Usage**

```r
Stopword_Maker(titles, cutoff = 20)
```

**Arguments**

- **titles**
  - The documents in which the most populous words are sought.

- **cutoff**
  - The number of $N$ top most used words to keep as stop words.

**Value**

- **output**
  - A vector of the $N$ most populous words.

**Author(s)**

Travis Barton

**Examples**

```r
test_set <- c('this is a testset', 'I am searching for a list of words',
'I like turtles',
'A rocket would be a fast way of getting to work, but I do not think it is very practical')
res <- Stopword_Maker(test_set, 4)
print(res)
```
Table_percent

**Description**

Finds the acc of square tables.

**Usage**

```r
Table_percent(in_table)
```

**Arguments**

- `in_table`: a confusion matrix

**Details**

The table must be square.

**Note**

make sure its square.

**Author(s)**

Travis Barton

**Examples**

```r
t = rep(1:110, 10)
test = rep(1:110, 10)
test[c(2, 22, 33, 89)] = 1
Table_percent(table(t, test))
```

---

Vector_Puller

**Function for extracting word vectors from embeddings.**

**Description**

Function for extracting word vectors from embeddings. This function is an internal function for 'Sentence_Puller'. It averages the word vectors and returns the average of these vectors.

**Usage**

```r
Vector_Puller(words, emb_matrix, dimension)
```
Arguments

- **words**: The word to be extracted.
- **emb_matrix**: The embeddings matrix. It must be a data frame.
- **dimension**: The Dimension of the embeddings to extract. They do not have to match that of the matrix, but they cannot exceed its maximum column count.

Details

This is a simple and fast internal function.

Value

The vector that corresponds to the average of the word vectors.

Author(s)

Travis Barton

Examples

```r
# This is an example emb_matrix

emb = data.frame(matrix(c(1, 2, 3, 4, 5, 5, 4, 3, 2, 1), nrow = 2), row.names = c('cow', 'moo'))

Vector_Puller(c('cow', 'moo'), emb, 5)
```
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