

# Package ‘fastNaiveBayes’

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**Type** Package

**Title** Extremely Fast Implementation of a Naive Bayes Classifier

**Version** 2.2.1

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**Description** This is an extremely fast implementation of a Naive Bayes classifier. This package is currently the only package that supports a Bernoulli distribution, a Multinomial distribution, and a Gaussian distribution, making it suitable for both binary features, frequency counts, and numerical features. Another feature is the support of a mix of different event models. Only numerical variables are allowed, however, categorical variables can be transformed into dummies and used with the Bernoulli distribution. The implementation is largely based on the paper "A comparison of event models for Naive Bayes anti-spam e-mail filtering" written by K.M. Schneider (2003) <doi:10.3115/1067807.1067848>. Any issues can be submitted to: <<https://github.com/mskogholt/fastNaiveBayes/issues>>.

**Depends** R (>= 3.2.0)

**License** GPL-3

**Encoding** UTF-8

**URL** <https://github.com/mskogholt/fastNaiveBayes>

**BugReports** <https://github.com/mskogholt/fastNaiveBayes/issues>

**LazyData** TRUE

**Imports** Matrix, stats

**Suggests** knitr, rmarkdown, testthat

**RoxygenNote** 7.1.0

**VignetteBuilder** knitr

**NeedsCompilation** no

**Repository** CRAN

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fastNaiveBayes	<i>Fast Naive Bayes Classifier for different Distributions</i>
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### Description

Extremely fast implementation of a Naive Bayes Classifier.

A Naive Bayes classifier that assumes independence between the feature variables. Currently, either a Bernoulli, multinomial, or Gaussian distribution can be used. The bernoulli distribution should be used when the features are 0 or 1 to indicate the presence or absence of the feature in each document. The multinomial distribution should be used when the features are the frequency that the feature occurs in each document. Finally, the Gaussian distribution should be used with numerical variables. The distribution parameter is used to mix different distributions for different columns in the input matrix

Use fastNaiveBayes(...) or fnb.train(...) for a mixed event distribution model. fnb.bernoulli, fnb.multinomial, fnb.gaussian and for the specific distributions

### Usage

```
fastNaiveBayes(
  x,
  y,
  priors = NULL,
  laplace = 0,
  sparse = FALSE,
  check = TRUE,
  distribution = fnb.detect_distribution(x)
)
```

## Default S3 method:

```
fastNaiveBayes(
  x,
  y,
  priors = NULL,
  laplace = 0,
  sparse = FALSE,
```

```
    check = TRUE,
    distribution = fnb.detect_distribution(x)
)

fnb.bernoulli(x, y, priors = NULL, laplace = 0, sparse = FALSE, check = TRUE)

## Default S3 method:
fnb.bernoulli(x, y, priors = NULL, laplace = 0, sparse = FALSE, check = TRUE)

fnb.gaussian(x, y, priors = NULL, sparse = FALSE, check = TRUE)

## Default S3 method:
fnb.gaussian(x, y, priors = NULL, sparse = FALSE, check = TRUE)

fnb.multinomial(x, y, priors = NULL, laplace = 0, sparse = FALSE, check = TRUE)

## Default S3 method:
fnb.multinomial(x, y, priors = NULL, laplace = 0, sparse = FALSE, check = TRUE)

fnb.poisson(x, y, priors = NULL, sparse = FALSE, check = TRUE)

## Default S3 method:
fnb.poisson(x, y, priors = NULL, sparse = FALSE, check = TRUE)

fnb.train(
  x,
  y,
  priors = NULL,
  laplace = 0,
  sparse = FALSE,
  check = TRUE,
  distribution = fnb.detect_distribution(x)
)

## Default S3 method:
fnb.train(
  x,
  y,
  priors = NULL,
  laplace = 0,
  sparse = FALSE,
  check = TRUE,
  distribution = fnb.detect_distribution(x)
)
```

### Arguments

x a numeric matrix, or a `dgcMatrix`. For `bernoulli` should only contain 0's and 1's. For `multinomial` should only contain integers.

y	a factor of classes to classify
priors	a numeric vector with the priors. If left empty the priors will be determined by the relative frequency of the classes in the data
laplace	A number used for Laplace smoothing. Default is 0
sparse	Use a sparse matrix? If true a sparse matrix will be constructed from x. It's possible to directly feed a sparse dgcmatrix as x, which will set this parameter to TRUE
check	Whether to enable formal checks on input. Recommended to set to TRUE. Set to FALSE will make it faster, but at your own risk.
distribution	A list with distribution names and column names for which to use the distribution, see examples.

### Details

fastNaiveBayes(...) will convert non numeric columns to one hot encoded features to use with the Bernoulli event model. NA's in x will be set to 0 by default and observations with NA in y will be removed.

The distribution that is used for each feature is determined by a set of rules: - if the column only contains 0's and 1's a Bernoulli event model will be used - if the column only contains whole numbers a Multinomial event model will be used - if none of the above a Gaussian event model will be used.

By setting sparse = TRUE the numeric matrix x will be converted to a sparse dgcmatrix. This can be considerably faster in case few observations have a value different than 0.

It's also possible to directly supply a sparse dgcmatrix, which can be a lot faster in case a fastNaive-Bayes model is trained multiple times on the same matrix or a subset of this. See examples for more details. Bear in mind that converting to a sparse matrix can actually be slower depending on the data.

### Value

A fitted object of class "fastNaiveBayes". It has four components:

**model** Fitted fastNaiveBayes model

**names** Names of features used to train this fastNaiveBayes model

**distribution** Distribution used for each column of x

**levels** Levels of y

### See Also

[predict.fastNaiveBayes](#) for the predict function for the fastNaiveBayes model.

### Examples

```
rm(list = ls())
library(fastNaiveBayes)
cars <- mtcars
```

```
y <- as.factor(ifelse(cars$mpg > 25, "High", "Low"))
x <- cars[,2:ncol(cars)]

mod <- fastNaiveBayes(x, y, laplace = 1)

pred <- predict(mod, newdata = x)
mean(y!=pred)

mod <- fnb.train(x, y, laplace = 1)

pred <- predict(mod, newdata = x)
mean(y!=pred)

dist <- fnb.detect_distribution(x)

bern <- fnb.bernoulli(x[,dist$bernoulli], y, laplace = 1)
pred <- predict(bern, x[,dist$bernoulli])
mean(y!=pred)

mult <- fnb.multinomial(x[,dist$multinomial], y, laplace = 1)
pred <- predict(mult, x[,dist$multinomial])
mean(y!=pred)

gauss <- fnb.gaussian(x[,dist$gaussian], y)
pred <- predict(gauss, x[,dist$gaussian])
mean(y!=pred)
```

---

fnb.detect\_distribution

*Distribution Detection Function*

---

## Description

Determines which distribution to use for which columns in the matrix based on a set of rules.

## Usage

```
fnb.detect_distribution(x, nrows = nrow(x))
```

```
## Default S3 method:
```

```
fnb.detect_distribution(x, nrows = nrow(x))
```

## Arguments

x	a numeric matrix, or a dgcMatrix
nrows	number of rows to use to detect distributions

**Details**

A simple utility function to detect the distribution to use for each columns

**Value**

A list of distribution names mapped to column names

**Examples**

```
rm(list = ls())
library(fastNaiveBayes)
cars <- mtcars
y <- as.factor(iffelse(cars$mpg > 25, "High", "Low"))
x <- cars[, 2:ncol(cars)]

# Uses default of all rows to determine distributions
dist <- fnb.detect_distribution(x)
print(dist)

# Uses top 10 rows of x to determine distributions. If top 10 rows
# are representative this is can be much faster.
dist <- fnb.detect_distribution(x, nrow = 10)
print(dist)
```

---

fnb.save

*Save & Load Function for Fast Naive Bayes Models*


---

**Description**

Loads and saves fitted Naive Bayes models.

**Usage**

```
fnb.save(model, filename, overwrite = FALSE)

## Default S3 method:
fnb.save(model, filename, overwrite = FALSE)

fnb.load(filename)

## Default S3 method:
fnb.load(filename)
```

**Arguments**

model	the fitted Naive Bayes model to save.
filename	the file name to use to save or load the model.
overwrite	Whether to allow overwriting of previously saved models.

**Value**

fnb.save returns the filename that was used, and fnb.load returns the saved object.

**Examples**

```
rm(list = ls())
library(fastNaiveBayes)
cars <- mtcars
y <- as.factor(ifelse(cars$mpg > 25, "High", "Low"))
x <- cars[,2:ncol(cars)]

mod <- fastNaiveBayes(x, y, laplace = 1)
fnb.save(mod, "fastNaiveBayesModel")
mod2 <- fnb.load("fastNaiveBayesModel")
identical(mod, mod2)
file.remove("fastNaiveBayesModel")
```

---

fnb.update

*Update function*


---

**Description**

Update function

**Usage**

```
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## Default S3 method:
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## S3 method for class 'fnb.bernoulli'
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## S3 method for class 'fnb.multinomial'
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## S3 method for class 'fnb.gaussian'
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## S3 method for class 'fnb.poisson'
fnb.update(object, x, y, sparse = FALSE, check = TRUE)

## S3 method for class 'fastNaiveBayes'
fnb.update(object, x, y, sparse = FALSE, check = TRUE)
```

**Arguments**

object	fitted model
x	numeric matrix
y	factor of classes
sparse	boolean, set to true to use sparse matrices
check	boolean, set to true to enable formal checks on input

---

predict.fnb.bernoulli *Predict Method for fastNaiveBayes fits*

---

**Description**

Uses a fastNaiveBayes model and a new data set to create the classifications. This can either be the raw probabilities generated by the fastNaiveBayes model or the classes themselves.

**Usage**

```
## S3 method for class 'fnb.bernoulli'
predict(
  object,
  newdata,
  type = c("class", "raw", "rawprob"),
  sparse = FALSE,
  threshold = .Machine$double.eps,
  check = TRUE,
  ...
)

## S3 method for class 'fnb.gaussian'
predict(
  object,
  newdata,
  type = c("class", "raw", "rawprob"),
  sparse = FALSE,
  threshold = .Machine$double.eps,
  check = TRUE,
  ...
)

## S3 method for class 'fnb.multinomial'
predict(
  object,
  newdata,
  type = c("class", "raw", "rawprob"),
  sparse = FALSE,
```



```

    threshold = .Machine$double.eps,
    check = TRUE,
    ...
)

## S3 method for class 'fnb.poisson'
predict(
  object,
  newdata,
  type = c("class", "raw", "rawprob"),
  sparse = FALSE,
  threshold = .Machine$double.eps,
  check = TRUE,
  ...
)

## S3 method for class 'fastNaiveBayes'
predict(
  object,
  newdata,
  type = c("class", "raw"),
  sparse = FALSE,
  threshold = .Machine$double.eps,
  check = TRUE,
  ...
)

```

### Arguments

object	A fitted object of class "fnb.bernoulli", "fnb.gaussian", "fnb.multinomial" or "fastNaiveBayes".
newdata	A numeric matrix. A Sparse dgCMatrix is also accepted. Note: if fnb.naiveBayes or fnb.gaussian or fnb.train was used to create the model, then if newdata contains features that were not encountered in the training data, these are omitted from the prediction. Furthermore, newdata can contain fewer features than encountered in the training data. In this case, newdata will be padded with extra columns all filled with 0's.
type	If "raw", the conditional a-posterior probabilities for each class are returned, and the class with maximal probability else.
sparse	Use a sparse matrix? If true a sparse matrix will be constructed from x. It's possible to directly feed a sparse dgCMatrix as x, which will set this parameter to TRUE
threshold	A threshold for the minimum probability. For Bernoulli and Multinomial event models Laplace smoothing should solve this, but in the case of Gaussian event models, this ensures numerical probabilities.
check	Whether to perform formal checks on the input. Set to false, if this is not necessary and speed is of the essence
...	not used

**Value**

If `type = 'class'`, a factor with classified class levels. If `type = 'raw'`, a matrix with the predicted probabilities of each class, where each column in the matrix corresponds to a class level.

**See Also**

[fastNaiveBayes](#) for the fastNaiveBayes model

---

tweets	<i>This data originally came from Crowdfunder's Data for Everyone library.</i>
--------	--

---

**Description**

As the original source says,

**Usage**

tweets

**Format**

A data frame with 14640 rows and 2 columns

**airline\_sentiment** sentiment, as either 'negative', 'neutral', 'positive'

**text** raw text, character

**Details**

"A sentiment analysis job about the problems of each major U.S. airline. Twitter data was scraped from February of 2015 and contributors were asked to first classify positive, negative, and neutral tweets, followed by categorizing negative reasons (such as "late flight" or "rude service")."

The data provided here is an altered version of the original source.

**Source**

<https://www.figure-eight.com/data-for-everyone/>

---

tweetsDTM	<i>This data originally came from Crowdfunder's Data for Everyone library.</i>
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---

### Description

As the original source says,

### Usage

tweetsDTM

### Format

A data frame with 14640 rows and 2186 columns

**airline\_sentiment** sentiment, as either 'negative', 'neutral', 'positive'

**said** Frequency count, numeric

**virginamerica** Frequency count, numeric

**commerci** Frequency count, numeric

**experi** Frequency count, numeric

**plus** Frequency count, numeric

**anoth** Frequency count, numeric

**mean** Frequency count, numeric

**must** Frequency count, numeric

**need** Frequency count, numeric

**take** Frequency count, numeric

**today** Frequency count, numeric

**trip** Frequency count, numeric

**amp** Frequency count, numeric

**blast** Frequency count, numeric

**entertain** Frequency count, numeric

**face** Frequency count, numeric

**guest** Frequency count, numeric

**littl** Frequency count, numeric

**realli** Frequency count, numeric

**recours** Frequency count, numeric

**bad** Frequency count, numeric

**big** Frequency count, numeric

**thing** Frequency count, numeric

**fli** Frequency count, numeric  
**flight** Frequency count, numeric  
**pay** Frequency count, numeric  
**play** Frequency count, numeric  
**seat** Frequency count, numeric  
**serious** Frequency count, numeric  
**away** Frequency count, numeric  
**everi** Frequency count, numeric  
**near** Frequency count, numeric  
**time** Frequency count, numeric  
**wonut** Frequency count, numeric  
**yes** Frequency count, numeric  
**hat** Frequency count, numeric  
**miss** Frequency count, numeric  
**opportun** Frequency count, numeric  
**without** Frequency count, numeric  
**now** Frequency count, numeric  
**well** Frequency count, numeric  
**amaz** Frequency count, numeric  
**arriv** Frequency count, numeric  
**earli** Frequency count, numeric  
**good** Frequency count, numeric  
**hour** Frequency count, numeric  
**among** Frequency count, numeric  
**caus** Frequency count, numeric  
**death** Frequency count, numeric  
**know** Frequency count, numeric  
**lead** Frequency count, numeric  
**second** Frequency count, numeric  
**suicid** Frequency count, numeric  
**teen** Frequency count, numeric  
**better** Frequency count, numeric  
**much** Frequency count, numeric  
**pretti** Frequency count, numeric  
**alreadi** Frequency count, numeric  
**australia** Frequency count, numeric  
**deal** Frequency count, numeric

**even** Frequency count, numeric  
**gone** Frequency count, numeric  
**great** Frequency count, numeric  
**think** Frequency count, numeric  
**yet** Frequency count, numeric  
**fabul** Frequency count, numeric  
**sky** Frequency count, numeric  
**stress** Frequency count, numeric  
**travel** Frequency count, numeric  
**thank** Frequency count, numeric  
**mia** Frequency count, numeric  
**schedul** Frequency count, numeric  
**still** Frequency count, numeric  
**america** Frequency count, numeric  
**countri** Frequency count, numeric  
**cross** Frequency count, numeric  
**excit** Frequency count, numeric  
**first** Frequency count, numeric  
**heard** Frequency count, numeric  
**lax** Frequency count, numeric  
**mco** Frequency count, numeric  
**noth** Frequency count, numeric  
**virgin** Frequency count, numeric  
**due** Frequency count, numeric  
**either** Frequency count, numeric  
**flew** Frequency count, numeric  
**fulli** Frequency count, numeric  
**help** Frequency count, numeric  
**larg** Frequency count, numeric  
**last** Frequency count, numeric  
**nyc** Frequency count, numeric  
**sfo** Frequency count, numeric  
**side** Frequency count, numeric  
**sit** Frequency count, numeric  
**two** Frequency count, numeric  
**week** Frequency count, numeric  
**cent** Frequency count, numeric

**uuo** Frequency count, numeric  
**awesom** Frequency count, numeric  
**pleas** Frequency count, numeric  
**want** Frequency count, numeric  
**avail** Frequency count, numeric  
**carrier** Frequency count, numeric  
**fare** Frequency count, numeric  
**may** Frequency count, numeric  
**select** Frequency count, numeric  
**three** Frequency count, numeric  
**love** Frequency count, numeric  
**brand** Frequency count, numeric  
**feel** Frequency count, numeric  
**anytim** Frequency count, numeric  
**make** Frequency count, numeric  
**non** Frequency count, numeric  
**soon** Frequency count, numeric  
**stop** Frequency count, numeric  
**will** Frequency count, numeric  
**free** Frequency count, numeric  
**friend** Frequency count, numeric  
**gave** Frequency count, numeric  
**guy** Frequency count, numeric  
**internet** Frequency count, numeric  
**mess** Frequency count, numeric  
**reserv** Frequency count, numeric  
**appli** Frequency count, numeric  
**call** Frequency count, numeric  
**email** Frequency count, numeric  
**match** Frequency count, numeric  
**program** Frequency count, numeric  
**respons** Frequency count, numeric  
**status** Frequency count, numeric  
**abl** Frequency count, numeric  
**anyth** Frequency count, numeric  
**eat** Frequency count, numeric  
**fail** Frequency count, numeric

**food** Frequency count, numeric  
**happen** Frequency count, numeric  
**hrs** Frequency count, numeric  
**least** Frequency count, numeric  
**next** Frequency count, numeric  
**option** Frequency count, numeric  
**say** Frequency count, numeric  
**site** Frequency count, numeric  
**togeth** Frequency count, numeric  
**worri** Frequency count, numeric  
**air** Frequency count, numeric  
**cold** Frequency count, numeric  
**get** Frequency count, numeric  
**ewr** Frequency count, numeric  
**eye** Frequency count, numeric  
**middl** Frequency count, numeric  
**red** Frequency count, numeric  
**add** Frequency count, numeric  
**birthday** Frequency count, numeric  
**book** Frequency count, numeric  
**cool** Frequency count, numeric  
**elev** Frequency count, numeric  
**enter** Frequency count, numeric  
**just** Frequency count, numeric  
**name** Frequency count, numeric  
**problem** Frequency count, numeric  
**club** Frequency count, numeric  
**current** Frequency count, numeric  
**onlin** Frequency count, numeric  
**oper** Frequency count, numeric  
**post** Frequency count, numeric  
**answer** Frequency count, numeric  
**expens** Frequency count, numeric  
**headphon** Frequency count, numeric  
**iad** Frequency count, numeric  
**left** Frequency count, numeric  
**number** Frequency count, numeric

**one** Frequency count, numeric  
**await** Frequency count, numeric  
**phone** Frequency count, numeric  
**prefer** Frequency count, numeric  
**return** Frequency count, numeric  
**use** Frequency count, numeric  
**end** Frequency count, numeric  
**hawaii** Frequency count, numeric  
**news** Frequency count, numeric  
**start** Frequency count, numeric  
**via** Frequency count, numeric  
**year** Frequency count, numeric  
**nice** Frequency count, numeric  
**takeoff** Frequency count, numeric  
**touchdown** Frequency count, numeric  
**best** Frequency count, numeric  
**ever** Frequency count, numeric  
**way** Frequency count, numeric  
**airlin** Frequency count, numeric  
**around** Frequency count, numeric  
**done** Frequency count, numeric  
**hand** Frequency count, numeric  
**can** Frequency count, numeric  
**chat** Frequency count, numeric  
**support** Frequency count, numeric  
**work** Frequency count, numeric  
**angel** Frequency count, numeric  
**beyond** Frequency count, numeric  
**sign** Frequency count, numeric  
**view** Frequency count, numeric  
**account** Frequency count, numeric  
**flyer** Frequency count, numeric  
**hard** Frequency count, numeric  
**hey** Frequency count, numeric  
**plz** Frequency count, numeric  
**upgrad** Frequency count, numeric  
**win** Frequency count, numeric



**citi** Frequency count, numeric  
**expir** Frequency count, numeric  
**move** Frequency count, numeric  
**new** Frequency count, numeric  
**ticket** Frequency count, numeric  
**unus** Frequency count, numeric  
**dalla** Frequency count, numeric  
**feb** Frequency count, numeric  
**leav** Frequency count, numeric  
**seattl** Frequency count, numeric  
**reason** Frequency count, numeric  
**rock** Frequency count, numeric  
**dream** Frequency count, numeric  
**mind** Frequency count, numeric  
**wow** Frequency count, numeric  
**agre** Frequency count, numeric  
**carrieunderwood** Frequency count, numeric  
**ladygaga** Frequency count, numeric  
**night** Frequency count, numeric  
**oscar** Frequency count, numeric  
**ago** Frequency count, numeric  
**minut** Frequency count, numeric  
**show** Frequency count, numeric  
**suppos** Frequency count, numeric  
**websit** Frequency count, numeric  
**andrew** Frequency count, numeric  
**impress** Frequency count, numeric  
**juli** Frequency count, numeric  
**though** Frequency count, numeric  
**atlanta** Frequency count, numeric  
**wish** Frequency count, numeric  
**februari** Frequency count, numeric  
**load** Frequency count, numeric  
**never** Frequency count, numeric  
**page** Frequency count, numeric  
**sinc** Frequency count, numeric  
**thx** Frequency count, numeric

**tri** Frequency count, numeric  
**stat** Frequency count, numeric  
**ladi** Frequency count, numeric  
**carri** Frequency count, numeric  
**let** Frequency count, numeric  
**market** Frequency count, numeric  
**song** Frequency count, numeric  
**shown** Frequency count, numeric  
**mari** Frequency count, numeric  
**sorri** Frequency count, numeric  
**beat** Frequency count, numeric  
**check** Frequency count, numeric  
**dal** Frequency count, numeric  
**dca** Frequency count, numeric  
**someon** Frequency count, numeric  
**earlier** Frequency count, numeric  
**hold** Frequency count, numeric  
**tonight** Frequency count, numeric  
**award** Frequency count, numeric  
**congrat** Frequency count, numeric  
**bag** Frequency count, numeric  
**everyth** Frequency count, numeric  
**fine** Frequency count, numeric  
**lost** Frequency count, numeric  
**card** Frequency count, numeric  
**chang** Frequency count, numeric  
**credit** Frequency count, numeric  
**fee** Frequency count, numeric  
**waiv** Frequency count, numeric  
**custom** Frequency count, numeric  
**servic** Frequency count, numeric  
**team** Frequency count, numeric  
**track** Frequency count, numeric  
**baggag** Frequency count, numeric  
**dirti** Frequency count, numeric  
**floor** Frequency count, numeric  
**game** Frequency count, numeric

**step** Frequency count, numeric  
**tabl** Frequency count, numeric  
**crew** Frequency count, numeric  
**like** Frequency count, numeric  
**plane** Frequency count, numeric  
**ride** Frequency count, numeric  
**bill** Frequency count, numeric  
**correct** Frequency count, numeric  
**morn** Frequency count, numeric  
**sat** Frequency count, numeric  
**yall** Frequency count, numeric  
**feet** Frequency count, numeric  
**film** Frequency count, numeric  
**student** Frequency count, numeric  
**watch** Frequency count, numeric  
**differ** Frequency count, numeric  
**media** Frequency count, numeric  
**anyway** Frequency count, numeric  
**asap** Frequency count, numeric  
**human** Frequency count, numeric  
**speak** Frequency count, numeric  
**biz** Frequency count, numeric  
**jetblu** Frequency count, numeric  
**southwestair** Frequency count, numeric  
**inflight** Frequency count, numeric  
**interest** Frequency count, numeric  
**member** Frequency count, numeric  
**delay** Frequency count, numeric  
**late** Frequency count, numeric  
**whenev** Frequency count, numeric  
**cancel** Frequency count, numeric  
**four** Frequency count, numeric  
**busi** Frequency count, numeric  
**disappoint** Frequency count, numeric  
**meet** Frequency count, numeric  
**share** Frequency count, numeric  
**ium** Frequency count, numeric

**troubl** Frequency count, numeric  
**wife** Frequency count, numeric  
**bring** Frequency count, numeric  
**code** Frequency count, numeric  
**bet** Frequency count, numeric  
**random** Frequency count, numeric  
**home** Frequency count, numeric  
**life** Frequency count, numeric  
**back** Frequency count, numeric  
**yeah** Frequency count, numeric  
**point** Frequency count, numeric  
**recent** Frequency count, numeric  
**flightl** Frequency count, numeric  
**jfk** Frequency count, numeric  
**saturday** Frequency count, numeric  
**video** Frequency count, numeric  
**went** Frequency count, numeric  
**land** Frequency count, numeric  
**redirect** Frequency count, numeric  
**btw** Frequency count, numeric  
**user** Frequency count, numeric  
**desktop** Frequency count, numeric  
**mobil** Frequency count, numeric  
**bin** Frequency count, numeric  
**class** Frequency count, numeric  
**passeng** Frequency count, numeric  
**remov** Frequency count, numeric  
**scan** Frequency count, numeric  
**told** Frequency count, numeric  
**uncomfort** Frequency count, numeric  
**find** Frequency count, numeric  
**anyon** Frequency count, numeric  
**useless** Frequency count, numeric  
**boy** Frequency count, numeric  
**thursday** Frequency count, numeric  
**appoint** Frequency count, numeric  
**music** Frequency count, numeric

**bought** Frequency count, numeric  
**direct** Frequency count, numeric  
**fuel** Frequency count, numeric  
**layov** Frequency count, numeric  
**unexpect** Frequency count, numeric  
**vega** Frequency count, numeric  
**exp** Frequency count, numeric  
**peopl** Frequency count, numeric  
**customerservic** Frequency count, numeric  
**uouo** Frequency count, numeric  
**hung** Frequency count, numeric  
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### Details

"A sentiment analysis job about the problems of each major U.S. airline. Twitter data was scraped from February of 2015 and contributors were asked to first classify positive, negative, and neutral tweets, followed by categorizing negative reasons (such as "late flight" or "rude service")."

The data provided here is an altered and cleaned version version of the original source.

### Source

<https://www.figure-eight.com/data-for-everyone/>

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