

# Damegender Manual: Counting Males and Females in Internet Communities

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for version 0.2.8, 06 May 2020

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This manual is for Damegender (version 0.2.8, 06 May 2020), which is an example in the Texinfo documentation.

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# 1 Introduction

Damegender is a gender detection tool from the name coded by David Arroyo MEnéndez (DAME).

The gender detection tools from the names are being used usually with commercial APIs. But many countries has been doing efforts in the last years for contribute names and a number of people using each name with Open Data Licenses. So, this software is collecting this effort on an original way (we are using Machine Learning algorithms for predict names that is not appearing in our database).

Damegender is giving measures to compare in any moment our solution with the commercial APIs. So, the user can understand when it's useful to invest money or not depending of the dataset. Damegender allows to the users download a big number of names from a csv file.

This software is written oriented to tests. So you can check the right behaviour of the software with python tests for the classes and methods and with shell tests for the python commands.

Damegender is using Perceval for count males and females in a lot of Internet Communities (wikis, mailing lists, software repositories, bug tracking systems, ...). We shows source for count males and females in different situations (Ex: count-debian-gender.py)

This software is taking into account the power to predict nations and ethnicity from the surnames (Ex: surname.py, surnameincountries.py and ethnicity.py).

## 2 Installation

Possible Debian/Ubuntu dependencies:

```
$ sudo apt-get install python3-nose-exclude python3-dev dict dict-freedict-  
eng-spa dict-freedict-spa-eng dictd
```

Now, to install damegender from sources:

```
$ git clone https://github.com/davidam/damegender  
$ cd damegender  
$ pip3 install -r requirements.txt
```

Now, to install damegender with python package:

```
$ python3 -m venv /tmp/d  
$ cd /tmp/d  
$ source bin/activate  
$ pip install --upgrade pip  
$ pip3 install damegender  
$ cd lib/python3.5/site-packages/damegender  
$ python3 main.py David
```

To install apis extra dependencies:

```
$ pip3 install damegender[apis]
```

To install mailing lists and repositories extra dependencies:

```
$ pip3 install damegender[mails_and_repositories]
```

To install all possible dependencies

```
$ pip3 install damegender[all]
```

Currently you can need an api key from:

- <https://store.genderize.io/documentation>
- <https://gender-api.com>
- <https://www.nameapi.org/>
- <https://v2.namsor.com/NamSorAPIv2/sign-in.html>

To configure your api key you can execute:

```
$ python3 apikeyadd.py
```

### 3 Commands

You must start to check tests to understand that all is ok:

```
$ cd src/damegender
$ ./testsbycommands.sh           # It must run for you
$ ./testsbycommandsextralocal.sh # You will need all dependencies
                                   # with: $ pip3 install damegender[all]
$ ./testsbycommandsextranet.sh   # You will need api keys
```

You can continue check python tests:

Execute all tests:

```
$ nosetests3 tests
```

Execute one file:

```
$ nosetests3 tests/test_basics.py
```

Execute one test:

```
$ nosetests3 tests/test_basics.py:TestBasics.test_indexing
```

If you are in a fresh installation, perhaps you want regenerate by your own risk some files downloaded to understand how it has been generated:

```
$ python3 postinstall.py
```

You can find an big list of commands to execute this shell scripts. Now a detailed execution of some selected examples:

The first command to learn is main.py. You can play now with this command:

```
# Detect gender from a name (INE is the dataset used by default)
$ python3 main.py David
David gender is male
363559 males for David from INE.es
0 females for David from INE.es
```

```
# Detect gender from a name only using machine learning (experimental way)
$ python3 main.py Mesa --ml=nlTK
Mesa gender is female
0 males for Mesa from INE.es
0 females for Mesa from INE.es
```

```
# Detect gender from a name (all census and machine learning)
$ python3 main.py David --verbose
365196 males for David from INE.es
0 females for David from INE.es
1193 males for David from Uruguay census
5 females for David from Uruguay census
26645 males for David from United Kingdom census
0 females for David from United Kingdom census
3552580 males for David from United States of America census
12826 females for David from United States of America census
David gender predicted with nlTK is male
```

```

David gender predicted with sgd is male
David gender predicted with svc is male
David gender predicted with gaussianNB is male
David gender predicted with multinomialNB is male
David gender predicted with bernoulliNB is male
David gender predicted with forest is male
David gender predicted with tree is male
David gender predicted with mlp is male

```

The first Free Software for gender detection tool was created in C language program and you can look for a python version with the name `genderguesser`. Some people was working in a Free dataset called `name_dict.txt` with 48500 names. I want to give thanks to this effort with `nameincountries.py` due to the good work organizing many names in different countries.

```

$ python3 nameincountries.py David
grep -i " David " files/names/nam_dict.txt > files/grep.tmp
males: ['Albania', 'Armenia', 'Austria', 'Azerbaijan', 'Belgium', 'Bosnia and Herze-
govina', 'Czech Republic', 'Denmark', 'East Frisia', 'France', 'Georgia', 'Ger-
many', 'Great Britain', 'Iceland', 'Ireland', 'Israel', 'Italy', 'Kaza-
khstan/Uzbekistan', 'Luxembourg', 'Malta', 'Norway', 'Portugal', 'Roma-
nia', 'Slovenia', 'Spain', 'Sweden', 'Swiss', 'The Netherlands', 'USA', 'Ukraine']
females: []
both: []

```

This Free Software has been developed in the frame of a Phd in the Universidad Rey Juan Carlos I with the Phd director Jesús González Barahona, so I have developed some commands to use Perceval (Free Software where he has done good contributions)

To count gender from a git repository:

```

$ python3 git2gender.py https://github.com/chaoss/grimoirelab-perceval.git -
-directory="/tmp/clonedir"
The number of males sending commits is 15
The number of females sending commits is 7

```

To count gender from a mailing list:

```

$ cd files/mbox
$ wget -c http://mail-archives.apache.org/mod_mbox/httpd-announce/201706.mbox
$ cd ..
$ python3 mail2gender.py http://mail-archives.apache.org/mod_mbox/httpd-
announce/

```

Perhaps you don't know a name, but you have obtained an free key for an api to retrieve it:

```

$ python3 api2gender.py Leticia --surname="Martin" --api=namsor
female
scale: 0.99

```

If you want to know the gender of a good number of names you can download results from an api and save in a file with `downloadjson.py`

```

$ python3 downloadjson.py --csv=files/names/min.csv --api=genderize

```

```
$ cat files/names/genderizefiles_names_min.csv.json
```

Now we are going to learn some commands for measure the successful of our solution:

```
$ python3 accuracy.py --csv=files/names/min.csv
```

```
##### NLTK!!
```

```
Gender list: [1, 1, 1, 1, 2, 1, 0, 0]
```

```
Guess list: [1, 1, 1, 1, 0, 1, 0, 0]
```

```
Dame Gender accuracy: 0.875
```

```
$ python3 confusion.py --csv="files/names/partial.csv" --api=nameapi --
jsondownloaded="files/names/nameapifiles_names_partial.csv.json"
```

A confusion matrix C is such that  $C_{i,j}$  is equal to the number of observations known to be in group i but predicted to be in group j.

If the classifier is nice, the diagonal is high because there are true positives

Nameapi confusion matrix:

```
[[ 3, 0, 0]
```

```
 [ 0, 15, 1]]
```

```
$ python3 errors.py --csv="files/names/all.csv" --api="genderguesser"
```

Gender Guesser with files/names/all.csv has:

```
+ The error code: 0.22564457518601835
```

```
+ The error code without na: 0.026539047204698716
```

```
+ The na coded: 0.20453365634192766
```

```
+ The error gender bias: 0.0026103980857080703
```

You can generate a lot of logs about errors, accuracies and/or confusion:

```
$ ./logs-accuracies.sh
```

```
$ ./logs-confusion.sh
```

```
$ ./logs-errors.sh
```

Perhaps you are interested on reproduce experiments to determine features:

```
$ python3 infofeatures.py
```

```
Females with last letter a: 0.4705246078961601
```

```
Males with last letter a: 0.048672566371681415
```

```
Females with last letter consonant: 0.2735841767750908
```

```
Males with last letter consonant: 0.6355328972681801
```

```
Females with last letter vocal: 0.7262612995441552
```

```
Males with last letter vocal: 0.3640823393612928
```

```
$ python3 pca-components.py --csv="files/features_list.csv" # To deter-
mine number of components
```

```
$ python3 pca-features.py # To under-
stand the weight between variables for a target
```

Now we can go to play with surnames:

```
$ python3 surname.py Gil --total=es
```

There are 140004 people using Gil in Spain

```
$ python3 surname.py Lenon --total=us
```

There are 837 people using Lenon in United States of America



```
$ python3 ethnicity.py Smith
```

```
In United States of America the percentages about the race of Smith sur-  
name is:
```

```
White: 73.35
```

```
Black: 22.22
```

```
Hispanic: 1.56
```

```
Asian Pacific Indian American: 0.40
```

```
American Indian and Alaska Native: 0.85
```

```
Various races: 1.63
```

## 4 Statistics

In the last chapter we were learning to execute some commands such as `accuracy.py`, `confusion.py`, or `errors.py`, but perhaps you need to understand more theory about statistics to understand why this commands is being interesting for you.

### 4.1 Measuring success and error

To guess the sex, we have an true idea (example: female) and we obtain a result with a method (example: using an api, querying a dataset or with a machine learning model). The guessed result could be male, female or perhaps unknown. Remember some definitions about results about this matter:

**True positive** is to find a value guessed as true if the value in the data source is positive.

**True negative** is to find a value guessed as true if the the value in the data source is negative.

**False positive** is to find a value guessed as false if the the value in the data source is positive.

**False negative** is to find a value guessed as false if the the value in the data source is negative.

So, we can find a vocabulary for measure true, false, success and errors. We can make a summary in the gender name context about mathematical concepts:

**Precision** is about true positives divided by true positives plus false positives

```
(femalefemale + malemale ) /
(femalefemale + malemale + femalemale)
```

Recall is about true positives divided by true positives plus false negatives.

```
(femalefemale + malemale ) /
(femalefemale + malemale + malefemale + femaleundefined + maleundefined)
```

Accuracy is about true positives divided by all.

```
(femalefemale + malemale ) /
(femalefemale + malemale + malefemale + femalemale + femaleundefined + maleundefined)
```

The F1 score is the harmonic mean of precision and recall taking both metrics into account in the following equation:

```
2 * (
  (precision * recall) /
  (precision + recall))
```

In Damengender, we are using `accuracy.py` to apply these concepts. Take a look to practice:

```
$ python3 accuracy.py --api="damengender" --measure="f1score" --csv="files/names/partialnoundefined.csv.json"
##### Damegender!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0,
Damegender f1score: 0.9090909090909091
```

```

$ python3 accuracy.py --api="damegender" --measure="recall" --csv="files/names/partialn
-jsondownloaded=files/names/partialnundefined.csv.json
##### Damegender!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Damegender recall: 1.0

$ python3 accuracy.py --api="damegender" --measure="accuracy" --csv="files/names/parti
-jsondownloaded=files/names/partialnundefined.csv.json
##### Damegender!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Damegender accuracy: 0.8571428571428571

$ python3 accuracy.py --api="genderguesser" --measure="accuracy" --csv="files/names/pa
-jsondownloaded=files/names/partialnundefined.csv.json
##### Genderguesser!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Genderguesser accuracy: 0.8571428571428571

$ python3 accuracy.py --api="genderguesser" --measure="precision" --csv="files/names/p
-jsondownloaded=files/names/partialnundefined.csv.json
##### Genderguesser!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Genderguesser precision: 0.9090909090909091

$ python3 accuracy.py --api="genderguesser" --measure="recall" --csv="files/names/part
-jsondownloaded=files/names/partialnundefined.csv.json
##### Genderguesser!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Genderguesser recall: 1.0

$ python3 accuracy.py --api="genderguesser" --measure="f1score" --csv="files/names/par
-jsondownloaded=files/names/partialnundefined.csv.json
##### Genderguesser!!
Gender list: [1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0,
Guess list:  [1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0,
Genderguesser f1score: 0.9090909090909091

```

**Error coded** is about the true is different than the guessed:

```

(femalemale + malefemale + maleundefined + femaleundefined) /
(malemale + femalemale + malefemale +
femalefemale + maleundefined + femaleundefined)

```

**Error coded without na** is about the true is different than the guessed, but without undefined results.

```
(maleundefined + femaleundefined) /
(malemale + femalemale + malefemale +
femalefemale + maleundefined + femaleundefined)
```

**Error gender bias** is to understand if the error is bigger guessing males than females or viceversa.

The **weighted error** is about the true is different than the guessed, but giving a weight to the guessed as undefined.

```
(femalemale + malefemale +
+ w * (maleundefined + femaleundefined)) /
(malemale + femalemale + malefemale + femalefemale +
+ w * (maleundefined + femaleundefined))
```

In Damegender, we have coded errors.py to implement the different definitions in different apis.

The confusion matrix creates a matrix about the true and the guess. If you have this confusion matrix:

```
[[ 2, 0, 0]
 [ 0, 5, 0]]
```

It means, I have 2 females true and I've guessed 2 females and I've 5 males true and I've guessed 5 males. I don't have errors in my classifier.

```
[[ 2  1  0]
 [ 2 14  0]]
```

It means, I have 2 females true and I've guessed 2 females and I've 14 males true and I've guessed 14 males. 1 female was considered male, 2 males was considered female.

In Damegender, we have coded confusion.py to implement this concept with the different apis.

## 4.2 Principal Component Analysis (PCA)

We have chosen a features selection in

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