Homework 3

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The Program

This document is a literate Python program inset within a LaTeX document, woven and executed using Pweave and typeset using pdfTeX This code is written in/for Python 3, and is intended for and tested under only version 3.5.1. It uses nltk to analyze corpora built using Scrapy (≥1.1.0rc1).[1]

Resolving the dependencies for this code is non-trivial. Ideally, should be able to handle the dependencies:

```
pip3 install                \
        bs4                 \
        chatterbot          \
        python-Levenshtein  \
        nltk                \
        vaderSentiment      \
        scrapy==1.1.0rc1
```

There are some issues with using pip, however. If you are using an operating system with a package manager, you may wish to allow that package manager to handle the packages which constitute your Python environment. If this is your preference, this code presents an unusual complication. It relies on both bleeding-edge versions of several Python packages (likely to be ahead of the stable versions packaged for your OS) and on some Python modules that are not packaged for most[2] operating systems. As a result, you may not want to attempt to alter your Python installation to accomodate this program. Additionally, if you are running OS X, pip will likely fail building lxml (a dependency of Scrapy), since OS X does not ship libxml by default. This can usually be solved by (re)installing the Xcode command line tools: `xcode-select install`. However, this is not always successful.

[1] Scrapy's stable release (1.0.5) does not support Python 3, so this program currently runs against only development versions after 1.1.0rc1. All code is tested to run against 1.1.0rc1 but is primarily run against 1.2.0dev2, the current development branch on github.

[2] Arch Linux is likely the only exception, as I have personally published packages to satisfy all dependencies the distribution lacked.

In either case, the best solution is probably virtualization. The following Dockerfiles are minimally sufficient to create suitable environments in Ubuntu 16.04 Xerial Xerus (which must still rely on pip) and Arch Linux (which is altogether more intensive to set up), respectively.[3]

Ubuntu:

```
FROM ubuntu:xenial
ENV LC_ALL C.UTF-8
RUN apt-get update &&                       \
        apt-get install -y                  \
                python3                     \
                python3-pip                 \
                python3-boto                \
                python3-cookies             \
                python3-cssselect           \
                python3-bs4                 \
                python3-future              \
                python3-fuzzywuzzy          \
                python3-levenshtein         \
                python3-lxml                \
                python3-nltk                \
                python3-responses           \
                python3-requests-oauthlib   \
                python3-pydispatch          \
                python3-pymongo             \
                python3-queuelib            \
                python3-twisted             \
                python3-w3lib
RUN pip3 install          \
        chatterbot        \
```

[3] Virtualenv is another good solution to avoid altering your Python installation, but cannot be used to satisfy the dependence on libxml, since it manages only Python-internal dependencies.

```
        scrapy==1.1.0rc1 \
        vaderSentiment
```

Arch Linux:

```
FROM greyltc/archlinux:latest

RUN pacman -q --noconfirm -Syyuu
RUN pacman -q --noconfirm -S  \
                base-devel    \
                curl          \
                expac         \
                git           \
                openssl       \
                yajl

RUN sed -i '/NOPASSWD/s/\#//' /etc/sudoers
RUN useradd -r -g wheel build

WORKDIR /build
RUN chown -R build /build

WORKDIR /home/build
RUN chown -R build /home/build
USER build
RUN gpg --recv-keys --keyserver hkp://pgp.mit.edu 1EB2638FF56C0C53

WORKDIR /build
RUN git clone https://aur.archlinux.org/cower.git
WORKDIR /build/cower
RUN makepkg --noconfirm -i
```

```
WORKDIR /build
RUN git clone https://aur.archlinux.org/pacaur.git
WORKDIR /build/pacaur
RUN makepkg --noconfirm -i

USER root

RUN sed -i '/silent/s/true/false/; /silent/s/#//' /etc/xdg/pacaur/config
ENV AURDEST /build
ENV PACMAN pacaur

RUN pacaur --noconfirm -S              \
               python-beautifulsoup4 \
               python-lxml
# Expand once things are pushed..

WORKDIR /
RUN paccache -r -k0
RUN pacaur -Scc
RUN rm -rf /usr/share/man/*
RUN rm -rf /tmp/*
RUN rm -rf /var/tmp/*
```

Building Corpora with Scrapy

Import stuff:

```
from chatterbot import ChatBot
from datetime import datetime
from glob import glob
from json import loads
```

```
from nltk import ConditionalFreqDist
from nltk import FreqDist
from nltk.corpus import stopwords
from nltk.data import load
from nltk.tokenize import word_tokenize
from scrapy import Field
from scrapy import Item
from scrapy import Request
from scrapy import Spider
from scrapy import signals
from scrapy.crawler import Crawler
from scrapy.exporters import JsonLinesItemExporter
from scrapy.loader import ItemLoader
from scrapy.loader.processors import Join
from scrapy.loader.processors import MapCompose
from scrapy.loader.processors import TakeFirst
from scrapy.settings import Settings
from scrapy.utils import log
from twisted.internet import reactor
from w3lib.html import remove_tags
import json
import re
```

Scrapy provides an `Item` class which is used to collect scraped data. The following code defines an `StoryItem` class to hold information about stories. Each chapter of each story in the corpus will be stored as a separate text (`body`) with a `title`, an `author`, a description or summary (`desc`), the topic or `theme` of the story, its `page` or chapter number within a larger work, the `site` it was scraped from, and the `url` from which it was scraped.

```
class StoryItem(Item):
    title    = Field()
    author   = Field()
    desc     = Field()
```

```
    body     = Field()
    url      = Field()
    site     = Field()
    chapter  = Field()
    category = Field()

class FFItem(StoryItem):
    id         = Field()
    rating     = Field()
    language   = Field()
    words      = Field()
    chapters   = Field()
    complete   = Field()
    comments   = Field()
    likes      = Field()
    marks      = Field()
    published  = Field()
    updated    = Field()

class AOItem(FFItem):
    fandom     = Field()
    characters = Field()
    ships      = Field()
    tags       = Field()
    warnings   = Field()
    hits       = Field()
```

Scrapy provides an API by which data can be loaded into an `Item` via an `ItemLoader`. The code below specifies a `StoryItemLoader` (which inherits the `ItemLoader` class defined by Scrapy) to load story data generally and two classes which inherit it, to load particular data from specific websites.

In cases where both the `StoryItemLoader` and one of the child classes specify a field (e.g. `body_out`), the child class supersedes the parent.

These loaders cannot be written before the `Spiders` defined below, as they operate on the output of those Spiders (and thus depend necessarily for their design on the design of those Spiders). They are defined here only because they must exist to be called by the Spiders.

```
class StoryItemLoader(ItemLoader):
    default_input_processor  = MapCompose(str.strip)
    default_output_processor = TakeFirst()

    body_in  = MapCompose(remove_tags)
    body_out = Join()

class FFItemLoader(StoryItemLoader):
    # desc_out = Join()
    desc_in  = MapCompose(remove_tags)
    desc_out = Join()

class AOItemLoader(StoryItemLoader):
    body_out       = Join()
    category_out   = Join(', ')
    warnings_out   = Join(', ')
    fandom_out     = Join(', ')
    characters_out = Join(', ')
    ships_out      = Join(', ')
    tags_out       = Join(', ')
```

Pipe the scraped text into Json items on the lines of a file (one file per spider).

```
class JsonLinesExportPipeline(object):
    def __init__(self):
        self.files = {}

    @classmethod
    def from_crawler(cls, crawler):
```

```
        pipeline = cls()
        crawler.signals.connect(
            pipeline.spider_opened,
            signals.spider_opened
        )
        crawler.signals.connect(
            pipeline.spider_closed,
            signals.spider_closed
        )
        return pipeline

    def spider_opened(self, spider):
        file = open('%s_stories.jl' % spider.name, 'w+b')
        self.files[spider] = file
        self.exporter = JsonLinesItemExporter(file)
        self.exporter.start_exporting()

    def spider_closed(self, spider):
        self.exporter.finish_exporting()
        file = self.files.pop(spider)
        file.close()

    def process_item(self, item, spider):
        self.exporter.export_item(item)
        return item
```

A spider to scrape fanfiction.net:

```
class FFSpider(Spider):
    name = "ff"
    allowed_domains = ["fanfiction.net"]
    start_urls = [
        "https://www.fanfiction.net/%s/" % c for c in
```

```
        (
            'anime',
            'book',
            'cartoon',
            'comic',
            'game',
            'misc',
            'movie',
            'play',
            'tv'
        )
    ]

    def parse(self, response):
        tags = response.xpath(
            '//td[@valign="TOP"]/div/a/@href'
        )
        for href in tags:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_tag)

    def parse_tag(self, response):
        next = response.xpath(
            '//center[1]/a[contains(text(), "Next")]/@href'
        )
        for href in next:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_tag)

        stories = response.xpath(
            '//div[contains(@class,"z-list")]/a[1]/@href'
        )
```

```
        for href in stories:
            long_url = response.urljoin(href.extract())
            url      = '/'.join(long_url.split('/')[0:-1])
            yield Request(url, callback = self.parse_story)

    def parse_story(self, response):
        header  = response.xpath(
            '//span[@class="xgray xcontrast_txt"]/text()'
        )
        head    = header.extract()
        chapter = int(response.url.split('/')[-1])
        more    = re.search('Chapters: [0-9]*', head[1])

        if more and chapter == 1:
            chapters = int(more.group(0).split()[1])
            base_url = '/'.join(response.url.split('/')[0:-1])
            urls = [
                base_url + '/' +  str(x) for x in range(2, chapters+1)
            ]
            for url in urls:
                yield Request(url, callback = self.parse_story)

        time_xpath  = response.xpath(
            '//span[@data-xutime]/@data-xutime'
        )
        times       = time_xpath.extract()
        u_published = float(times[0])
        d_published = datetime.fromtimestamp(u_published)
        published   = d_published.strftime('%Y-%m-%d')
        u_updated   = float(next(reversed(times)))
        d_updated   = datetime.fromtimestamp(u_updated)
        updated     = d_updated.strftime('%Y-%m-%d')
```

```
        # info     = head[1].split(' - ')
        # language = info[1]
        # category = info[2]
        # characters = info[3]
        # words = ''.join([s for s in info[5] if s.isdigit()])

        complete = str(bool('Complete' in ' '.join(head)))

        loader = FFItemLoader(FFItem(), response=response)
        loader.add_xpath(
            'title', '//*[@id="profile_top"]/b/text()'
        )
        loader.add_xpath(
            'author', '//*[@id="profile_top"]/a[1]/text()'
        )
        loader.add_xpath(
            'desc', '//*[@id="profile_top"]/div'
        )
        loader.add_xpath(
            'body', '//*[@id="storytext"]'
        )
        loader.add_value(
            'url', response.url
        )
        loader.add_value(
            'site', 'fanfiction.net'
        )
        loader.add_value(
            'chapter', str(chapter)
        )
        loader.add_xpath(
```

```
            'rating', '//span[@class="xgray xcontrast_txt"]/a/text()'
        )
        loader.add_value(
            'published', published
        )
        loader.add_value(
            'updated', updated
        )
        yield loader.load_item()
```

Spider for Literotica:

```
class LESpider(Spider):
    name = "le"
    allowed_domains = ["literotica.com"]
    start_urls = [
        "https://www.literotica.com/c/%s/1-page" % c for c in
        (
            'adult-how-to',
            'adult-humor',
            'adult-romance',
            'anal-sex-stories',
            'bdsm-stories',
            'bdsm-stories',
            'celebrity-stories',
            'chain-stories',
            'erotic-couplings',
            'erotic-horror',
            'erotic-letters',
            'erotic-novels',
            'erotic-poetry',
            'exhibitionist-voyeur',
            'fetish-stories',
```

```
            'first-time-sex-stories',
            'gay-sex-stories',
            'group-sex-stories',
            'illustrated-erotic-fiction',
            'interracial-erotic-fiction',
            'lesbian-sex-stories',
            'loving-wives',
            'masturbation-stories',
            'mature-sex',
            'mind-control',
            'non-consent-stories',
            'non-erotic-poetry',
            'non-erotic-stories',
            'non-human-stories',
            'reviews-and-essays',
            'science-fiction-fantasy',
            'taboo-sex-stories',
            'transsexuals-crossdressers'
        )
    ]

    def parse(self, response):
        next = response.xpath(
            '//*[@class="b-pager-next"]/@href'
        )
        for href in next:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse)

        stories = response.xpath(
            '//*[@id="content"]/div/div/h3/a/@href'
        )
```

```
        for href in stories:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_story)

    def parse_story(self, response):
        next = response.xpath(
            '//*[@class="b-pager-next"]/@href'
        )
        for href in next:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_story)

        loader = LEItemLoader(LEItem(), response = response)
        loader.add_xpath(
            'title', '//h1/text()'
        )
        loader.add_xpath(
            'author', '//*[@id="content"]/div[2]/span[1]/a/text()'
        )
        loader.add_value(
            'desc', ''
        )
        loader.add_xpath(
            'category', ('//*[@id="content"]/div[1]/a/text()')
        )
        loader.add_xpath(
            'body', '//*[@id="content"]/div[3]/div'
        )
        loader.add_value(
            'url', response.url
        )
        loader.add_value(
```

```
            'site', 'literotica.com'
        )
        loader.add_xpath(
            'page', '//*[@class="b-pager-active"]/text()'
        )
        yield loader.load_item()
```

Spider for AO3:

```
class AOSpider(Spider):
    name = "ao"
    allowed_domains = ["archiveofourown.org"]
    start_urls = [
        "https://archiveofourown.org/media"
    ]

    def parse(self, response):
        genres = response.xpath(
            '//h3/a/@href'
        )
        for href in genres:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_genre)

    def parse_genre(self, response):
        tags = response.xpath(
            '//li/ul/li/a/@href'
        )
        for href in tags:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_tag)
```

```
    def parse_tag(self, response):
        next = response.xpath(
            '(//ol[@role="navigation"])[1]/li[last()]/a/@href'
        )
        for href in next:
            url = response.urljoin(href.extract())
            yield Request(url, callback = self.parse_tag)

        stories = response.xpath('//h4/a[1]/@href')
        for href in stories:
            extension = '?view_adult=true&style=disable'
            url = response.urljoin(href.extract()) + extension
            yield Request(url, callback = self.parse_story)

    def parse_story(self, response):
        next = response.xpath(
            'a[contains(text(), "Next Chapter âĘŠ")]/@href'
        )
        for href in next:
            extension = '?view_adult=true&style=disable'
            url = response.urljoin(href.extract()) + extension
            yield Request(url, callback = self.parse_story)

        chapter_path   =
response.xpath('//dd[@class="chapters"]/text()')
        chapters       = tuple(chapter_path.extract()[0].split('/'))
        current, total = chapters
        complete       = str(bool(current == total))

        loader = AOItemLoader(AOItem(), response = response)
        loader.add_xpath(
            'title', '//h2/text()'
```

```
        )
        loader.add_xpath(
            'author', '//a[@rel="author"]/text()'
        )
        loader.add_xpath(
            'desc', '(//*[@class="summary module"])[1]//p/text()'
        )
        loader.add_xpath(
            'body', '//*[@id="chapters"]//div/p/text()'
        )
        loader.add_value(
            'url', response.url
        )
        loader.add_value(
            'site', 'archiveofourown.org'
        )
        loader.add_xpath(
            'category', '//dd[@class="category tags"]//a/text()'
        )
        loader.add_xpath(
            'language', '//dd[@class="language"]/text()'
        )
        loader.add_xpath(
            'rating', '//dd[@class="rating tags"]//a/text()'
        )
        loader.add_xpath(
            'warnings', '//dd[@class="warning tags"]//a/text()'
        )
        loader.add_xpath(
            'fandom', '//dd[@class="fandom tags"]//a/text()'
        )
        loader.add_xpath(
```

```
        'characters', '//dd[@class="character tags"]//a/text()'
    )
    loader.add_xpath(
        'ships', '//dd[@class="relationship tags"]//a/text()'
    )
    loader.add_xpath(
        'tags', '//dd[@class="freeform tags"]//a/text()'
    )
    loader.add_xpath(
        'hits', '//dd[@class="hits"]/text()'
    )
    loader.add_xpath(
        'published', '//dd[@class="published"]/text()'
    )
    loader.add_xpath(
        'updated', '//dd[@class="status"]/text()'
    )
    loader.add_xpath(
        'words', '//dd[@class="words"]/text()'
    )
    loader.add_xpath(
        'comments', '//dd[@class="comments"]/text()'
    )
    loader.add_xpath(
        'likes', '//dd[@class="kudos"]/text()'
    )
    loader.add_xpath(
        'marks', '//dd[@class="bookmarks"]/a/text()'
    )
    loader.add_xpath(
        'hits', '//dd[@class="hits"]/text()'
    )
```

```
        loader.add_value(
            'chapter', current
        )
        loader.add_value(
            'complete', complete
        )
        yield loader.load_item()
```

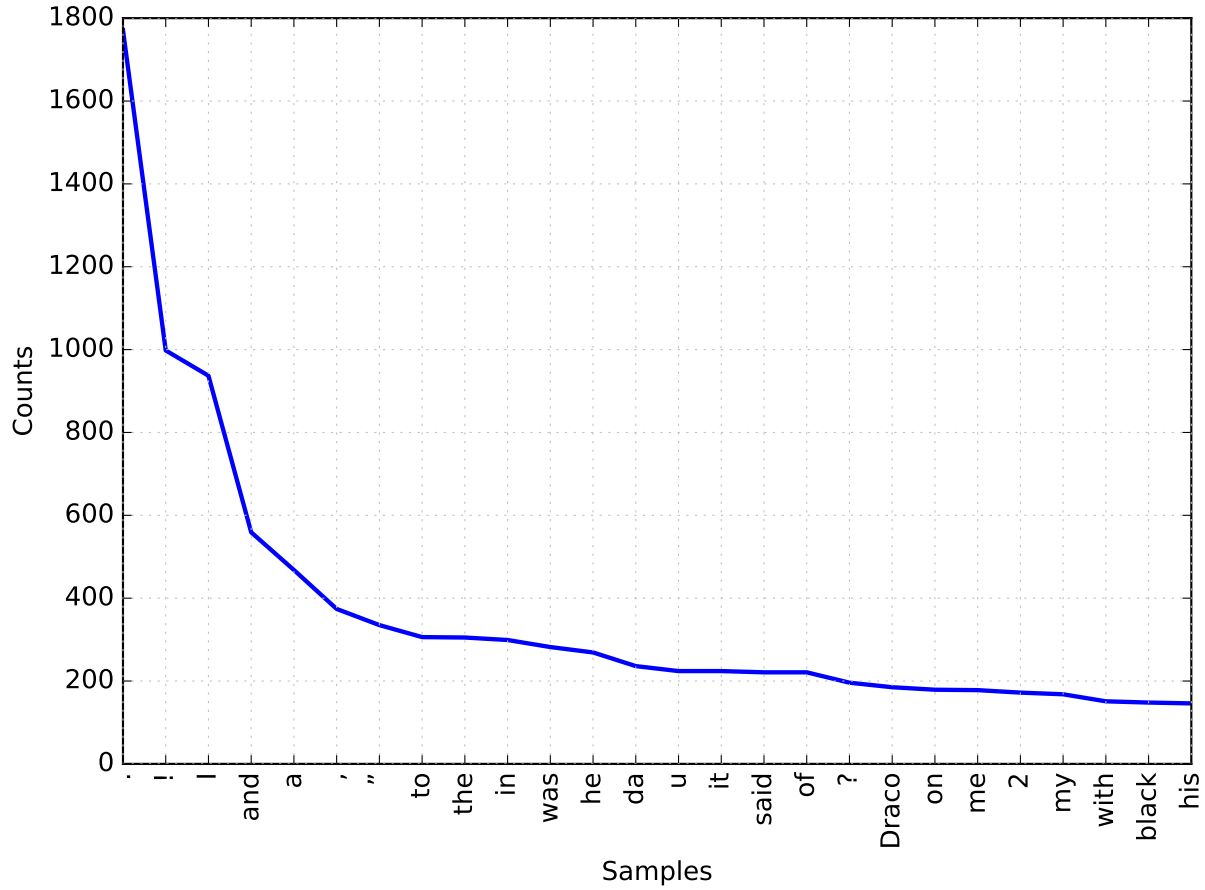
I haven't yet figured out what signal the spiders should send to avoid shutting down the reactor (which cannot be restarted) before all three are finished (if they are all run together).

```
# callback fired when the spider is closed
def callback(spider, reason):
    stats = spider.crawler.stats.get_stats()  # collect/log stats?

    # stop the reactor
    reactor.stop()

# instantiate settings and provide a custom configuration
settings = Settings()
settings.set(
    'ITEM_PIPELINES', {
        '__main__.JsonLinesExportPipeline': 100,
    }
)
settings.set(
    'USER_AGENT', 'Mozilla/5.0 (Windows NT 6.3; Win64; x64)'
)

# instantiate a spider
ff_spider = FFSpider()
le_spider = LESpider()
ao_spider = AOSpider()
```

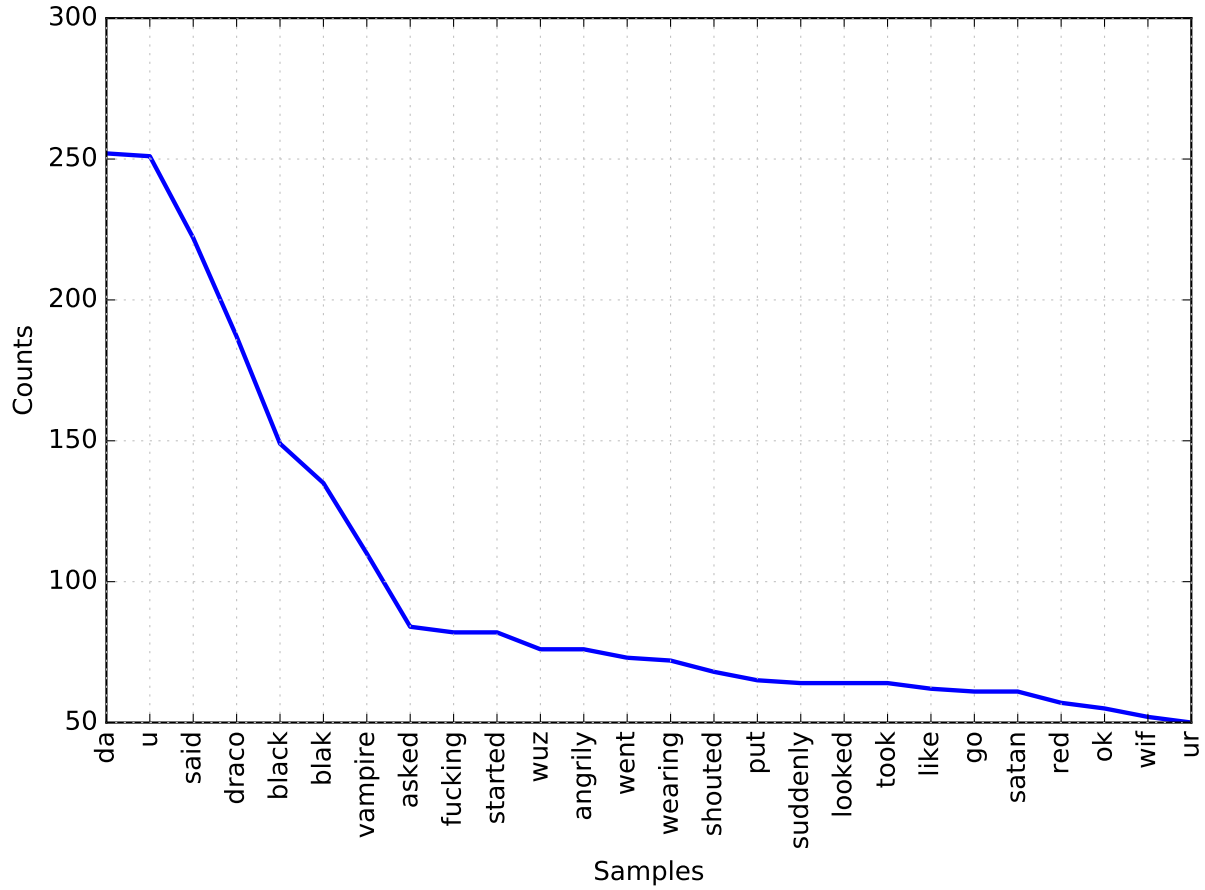
```
# instantiate a crawler passing in settings
# crawler = Crawler(settings)
ff_crawler = Crawler(ff_spider, settings)
le_crawler = Crawler(le_spider, settings)
ao_crawler = Crawler(ao_spider, settings)
# configure signals
ff_crawler.signals.connect(
    callback,
    signal = signals.spider_closed
)
le_crawler.signals.connect(
    callback,
    signal = signals.spider_closed
)
ao_crawler.signals.connect(
    callback,
    signal = signals.spider_closed
)

# configure and start the crawler
# crawler.configure()
# crawler.crawl(spider)
# ff_crawler.crawl()
# le_crawler.crawl()
ao_crawler.crawl()

# start logging
# log.start()
log.configure_logging()

# start the reactor (blocks execution)
reactor.run()
```

Analysis with NLTK

```
stop = stopwords.words('english')
tokenizer = load('tokenizers/punkt/english.pickle')

immortal_chapters = []
immortal_words    = []

for path in glob("immortal/*.txt"):
        file = open(path)
        chapter = file.read()
        chapter_tuple = (chapter, 'real')

        words = word_tokenize(chapter)

        immortal_chapters.append(chapter_tuple)
        immortal_words.extend(words)

fd = FreqDist(immortal_words)
fd.plot(26)
```

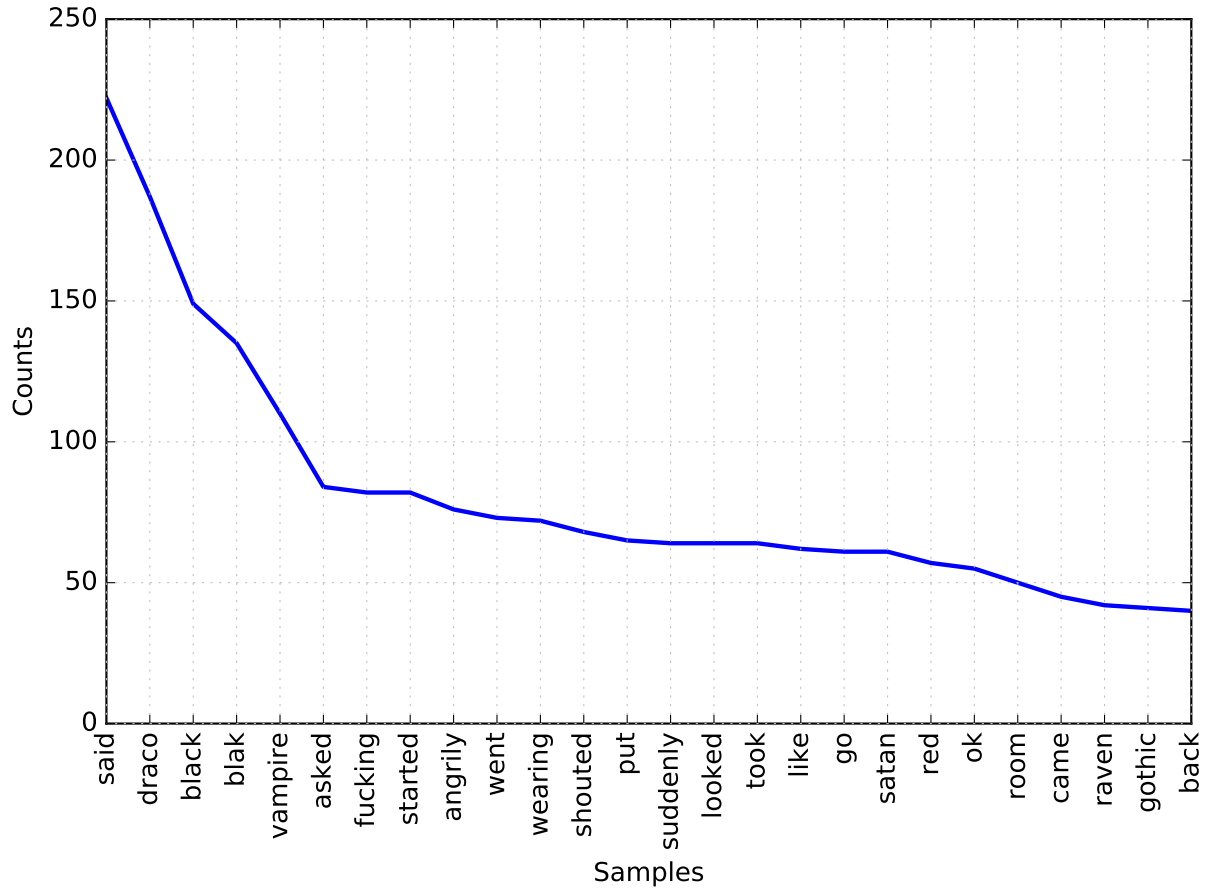



```
filtered_immortal_words = [ w.lower() for w in immortal_words if
w.isalpha() ]
filtered_immortal_words = [ w for w in filtered_immortal_words if w
not in stop ]


fd  = FreqDist(filtered_immortal_words)
fd.plot(26)
```




```
i_stop = [
    'da',
    'dat',
    'u',
    'ur',
    'wif',
    'wuz',
    'chapter'
]

filtered_immortal_words = [ w.lower() for w in immortal_words if
w.isalpha() ]
filtered_immortal_words = [ w for w in filtered_immortal_words if w
not in stop and w not in i_stop ]
```

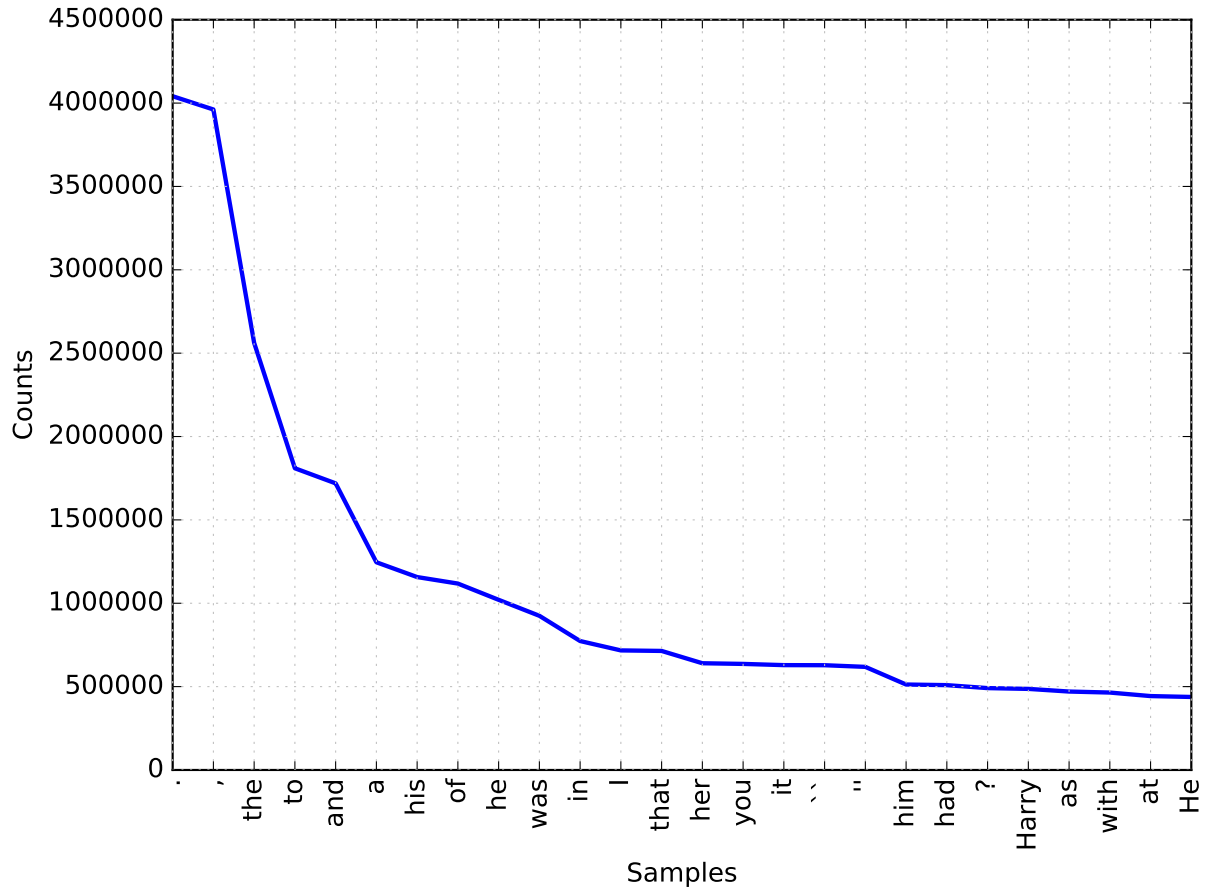
```
My_Immortal = filtered_immortal_words

fd  = FreqDist(filtered_immortal_words)
fd.plot(26)
```



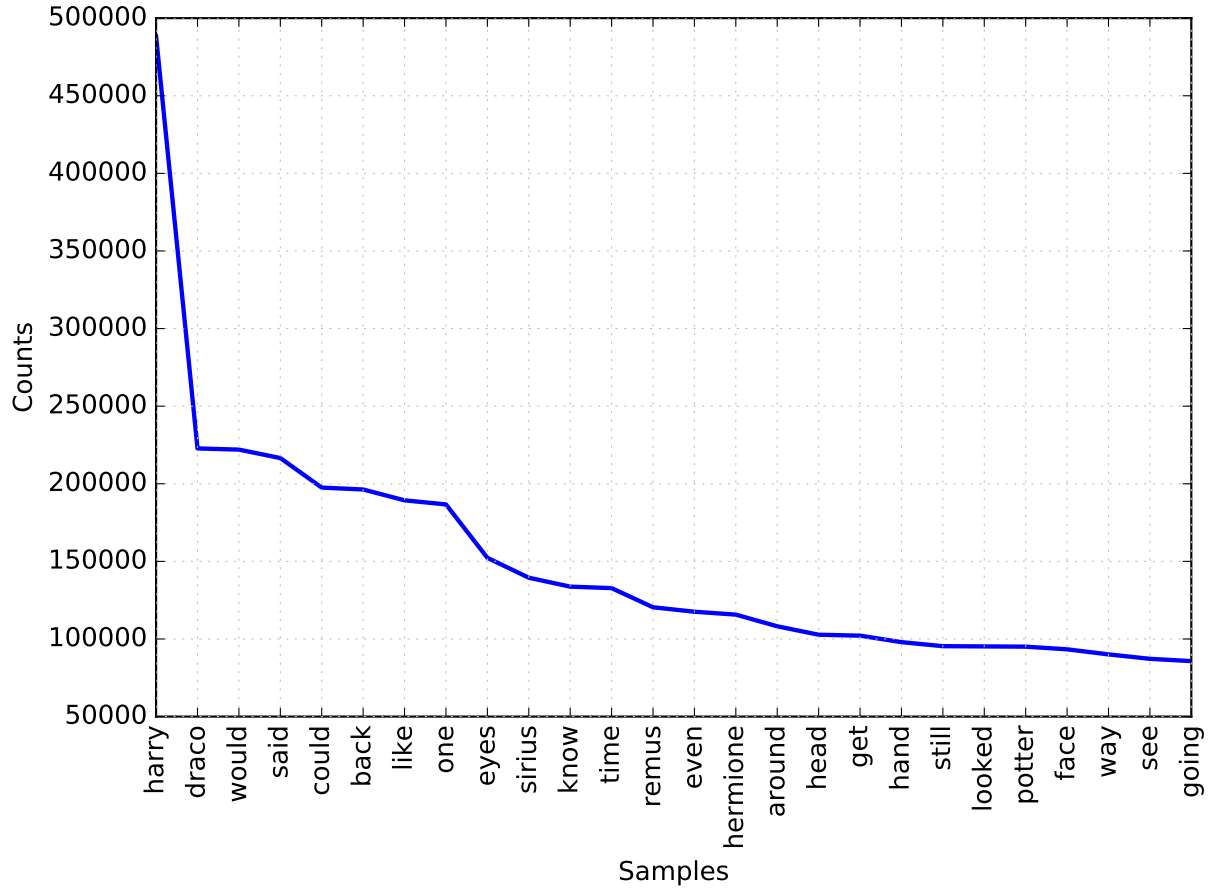

```
# fake

file = open('ao_hp_stories.jl')

ao_chapters = []
ao_words    = []
AO3         = []

i = 1100
```

```
for line in file.readlines():
    chapter_obj = loads(line)
    if chapter_obj['language'] == 'English':
        try:
            chapter = chapter_obj['body']
            chapter_tuple = (chapter, 'fake')
            words = word_tokenize(chapter)
            ao_words.extend(words)
            ao_chapters.append(chapter_tuple)
            if i > 0:
                AO3.extend(words)
                i -= 1
        except:
            pass

# i = 1100
# for line in file.readlines():
#     if i > 0:
#         chapter_obj = loads(line)
#         if chapter_obj['language'] == 'English':
#             try:
#                 chapter = chapter_obj['body']
#                 chapter_tuple = (chapter, 'fake')
#                 words = word_tokenize(chapter)
#                 ao_words.extend(words)
#                 ao_chapters.append(chapter_tuple)
#                 AO3.extend(words)
#             except:
#                 pass
#     i += 1

fd = FreqDist(ao_words)
```

```
fd.plot(26)
```

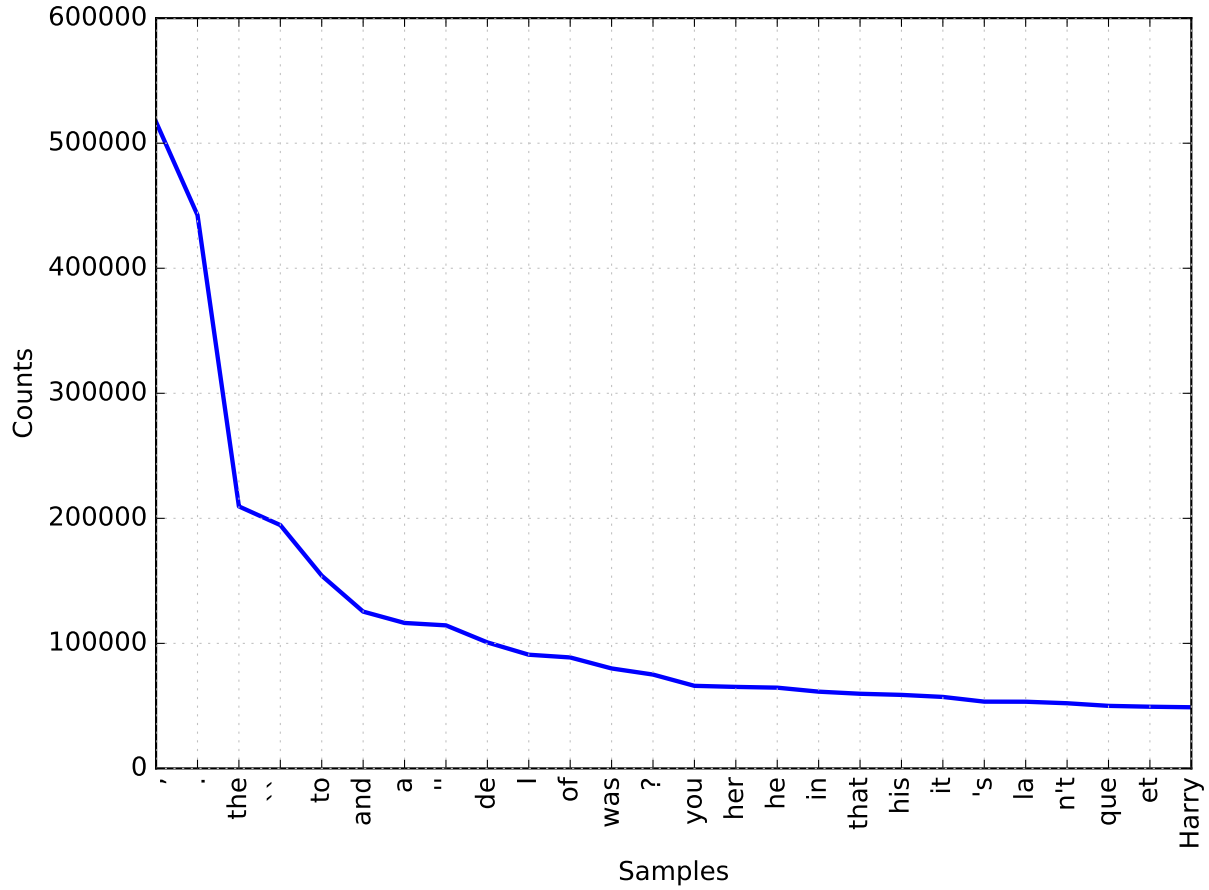



```
filtered_ao_words = [ w.lower() for w in ao_words if w.isalpha() ]
filtered_ao_words = [ w for w in filtered_ao_words if w not in stop ]

fd = FreqDist(filtered_ao_words)
fd.plot(26)
```

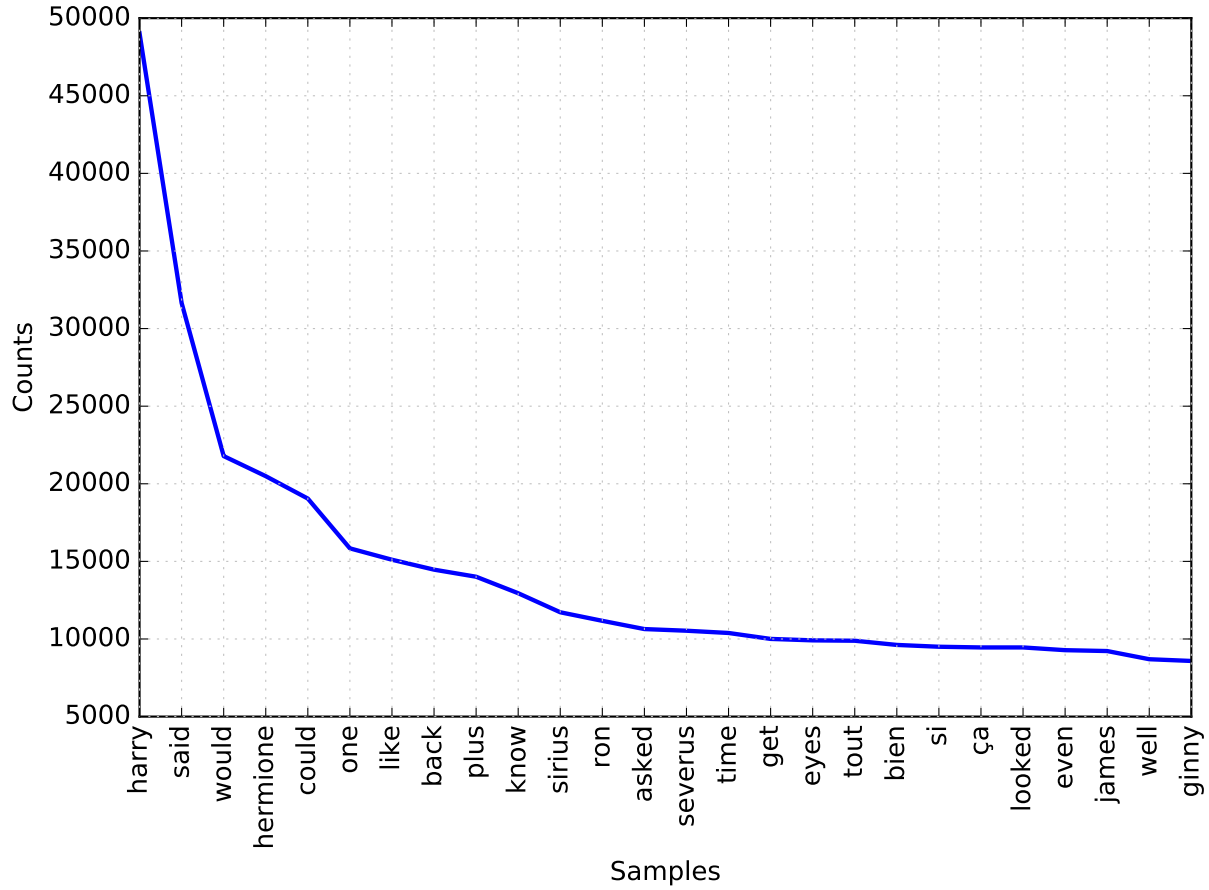



```
# fake

file = open('ff_hp_stories.jl')

ff_chapters = []
ff_words    = []
fanfiction  = []

i = 950
for line in file.readlines():
    chapter_obj = loads(line)
    try:
        chapter = chapter_obj['body']
        chapter_tuple = (chapter, 'fake')
```

```
        words = word_tokenize(chapter)
        ff_words.extend(words)
        ff_chapters.append(chapter_tuple)
        if i > 0:
            fanfiction.extend(words)
            i -= 1
    except:
        pass

# i = 950
# for line in file.readlines():
#     if i > 0:
#         chapter_obj = loads(line)
#         try:
#             chapter = chapter_obj['body']
#             chapter_tuple = (chapter, 'fake')
#             words = word_tokenize(chapter)
#             ff_words.extend(words)
#             ff_chapters.append(chapter_tuple)
#             fanfiction.extend(words)
#         except:
#             pass
#         i -= 1

fd = FreqDist(ff_words)
fd.plot(26)
```

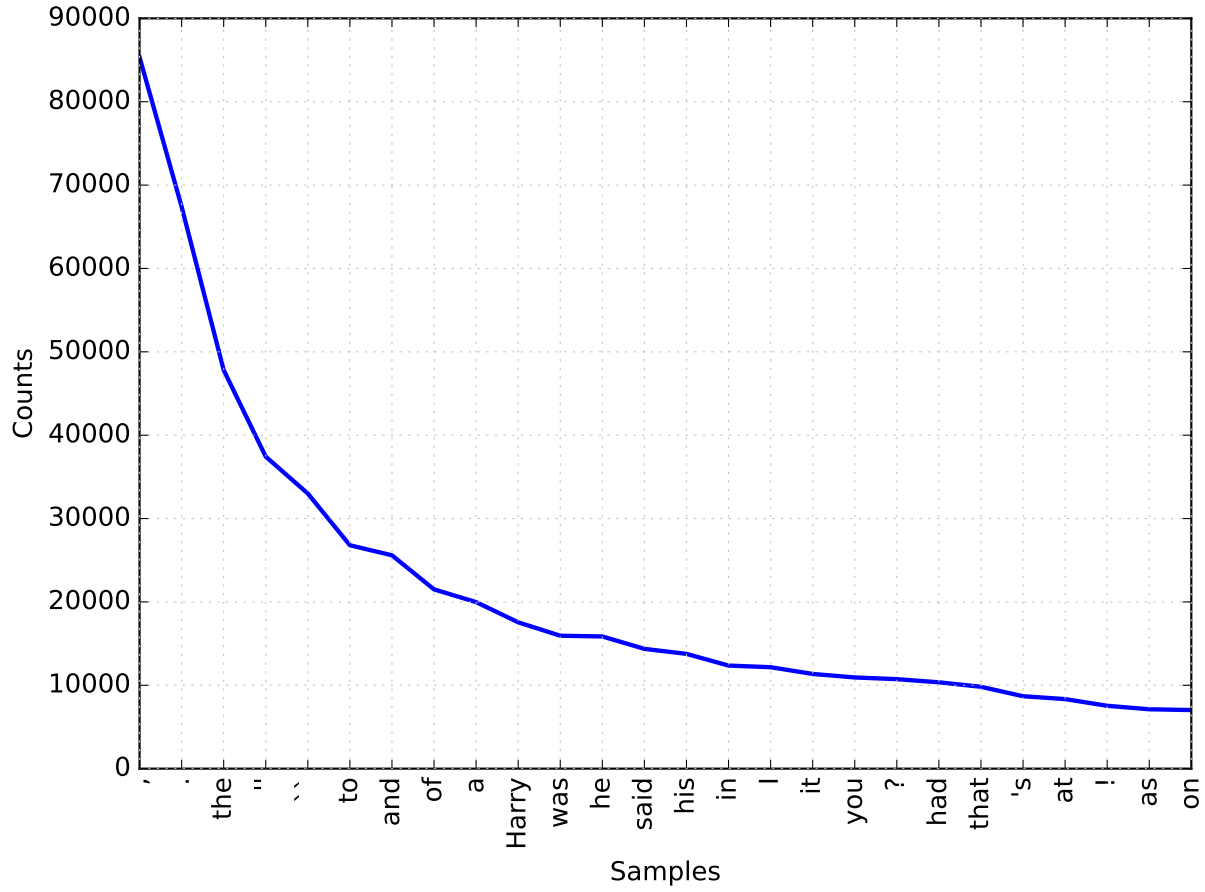



```
ff_stop = stop
for language in ('spanish', 'portuguese', 'french'):
    ff_stop.extend(
        stopwords.words(language)
    )

filtered_ff_words = [ w.lower() for w in ff_words if w.isalpha() ]
filtered_ff_words = [ w for w in filtered_ff_words if w not in ff_stop
]

fd = FreqDist(filtered_ff_words)
fd.plot(26)
```

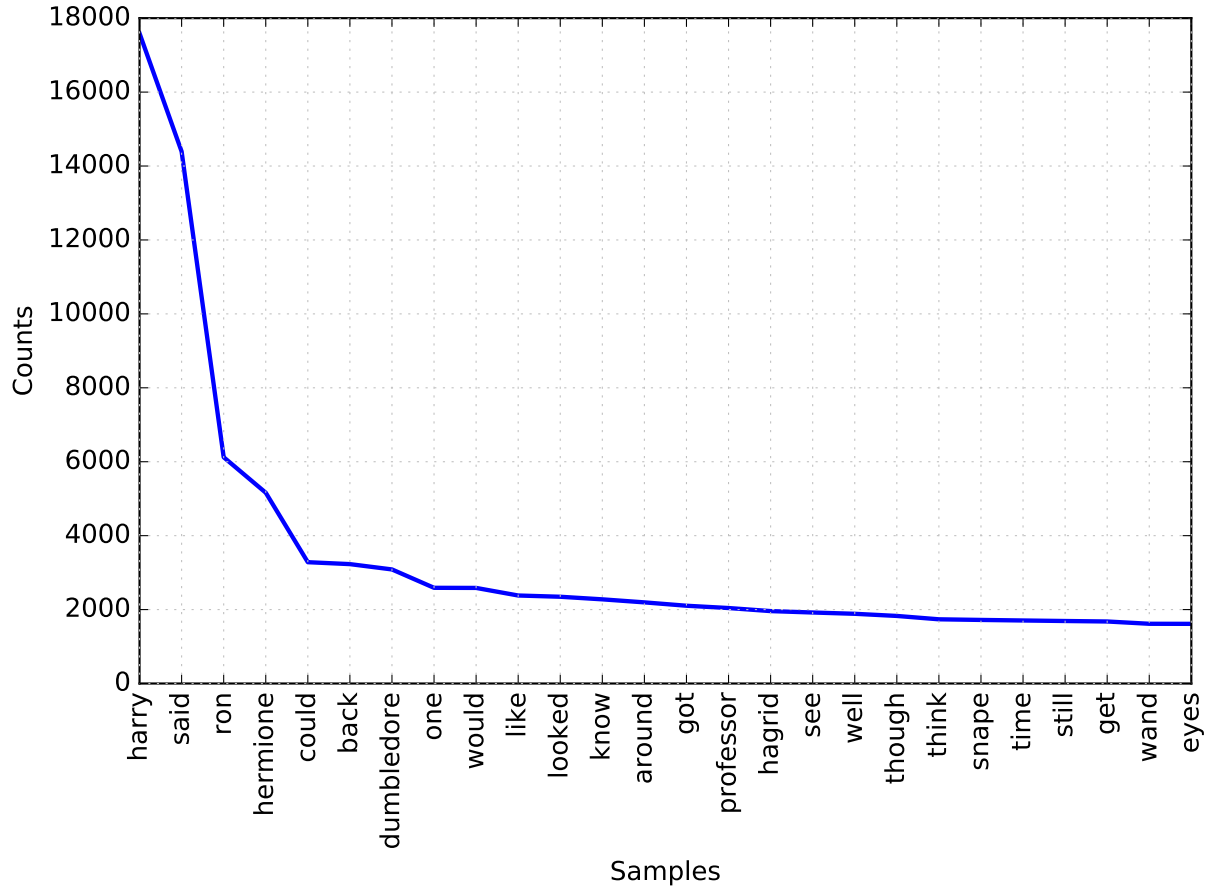



```
# real

real_chapters = []
real_words    = []
dir = 'hp'

for path in glob("hp/*.txt"):
        # soup = BeautifulSoup(open(path))
        # chapter = soup.findAll(text=True)[0]
        file = open(path)
        chapter = file.read()
        chapter_tuple = (chapter, 'real')

        words = word_tokenize(chapter)
```

```
        real_chapters.append(chapter_tuple)
        real_words.extend(words)

fd = FreqDist(real_words)
fd.plot(26)
```




```
filtered_real_words = [ w.lower() for w in real_words if w.isalpha() ]
filtered_real_words = [ w for w in filtered_real_words if w not in
stop ]

Rowling = filtered_real_words

fd  = FreqDist(filtered_real_words)
fd.plot(26)
```

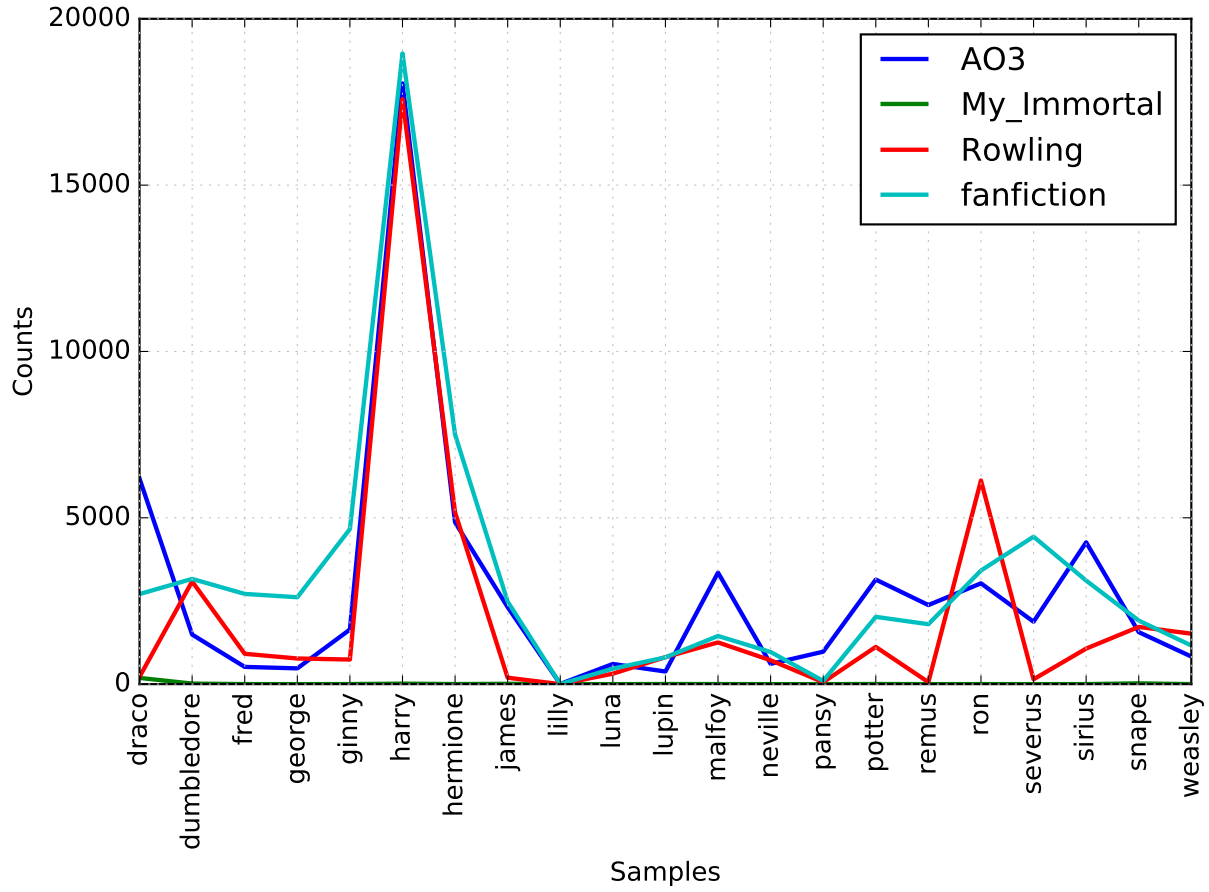



```
names = (
    'neville',
    'draco',
    'dumbledore',
    'fred',
    'george',
    'ginny',
    'harry',
    'hermione',
    'james',
    'lilly',
    'luna',
    'lupin',
    'malfoy',
```

```
    'pansy',
    'potter',
    'remus',
    'ron',
    'severus',
    'sirius',
    'snape',
    'weasley'
)

AO3 = [ w.lower() for w in AO3 if w.isalpha() ]
AO3 = [ w for w in AO3 if w not in stop ]

fanfiction = [ w.lower() for w in fanfiction if w.isalpha() ]
fanfiction = [ w for w in fanfiction if w not in stop ]

My_Immortal = [ w.lower() for w in My_Immortal if w.isalpha() ]
My_Immortal = [ w for w in My_Immortal if w not in stop and w not in
i_stop]

unified_words = (
    (source, word)
    for source in (
        'Rowling',
        'AO3',
        'fanfiction',
        'My_Immortal'
    )
    for word in eval(source)
    if word in names
)
```

```
cfd = ConditionalFreqDist(unified_words)
```

```
cfd.plot()
```




```
unified_words = (
    (source, word)
    for source in (
        'Rowling',
        'AO3',
        'fanfiction',
        'My_Immortal'
    )
    for word in eval(source)
)
cfd = ConditionalFreqDist(unified_words)
```

Training a ChatterBot

```
chatbot = ChatBot(
    "Mary Sue",
    io_adapter = "chatterbot.adapters.io.NoOutputAdapter"
)
# chatbot.train("chatterbot.corpus.english")

file = open('le_products.jl')

for line in file.readlines():
    conversation = []
    story = json.loads(line)
    body = story['body']
    graphs = body.split('\n')
    for graph in graphs:
        speech = graph.split('"')[1::2]
        utterance = ' '.join(speech)
        if utterance:
            conversation.append(utterance)
    if conversation:
        chatbot.train(conversation)

print(
    chatbot.get_response("Hello")
)
```

Unfortunately, once the chatbot has been trained on a decent amount of data, it becomes unusably slow. This is almost certainly a result of its storage method (a flat database stored to disk) and the nature of its implementation (in Python).