read.me

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Dec 17, 2010

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Goals for the Project

We had two major goals:

1. We wanted to simulate the look and feel of a newspaper. Many RSS readers lack a stylized appearance, and we felt that an aesthetically pleasing interface would engage users of our service and help distinguish it from 'the competition.'

2. We wanted to avoid overloading users with content; showing them articles that they were most interested in with minimal effort on their part.

System Design & Algorithmic choices

System Overview

Users create their own categories - which are meant to resemble the sections of a newspaper. Users can then associate RSS feeds with their categories. When a user selects a category, he/she will see the most recent summaries for all the feeds associated with that category. To avoid showing the user too much content we limited the number of pages served to a maximum of 10 (or 4 if the classifier is filtering articles, as discussed later).

Every feed is updated at least once a hour. Additionally all feeds associated with category are updated when a user selects a category. A crontab job to update feeds has been set up to run on the first minute of every hour. The system keeps track of last modified and html etags to avoid retrieving articles in case the local data is up-to-date. This is a good practice that allows feed publishers to save bandwidth. The standard out from this job is emailed to a group member to ensure successful execution.

Old articles are deleted once an hour. This is also scheduled as a crontab job. The system removes all but the 20 newest articles from every feed. An exception is made for the outdated articles that has been queued by at least one user.

When a user selects an article to read more, the system will load the article website in real-time. Many levels of html parsing must be done before it is displayed to the user. On the server, we remove html tags that could potentially prevent our site from loading it correctly. Another level of parsing is done in javascript so everything except the article content is removed. If the article content could not be retrieved for one reason or another, the description of the article along with the link to the full story is shown instead.

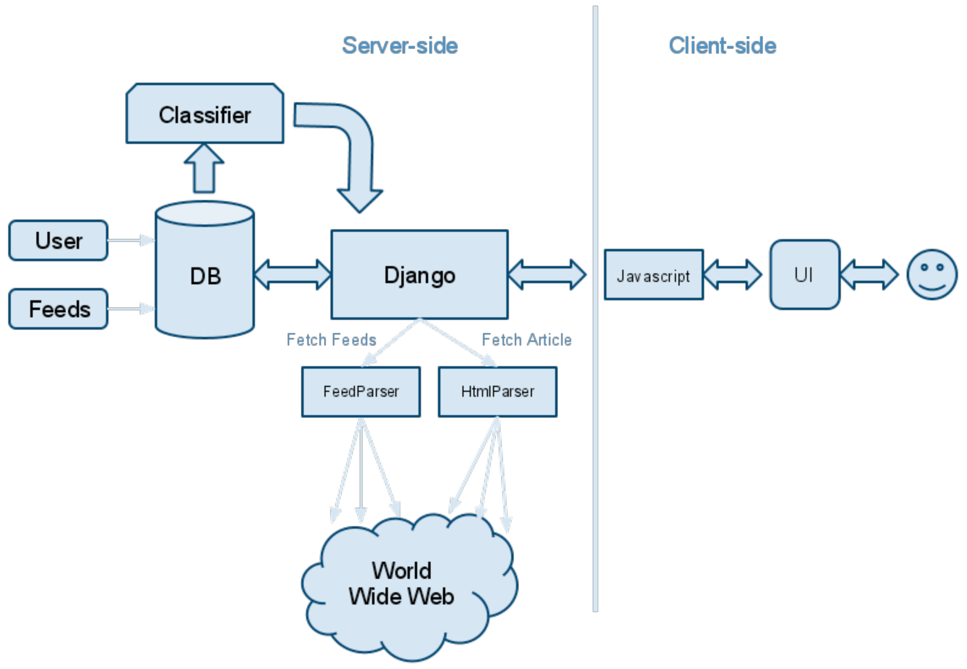


Figure 1: System Diagram

Each category created by the user has its own classifier. The classifier initially has no training data and is inactive; at this stage, when a user selects a category the system displays articles from all the feeds associated with the category.

To train the classifier, the system makes use of two different kinds of user feedback. Firstly, when a user selects an article to read more, this is treated as implicit positive feedback - the article is added to the classifier as a relevant training example (specifically, the title and description of the RSS item is added, as opposed to the full article story). Secondly, each displayed article includes an 'x' which a user may select if he/she dislikes an article, which adds the article to the classifier as an irrelevant training example. When the user refreshes the page, all articles that have been read or marked irrelevant will be removed.

Classifier

The classifier is Naïve Bayes with two classes: 'relevant' and 'irrelevant'. To reduce the size of the feature space, stop words are omitted and words are stemmed (this is not done in the classifier itself but in an external utility function).

The classifier is capable of two different types of feature pruning: frequency based and mutual information based. As of the time of the presentation, neither pruning method was being used in the live system (it does, however, support the use of both pruning methods, and frequency based pruning was activated prior to project turn-in).

Once the classifier is active, our initial approach was to simply classify each document as relevant or irrelevant, and return only articles classified as relevant. However, we were concerned about the possibility that the classifier would return no articles if it classified everything as irrelevant. To guarantee the return of some articles while still attempting quality control, we made use of some of the details of the classifier.

Naïve Bayes assigns a score to each possible class when determining the class of a document (in our system there would be a score for the relevant class and a score for the irrelevant class), and the class with the highest score is the chosen class.

We decided that instead of only returning items for which $S_R > S_{\bar{R}}$ we would use the following method:

1. Assign to each document the difference between the scores for the relevant and irrelevant classes: $S_R - S_{\bar{R}}$
2. Return a fixed number of items - those with the most positive differences

This approach allows for returning articles that would be classified as irrelevant (i.e. articles for which $S_R < S_{\bar{R}}$), but it favors returning articles that are ‘more relevant’.

Database

The live service runs on a PostgreSQL database. The entity representation diagram is given below.

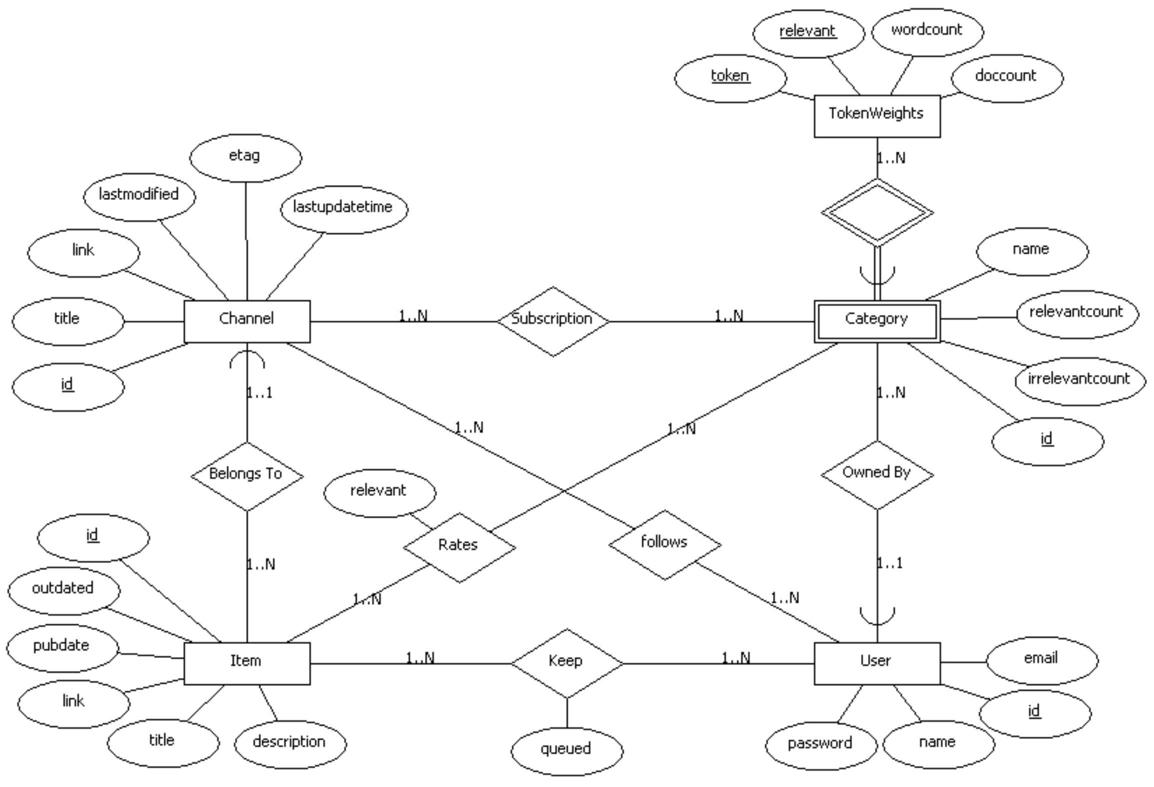


Figure 2: Entity Relationship Diagram for Database

The Channel table stores feed metadata, including the feed link and title. It also stores the HTTP cache validation tags 'etag' and 'last-modified' to avoid re-downloading article summaries if our stored version is up-to-date.

As defined in the RSS specifications, items are the individual article summaries in a feed. The Item table stores the data associated with each item, which includes (in addition to the feed it belongs to) at least one of a title or description, along with possibly a link to the full article and/or a publishing date (according to the most liberal RSS specification examined[1]). The Item table also includes an 'outdated' field, which keeps track of whether an item is 'old' - i.e. whether it is older than the 20th oldest article in its feed.

[1] There are three major RSS specifications: .91, 1.0, and 2.0 (which is the most flexible in what is allowed).

.91: http://www.rssboard.org/rss-0-9-1
1.0: http://web.resource.org/rss/1.0/
2.0: http://cyber.law.harvard.edu/rss/rss.html

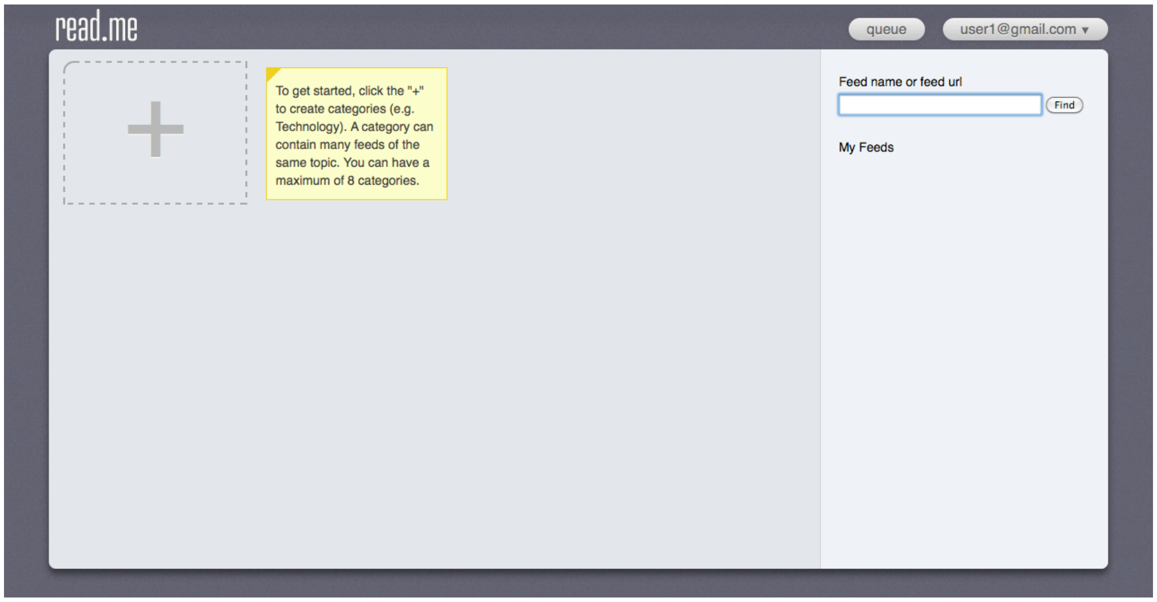
There are four junction tables: ‘Subscription’ keeps track of which feeds are associated with which categories. ‘Keep’ tracks which articles each user has queued. ‘Follows’ tracks what feeds each user likes (which may not yet have been added to a particular category). ‘Rates’ tracks the feedback users give on articles.

Django automatically creates the User table, along with a Session table for maintaining sessions (not shown here).

Typical Usage Scenarios

Scenario 1: Sign up, create a new category, find a feed, and assign the feed to a category

After a user signs up/logs in, they will be presented with the categories page, which is initially empty (fig 3.). The system detects when the user has no categories and provides guides to get started. The user can add categories by selecting the ‘+’ icon (fig. 3) and entering a name for the category (fig. 4). The users can then use the search bar on the right of the categories page to find feeds (fig. 5) and can associate them with categories by dragging the feed from the feed list to the desired category (fig. 6)



To get started, click the "+" to create categories (e.g. Technology). A category can contain many feeds of the same topic. You can have a maximum of 8 categories.

Figure 3: Category Page After Sign Up

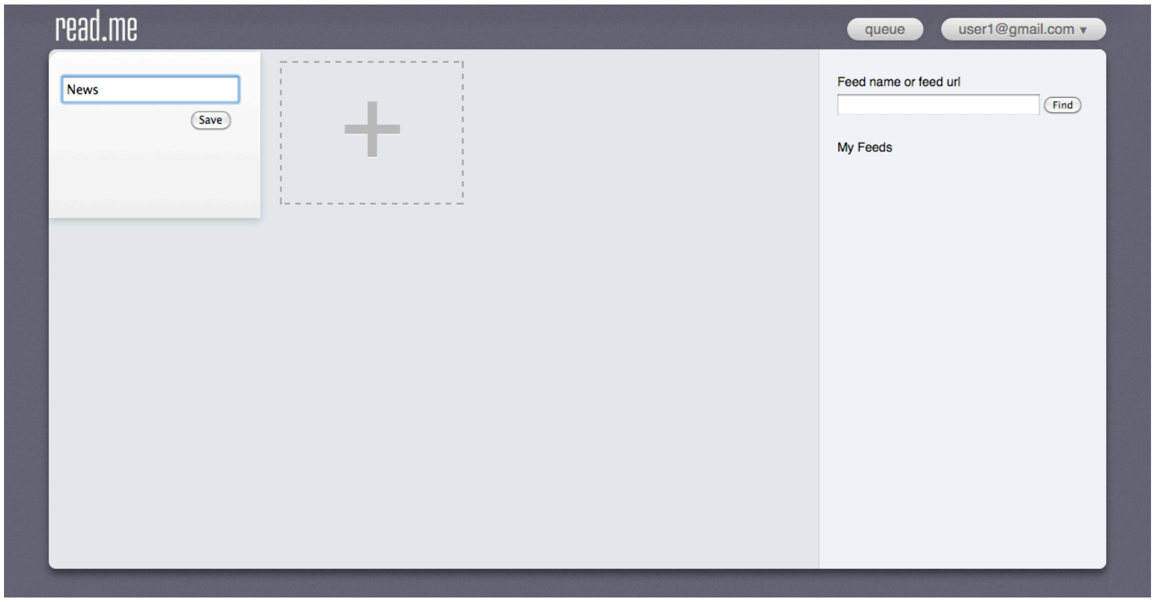
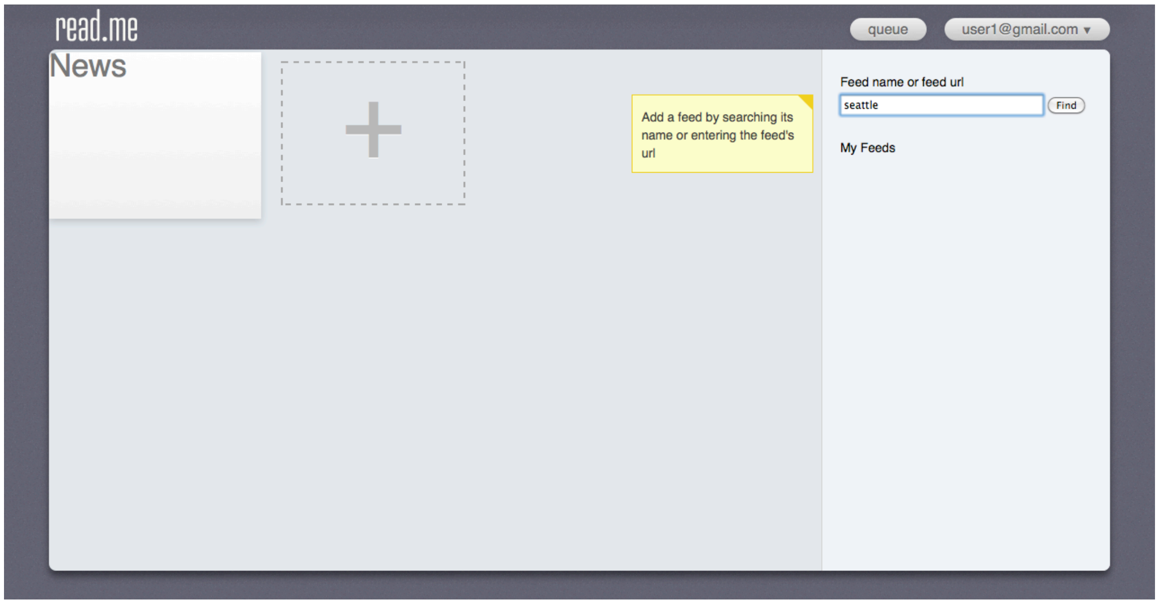
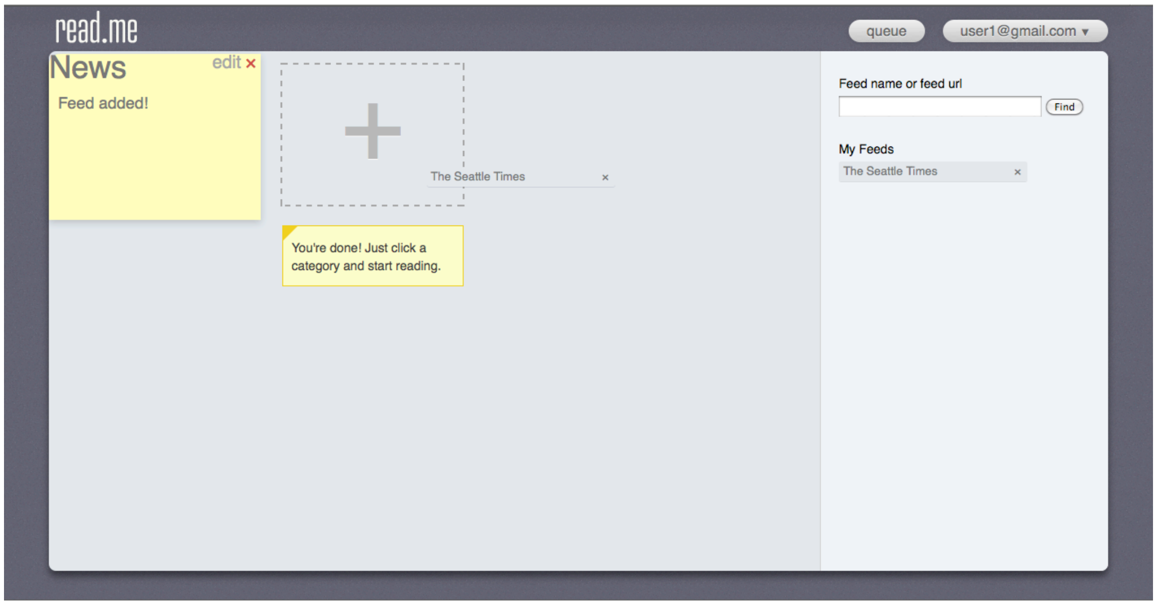


Figure 4: Adding a Category



Add a feed by searching its name or entering the feed's url

Figure 5: Finding a feed



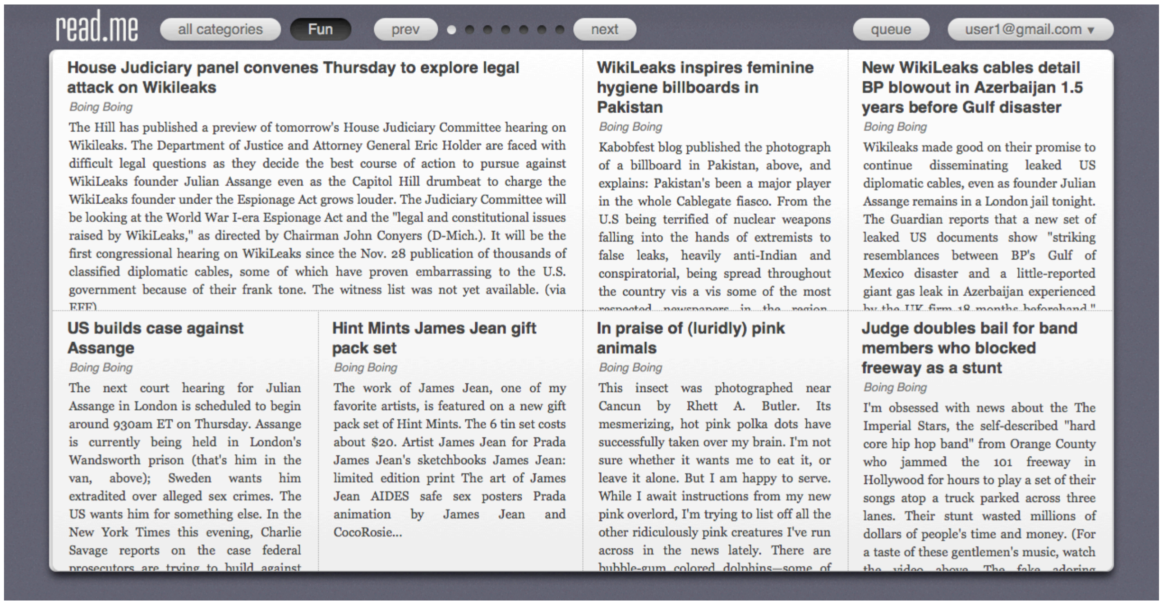
Feed added!

You're done! Just click a category and start reading.

Figure 6: Adding a feed to a category

Scenario 2: Browse articles in a category. Flip through pages. Mark some articles as irrelevant. Read an article.

When a user selects a category to browse, he/she can navigate through pages by clicking the “prev”, “next”, or the paging dots (fig. 7). The user can mark articles as irrelevant by clicking the red “×” that appears when the mouse hovers over an article (fig. 8). The user may read the full article by clicking on the article’s display panel (fig. 9).



House Judiciary panel convenes Thursday to explore legal attack on Wikileaks

Boing Boing

The Hill has published a preview of tomorrow's House Judiciary Committee hearing on Wikileaks. The Department of Justice and Attorney General Eric Holder are faced with difficult legal questions as they decide the best course of action to pursue against WikiLeaks founder Julian Assange even as the Capitol Hill drumbeat to charge the WikiLeaks founder under the Espionage Act grows louder. The Judiciary Committee will be looking at the World War I-era Espionage Act and the "legal and constitutional issues raised by WikiLeaks," as directed by Chairman John Conyers (D-Mich.). It will be the first congressional hearing on WikiLeaks since the Nov. 28 publication of thousands of classified diplomatic cables, some of which have proven embarrassing to the U.S. government because of their frank tone. The witness list was not yet available. (via EFF)

WikiLeaks inspires feminine hygiene billboards in Pakistan

Boing Boing

Kabobfest blog published the photograph of a billboard in Pakistan, above, and explains: Pakistan's been a major player in the whole Cablegate fiasco. From the U.S being terrified of nuclear weapons falling into the hands of extremists to false leaks, heavily anti-Indian and conspiratorial, being spread throughout the country vis a vis some of the most respected newspapers in the region.

New WikiLeaks cables detail BP blowout in Azerbaijan 1.5 years before Gulf disaster

Boing Boing

Wikileaks made good on their promise to continue disseminating leaked US diplomatic cables, even as founder Julian Assange remains in a London jail tonight. The Guardian reports that a new set of leaked US documents show "striking resemblances between BP's Gulf of Mexico disaster and a little-reported giant gas leak in Azerbaijan experienced by the UK firm 18 months beforehand."

US builds case against Assange

Boing Boing

The next court hearing for Julian Assange in London is scheduled to begin around 930am ET on Thursday. Assange is currently being held in London's Wandsworth prison (that's him in the van, above); Sweden wants him extradited over alleged sex crimes. The US wants him for something else. In the New York Times this evening, Charlie Savage reports on the case federal prosecutors are trying to build against

Hint Mints James Jean gift pack set

Boing Boing

The work of James Jean, one of my favorite artists, is featured on a new gift pack set of Hint Mints. The 6 tin set costs about $20. Artist James Jean for Prada James Jean's sketchbooks James Jean: limited edition print The art of James Jean AIDES safe sex posters Prada animation by James Jean and CocoRosie...

In praise of (luridly) pink animals

Boing Boing

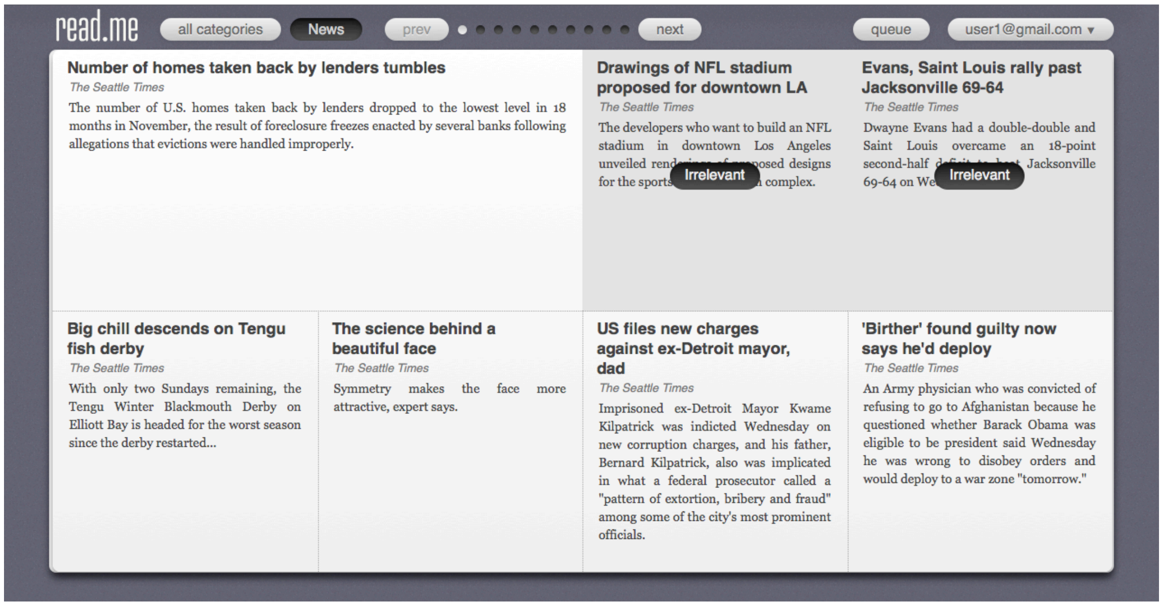
This insect was photographed near Cancun by Rhett A. Butler. Its mesmerizing, hot pink polka dots have successfully taken over my brain. I'm not sure whether it wants me to eat it, or leave it alone. But I am happy to serve. While I await instructions from my new pink overlord, I'm trying to list off all the other ridiculously pink creatures I've run across in the news lately. There are bubble-gum colored dolphins—some of

Judge doubles bail for band members who blocked freeway as a stunt

Boing Boing

I'm obsessed with news about the The Imperial Stars, the self-described "hard core hip hop band" from Orange County who jammed the 101 freeway in Hollywood for hours to play a set of their songs atop a truck parked across three lanes. Their stunt wasted millions of dollars of people's time and money. (For a taste of these gentlemen's music, watch the video above. The fake adoring

Figure 7: Browsing articles in a category


read.me all categories News prev next queue user1@gmail.com ▾

Number of homes taken back by lenders tumbles
The Seattle Times
The number of U.S. homes taken back by lenders dropped to the lowest level in 18 months in November, the result of foreclosure freezes enacted by several banks following allegations that evictions were handled improperly.

Drawings of NFL stadium proposed for downtown LA
The Seattle Times
The developers who want to build an NFL stadium in downtown Los Angeles unveiled rend Irrelevant osed designs for the sports n complex.

Evans, Saint Louis rally past Jacksonville 69-64
The Seattle Times
Dwayne Evans had a double-double and Saint Louis overcame an 18-point second-half Irrelevant Jacksonville 69-64 on We

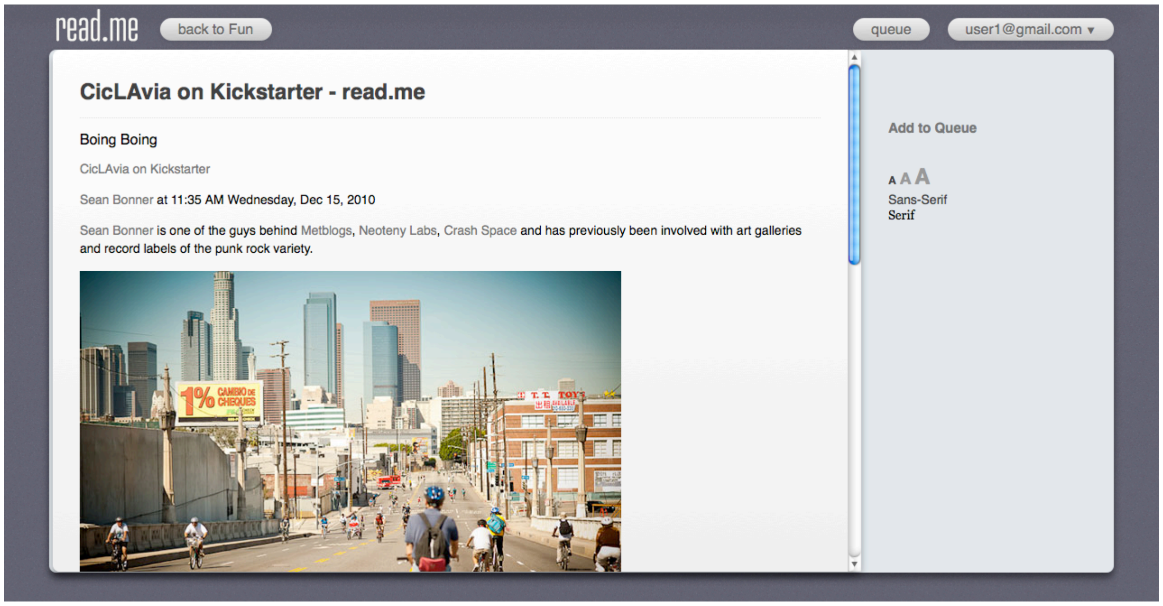
Big chill descends on Tengu fish derby
The Seattle Times
With only two Sundays remaining, the Tengu Winter Blackmouth Derby on Elliott Bay is headed for the worst season since the derby restarted...

The science behind a beautiful face
The Seattle Times
Symmetry makes the face more attractive, expert says.

US files new charges against ex-Detroit mayor, dad
The Seattle Times
Imprisoned ex-Detroit Mayor Kwame Kilpatrick was indicted Wednesday on new corruption charges, and his father, Bernard Kilpatrick, also was implicated in what a federal prosecutor called a "pattern of extortion, bribery and fraud" among some of the city's most prominent officials.

'Birther' found guilty now says he'd deploy
The Seattle Times
An Army physician who was convicted of refusing to go to Afghanistan because he questioned whether Barack Obama was eligible to be president said Wednesday he was wrong to disobey orders and would deploy to a war zone "tomorrow."

Figure 8: Marking articles as irrelevant


read.me back to Fun queue user1@gmail.com ▾

CicLAvia on Kickstarter - read.me

Boing Boing

CicLAvia on Kickstarter

Sean Bonner at 11:35 AM Wednesday, Dec 15, 2010

Sean Bonner is one of the guys behind Metblogs, Neoteny Labs, Crash Space and has previously been involved with art galleries and record labels of the punk rock variety.

Add to Queue
A A A
Sans-Serif
Serif

Figure 9: Reading the full article

Scenario 3: Edit name and remove feeds in a category

The 'edit' option appears when the mouse hovers over a category (fig. 10). When the option is selected, an editing view for the category expands (fig. 11) which allows users to remove feeds and change the category name.

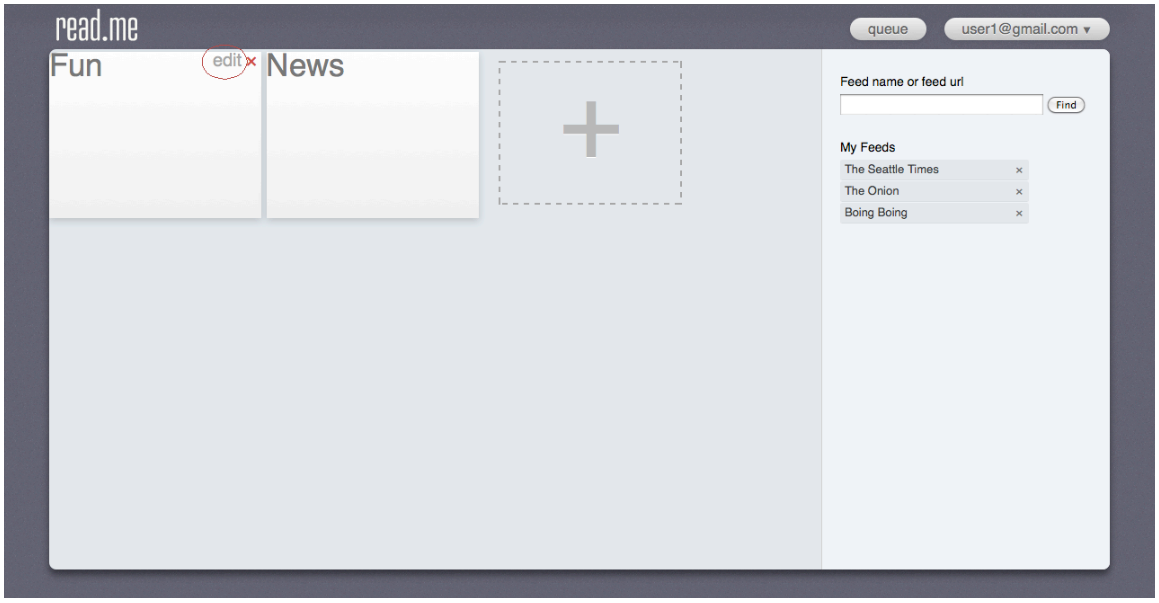


Figure 10: Activating the view for editing a category

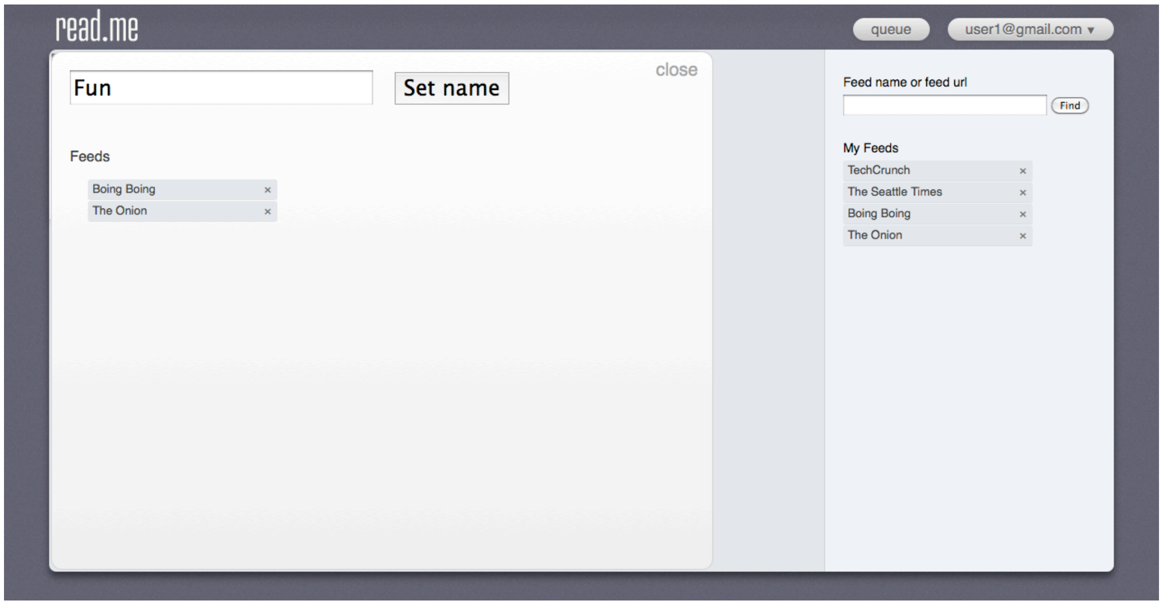
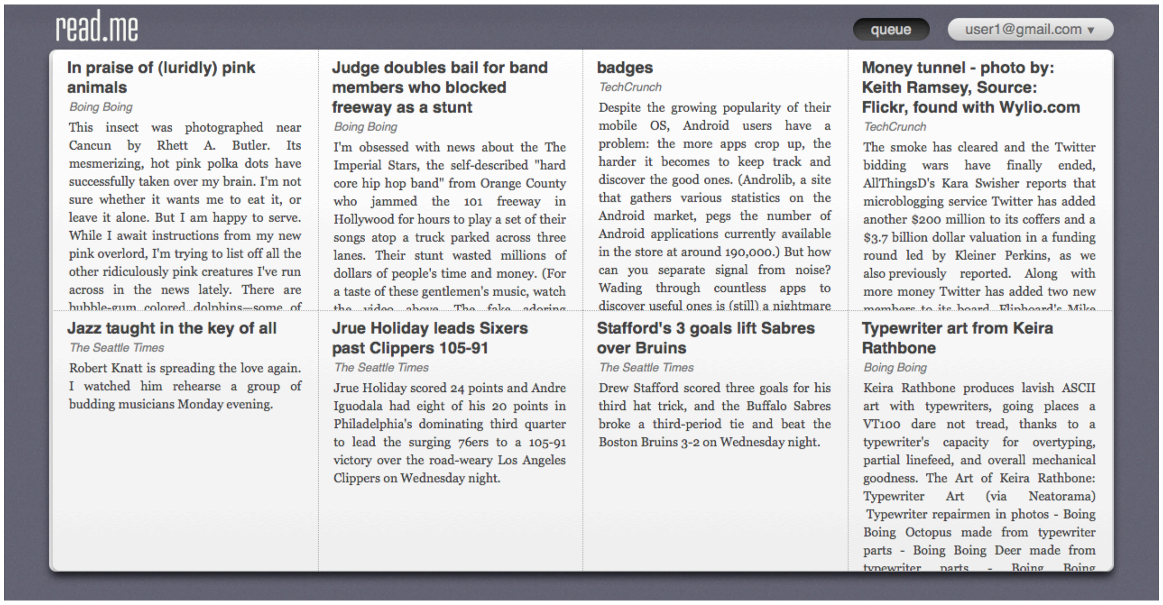


Figure 11: View for editing a category

Scenario 4: View Queue

To view their queue, users can select the “queue” button on the top right.



In praise of (luridly) pink animals
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This insect was photographed near Cancun by Rhett A. Butler. Its mesmerizing, hot pink polka dots have successfully taken over my brain. I'm not sure whether it wants me to eat it, or leave it alone. But I am happy to serve. While I await instructions from my new pink overlord, I'm trying to list off all the other ridiculously pink creatures I've run across in the news lately. There are

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badges
TechCrunch
Despite the growing popularity of their mobile OS, Android users have a problem: the more apps crop up, the harder it becomes to keep track and discover the good ones. (Androlib, a site that gathers various statistics on the Android market, pegs the number of Android applications currently available in the store at around 190,000.) But how can you separate signal from noise? Wading through countless apps to discover useful ones is (still) a nightmare

Money tunnel - photo by: Keith Ramsey, Source: Flickr, found with Wylio.com
TechCrunch
The smoke has cleared and the Twitter bidding wars have finally ended, AllThingsD's Kara Swisher reports that microblogging service Twitter has added another $200 million to its coffers and a $3.7 billion dollar valuation in a funding round led by Kleiner Perkins, as we also previously reported. Along with more money Twitter has added two new

Jazz taught in the key of all
The Seattle Times
Robert Knatt is spreading the love again. I watched him rehearse a group of budding musicians Monday evening.

Jrue Holiday leads Sixers past Clippers 105-91
The Seattle Times
Jrue Holiday scored 24 points and Andre Iguodala had eight of his 20 points in Philadelphia's dominating third quarter to lead the surging 76ers to a 105-91 victory over the road-weary Los Angeles Clippers on Wednesday night.

Stafford's 3 goals lift Sabres over Bruins
The Seattle Times
Drew Stafford scored three goals for his third hat trick, and the Buffalo Sabres broke a third-period tie and beat the Boston Bruins 3-2 on Wednesday night.

Typewriter art from Keira Rathbone
Boing Boing
Keira Rathbone produces lavish ASCII art with typewriters, going places a VT100 dare not tread, thanks to a typewriter's capacity for overtyping, partial linefeed, and overall mechanical goodness. The Art of Keira Rathbone: Typewriter Art (via Neatorama) Typewriter repairmen in photos - Boing Boing Octopus made from typewriter parts - Boing Boing Deer made from

Figure 12: Viewing the queue

These are the screens in most common usage scenarios. Many other pages, such as sign up, login, and help, are not included in this document but can be viewed in the demo.

Experiments and Evaluations

Classifier Testing

We wanted to evaluate whether feature pruning could be used to improve the F-measure of our classifier. To do this we made use of the RCV1 dataset[2], which consists of articles that have been human-labeled using a set of subjects.

We chose a subset of subjects to represent a user with particular preferences, and treated the entire set of data as being part of feeds that were served to one category for the user. Under this scheme, articles having one of the chosen subjects would be considered relevant, and otherwise they would be irrelevant.

The following experiment was repeated 25 times to obtain average precision, recall, and F-measure after training with up to 150 documents in increments of 5.

[2] *Lewis, D. D.; Yang, Y.; Rose, T.; and Li, F. RCV1: A New Benchmark Collection for Text Categorization Research. Journal of Machine Learning Research, 5:361-397, 2004.*
Available at:
http://www.ai.mit.edu/projects/jmlr/papers/volume5/lewis04a/lyrl2004_rcv1v2_README.htm

Document samples were taken from a pool of 23149 documents, with all articles labeled 'government/social' (6970) being considered relevant. Pruning was triggered whenever the number of features exceeded 1000, and reduced the number of features to 300 (150 per class):

1. Pick 150 documents for training the classifier and 3000 for testing from a set of 23149 documents.
2. Repeat:
    a. Add 5 training examples to the classifier
    b. Classify all testing documents. Record precision, recall, and F-measure.

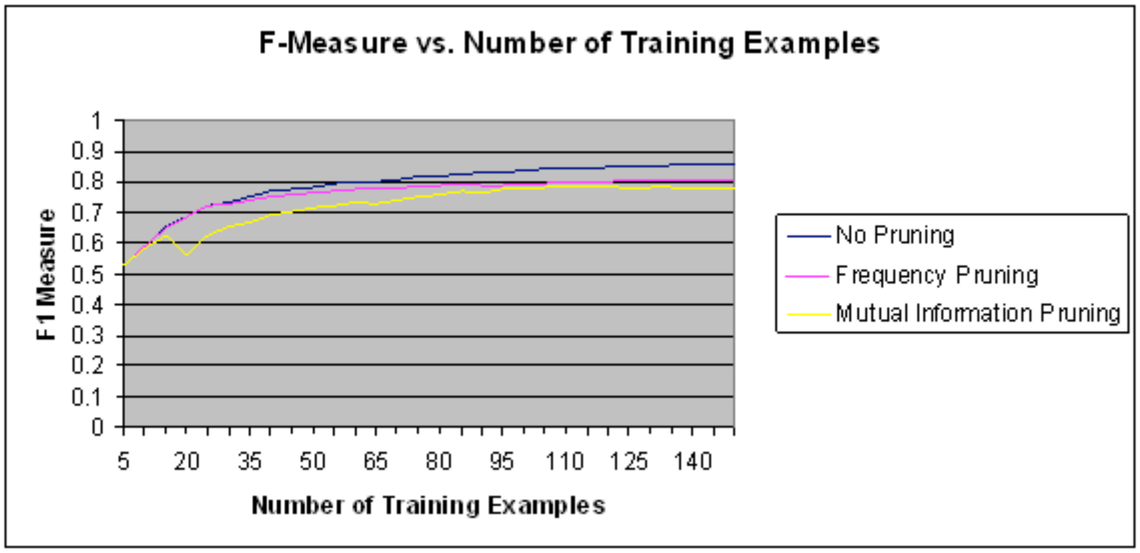

Figure 13: F-measure vs. Number of Training Examples for Classifier Variants

It should be noted that documents in the obtained dataset are longer than the typical article summary: 120.9 words per instance (averaged over the 23149 documents) versus 31.4 words per article summary (averaged with 1394 articles from 20 feeds).

As visible from the graph, feature pruning does not enhance the performance of the system. Using two-sample unpooled t-tests with a critical region of .05, frequency based pruning was found to generally have similar recall and worse precision compared to no pruning, and mutual information based pruning was found to generally have worse recall and similar precision.

Usability Testing

We conducted usability tests with several computer science students, who are potential users of our RSS reader. The tests were organized into two rounds, the first round had three testers and the second round had two. For each tester, we assigned them tasks for all the scenarios, and let them perform the tasks while thinking aloud. We observed the tester's performance in the tasks and wrote down anything noticeable. Every test revealed new bugs and usability issues. After the first round, we gathered all the notes and compiled them into to-do items, prioritized the bugs, and fixed them. After all the bugs were fixed, we conducted a second round of usability tests. Besides some minor issues, the testers' experiences significantly improved thanks to the bug fixes.

Examples of bugs and usability issues:

- **Issue:** HTML not parsed correctly using our own regular expressions
  Fix: use a Python HTML parser, Beautiful Soup, to parse HTML pages
- **Issue:** No feedback when dragging a feed to a category
  Fix: Add highlight and text feedback to the category box when the feed is dropped
- **Issue:** Do not know what a feed is and how to add it
  Fix: Besides our guides (yellow post-it notes) after registration, we added a help page that guides users through the process of adding a feed
- **Issue:** When browsing articles, don't know where the articles are from
  Fix: Add a source description under article title

What we learned/what we would have done differently

We've learned a great deal as well as realized many things that could be done better. By the end of the quarter, our main problems occur in UI, classifier, and performance. It would have been very beneficial if we have done them differently in the beginning.

Using a framework can be very beneficial. Django made the web development process manageable. It saved us time by providing library for database access, template frameworks and session management. All of which would of taken very long time to implement ourselves.

We learned that it is important to listen carefully to user feedback. We should have talked with people about our vision and goals, and developed paper prototypes before coding the user interface. Paper prototype allows us to make changes easily so we can have a well-tested UI before implementing the final version. This would have allowed us to create a friendlier user interface.

If we were starting over again, we also would have experimented with more diverse classification schemes. The Naïve Bayes classifier used in our system requires many training examples to learn the preferences of a user for a particular category. Users would likely become frustrated when they see articles similar to those they have provided negative feedback on. This can be especially difficult to avoid if an article is a conjunction of relevant and irrelevant concepts (for example, a user may find articles about international criminals interesting, but does not want to hear about WikiLeaks). With these issues in mind, it would have been worthwhile to test a separate technique to filter content (like keyword based search) to get a more interesting comparison.

We could have improved the system performance-wise. Firstly, we implemented caching too early. The view is not updated when needed. This had a significant impact on our classifier's performance. We should have got our system working properly, and then implemented caching later. Secondly, our current system updates feeds as we view a category. This does reduce the performance of the system, and have potential scalability issues if the number of users were to be increased. We would automatically update feeds more frequently and not updating when users choose category.

Conclusions

Although the usefulness of the service is limited by speed and classification issues and many of the extra features we planned were not implemented, we have achieved our initial goals. The application displays articles in a newspaper layout, learns user's preference on the fly, and only shows stories that users really care about. In conclusion, we have done a successful project within the 10-week timeframe and with the resources we were given.

Ideas for future work:

- Add caching in a way that it will refresh when users expect to see changes
- Updating feeds should always be a crontab job that runs in the background. It shouldn't be triggered by user interactions, which take a long time.
- Refine the user interface to make it more robust and browser compatible.
- Try new classifiers and training data to improve our machine learning algorithms.
- Better method for retrieving articles or doing more to make it reliable.
- Implement "favorite" feature
- Supports for other languages
- More the public testing

Appendices

Who Did What

- **Sean Ren:** user interface design and implementation, Django view functions for most pages, javascript functions, usability testing
- **Peter Scheibel:** database schema, Django model definitions, Naive Bayes classifier
- **Kha Nguyen:** application deployment and maintenance, classifier utilities, repeat detection experiment, homepage, queue functionality for application, help page
- **Michael Mathews:** updating feeds, setting up crontabs, fetching/parsing of feeds and individual articles

External Code

Python:
[Django]
http://www.djangoproject.com/
Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design.

[Stemmer]
http://pypi.python.org/pypi/stemming/1.0
Stemming is done using Stemming 1.0 package for Python. Stemming was used with the intention to increase precision of the classifier.

[Feed Parser]
http://www.feedparser.org/
Universal feed parser is a python library for parsing feeds.

[HTML Parser]
http://www.crummy.com/software/BeautifulSoup/
Beautiful Soup is a Python HTML/XML parser designed for quick turnaround projects like screen-scraping.

JavaScript:
[jQuery]
http://jquery.com/
Query is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development. jQuery is designed to change the way that you write JavaScript.

[Readability]

http://lab.arc90.com/experiments/readability/
Makes reading more enjoyable by removing clutter that surrounds what you are reading.

Readme for Read.me

Project URL

http://readme.cs.washington.edu

Browser Compatibility

The service is compatible with Firefox and Chrome (Internet Explorer has compatibility issues).

Deployment Instructions

The application was deployed on Cubist's apache server with mod_wsgi.

1. Mod_WSGI: an apache module that provides for hosting Python Web applications.
   Depending on the platform, the installation process can be slightly different. For cubist server, we had to install the module for fedora. The module for fedora can be obtained at
   http://download.fedora.redhat.com/pub/epel/5/i386/repoview/mod_wsgi.html
   From this url, a rpm package can be downloaded and installed. (rpm -ivh package.rmp)

2. Apache configuration: in the case of cubist server, apache has been installed, and the configuration file is located at "/etc/httpd/conf/httpd.conf."
   a. Once mod_wsgi was installed, Apache had to be told to connect to the module. This was done in Apache configuration file by "LoadModule wsgi_module modules/mod_wsgi.so."

   b. A virtual host is needed since cubist hosts multiple domains using the same IP address. This is done by <virtualhost 128.208.1.51:80> </virtualhost>. All other configurations must be encapsulated within these 2 tags.

   c. WSGI Daemon: wsgi runs in daemon mode for the purpose of resetting the application on Apache without resetting Apache. Daemon mode also offers faster performance because we don't have to tune the Apache MPM settings. Daemon mode is enabled by:
   wsgirestrictstdout off
   wsgidaemonprocess django
   wsgiprocessgroup django

d. Direct Apache to the Readme application: we need to tell Apache to direct to our application using mod_wsgi. This is done by “wsgiscriptalias / /www/htdocs/projects/10au/cse454/c/SmartRSS/apache/django.wsgi.” This alias will match the request to root directory to wsgi setting.
WSGI setting: is in django.wsgi file. The syntax of this file is Python syntax. What this file does is to add the paths of the application to Python search paths, and to point the Django settings module to our application settings module.

e. Media files: Django does not serve media files, so this is done separately by “alias /media/ /www/htdocs/projects/10au/cse454/c/SmartRSS/media/” and “alias /admin_media/ /usr/lib/python2.6/site-packages/django/contrib/admin/media/” to serve image contents.

f. Edit settings.py to configure the application settings

g. For a detailed configuration, please see the attached apache.txt file.