Sentiment Analysis - Stanford Large Movie Review Dataset

The dataset used in this example can be found at http://ai.stanford.edu/~amaas//data/sentiment/ (http://ai.stanford.edu/~amaas//data/sentiment/)

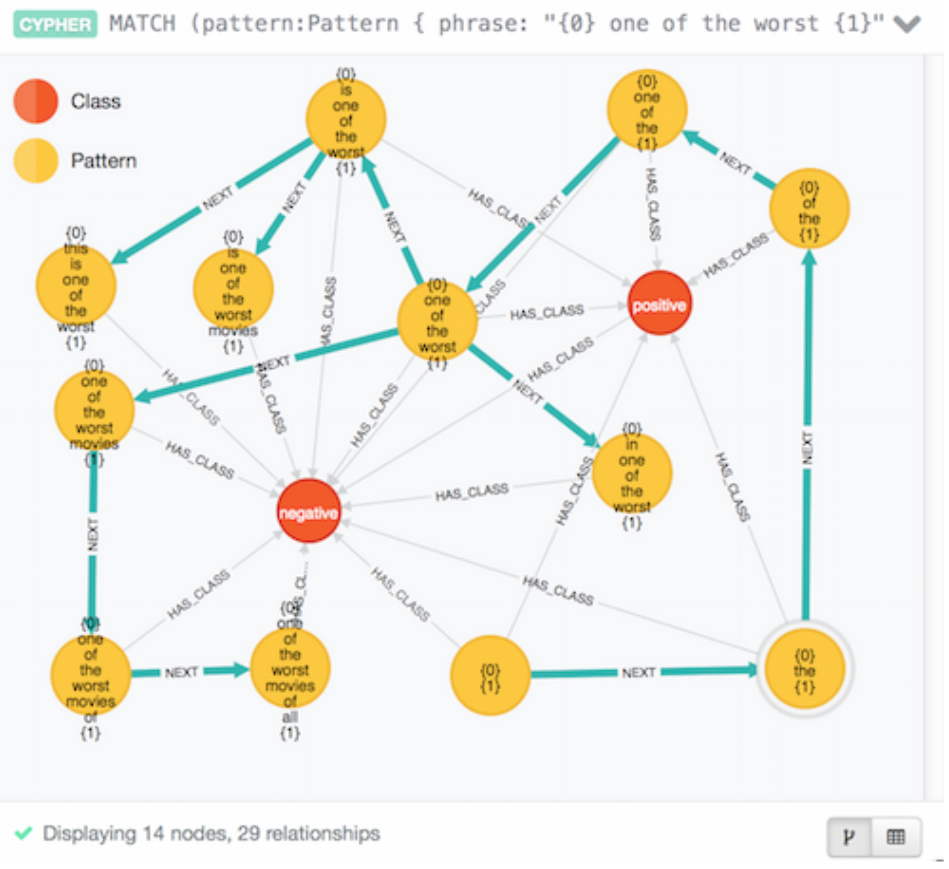
Paper: Learning Word Vectors for Sentiment Analysis (http://ai.stanford.edu/~amaas//papers/wvSent_acl2011.bib).

This notebook creates a logistic regression classifier from training data generated from Graphify (http://github.com/graphify/graphify), a graph-based natural language processing library. Graphify performs feature extraction and creates training data in the form of tf-idf over a set of n-grams extracted probabilistically using a combination of a decision tree and evolutionary algorithm.

Each class node represents a label for a movie review (either negative or positive) and is used as a document for calculating the tf-idf weighting for the feature vectors. A decision tree of patterns activates over an unlabeled input (a movie review), creating a binary feature vector that is weighted using tf-idf. The result is a vector of scalars used to train a logistic regression classifier.

```
In [5]: from IPython.display import Image
        Image(filename='images/movie-sentiment-3.png')
```

Out[5]:



```
CYPHER MATCH (pattern:Pattern { phrase: "{0} one of the worst {1}"
```

Class
Pattern
{0} is one of the worst {1}
{0} one of the {1}
{0} of the {1}
{0} this is one of the worst {1}
{0} is one of the worst movies {1}
{0} one of the worst {1}
positive
{0} one of the worst movies {1}
{0} in one of the worst {1}
negative
{0} one of the worst movies of {1}
{0} one of the worst movies of all {1}
{0} {1}
{0} the {1}
NEXT
HAS_CLASS

```
✓ Displaying 14 nodes, 29 relationships
```

Load training dataset

In [6]:
```
%matplotlib inline

from numpy import *
import matplotlib.pyplot as plt
X_data = loadtxt("data/Large Movie Review Dataset/X_train.txt")
print X_data.shape
X = X_data
```

```
(2000, 1995)
```

There are 2000 training examples and 1995 features for each row of the training examples.

In [7]:
```
y_data = loadtxt("data/Large Movie Review Dataset/y_train.txt", dtype = i
nt)
print y_data.shape
y = y_data
```

```
(2000,)
```

The `y_data` is used to train and test the learning model and indicates a 0 or 1 value, 0=negative review and 1=positive review. The length of 2000 for y corresponds to the training label for each row in X_data.

The dataset consists of 1000 negative examples and 1000 positive examples of movie reviews. In the raw data, the first 1000 feature vectors correspond to positive examples and the last 1000 correspond to negative examples. Before training the model, we need to shuffle the data and then slice 1000 training rows and 1000 test rows.

In [8]:
```
from sklearn.utils import shuffle
X_new, y_new = shuffle(X, y)

X_train = X_new[:1000]
y_train = y_new[:1000]
X_test = X_new[1000:]
y_test = y_new[1000:]
```

In [9]:
```
from sklearn.linear_model import LogisticRegression
logreg = LogisticRegression()
```

Train the model

Fit the logistic regression model to 1000 rows of the training data and test the accuracy by predicting on the training data that was used to build the model. The lower the accuracy is on the training set, may be an indication of over fitting.

In [10]:
```
logreg.fit(X_train, y_train)
y_pred_train = logreg.predict(X_train)
print "Accuracy on training set:", logreg.score(X_train, y_train)
```

```
Accuracy on training set: 0.945
```

Test the model

Test the learning model on the remaining 1000 test rows that were not used to train the model.

In [11]:
```
y_pred_test = logreg.predict(X_test)
print "Accuracy on test set:", logreg.score(X_test, y_test)
```

```
Accuracy on test set: 0.819
```

While this score was generated by examining 1000 movie reviews, where negative reviews were 1 star and positive reviews were 10 stars, the classifier and feature extractor performs much better on multi-sentence inputs. The average length of the IMDB movie reviews from http://ai.stanford.edu/~amaas//data/sentiment/ (http://ai.stanford.edu/~amaas//data/sentiment/) is less than the Pang and Lee movie review dataset http://www.cs.cornell.edu/people/pabo/movie-review-data/ (http://www.cs.cornell.edu/people/pabo/movie-review-data/). Graphify performs much better at generating the weighted feature vectors for longer more verbose reviews (8-10 sentences).