# Natural Language Processing and the Web (Final-Presentation)



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## **Motivation**



We want to look for potential competitors based on customer reviews of hotels/restaurants, that is, to find peers who are similar to each other. At the same time, this method can also be used for those tourists who do not want to stay in the same hotel/restaurant in the same city, we recommend similar hotels/restaurants for them to choose.

## Guideline



The whole process will be executed in two steps:

First step: we calculate the tf-idf values of the predefined feature words for every hotel file (in this case, a document means every single paragraph in the file) with help of UIMA annotation. We transfer this as a vector for the file to libsvm and get predicted label for the test hotel file. Then we will select the hotels, which locate in the same city with the test hotel file, and then pick the hotels with the most similar labels (overall rating) with the predicted label of the test hotel file as candidates.

Second step: we let the user type in the feature words they want to use, and use these feature words together to form a new feature and calculate the tfidf value again among the candidate hotels. In the end we pick out one hotel with the highest tfidf value of this new feature.



### **Original data:**

Data provided by TripAdvisor, Most of the files contain the overall rating, hotel name and location. Then the comments from users with <Content> tag.

(Overall Rating>4 rating

<Avg. Price>\$302

<URL>http://www.tripadvisor.com/ShowUserReviews-g60878-d100504-r22932337-

Hotel\_Monaco\_Seattle\_a\_Kimpton\_Hotel+Seattle\_Washington.html

<Author>selizabethm h

hotel name

location

(Content>Wonderful time- even with the snow! What a great experience! From the goldfish in the room (which my daughter loved) to the fact that the valet parking staff who put on my chains on for me it was fabulous. The staff was attentive and went above and beyond to make our stay enjoyable. Oh, and about the parking: the charge is about what you would pay at any garage or lot- and I bet they wouldn't help you out in the snow!

hotelName Hotel\_Monaco\_Seattle\_a\_Kimpton\_Hotel

location: Seattle\_Washington

overallRating 4

<Content>Wonderful time- even with the snow! What a great experience! From the goldfish in the room (which my daughter loved) to the fact that the valet parking staff who put on my chains on for me it was fabulous. The staff was attentive and went above and beyond to make our stay enjoyable. Oh, and about the parking: the charge is about what you would pay at any garage or lot- and I bet they wouldn't help you out in the snow!

<Date>Dec 23, 2008

comment

⟨No. Reader⟩-1

<No. Helpful>-1

<0veral1>5

picture 2: modified hotel file

picture 1: original hotel file

#### **Train data:**

We will only take the part in which is tagged in the left picture and it looks like in the right picture.



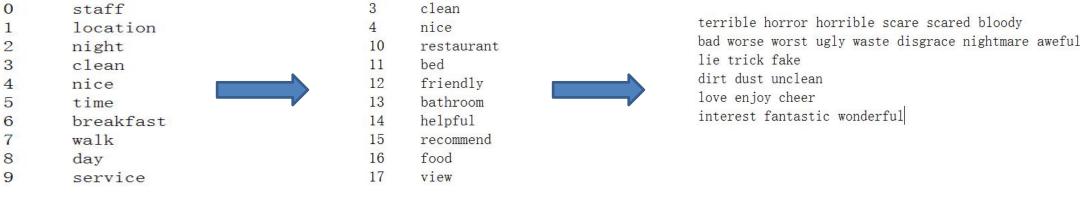
#### Test data:

The test hotel files look exactly the same with train data.

(\* because some original files don't have a url and thus have no location and hotel name, we just discard them)

#### **Feature words:**

The original feature words provided by dataset contains more than thousand feature words. At the very begining we just picked out 400 words due to their indexes (picture 3).



picture 3: original feature words

picture 4: delete some feature words

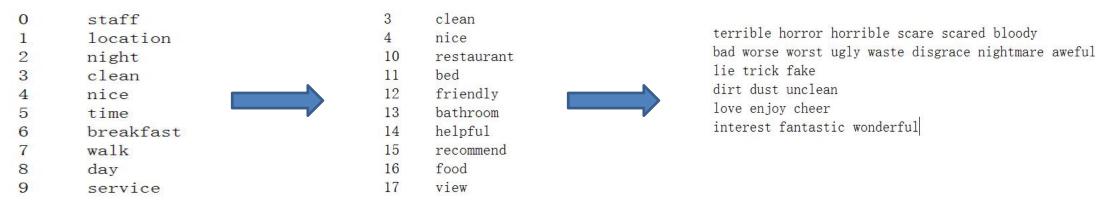
picture 5: collapse similar words



#### **Feature words:**

During the sym processing we noticed that many words are not very relevant to the label, which is the rating. So we picked about 300 out of the words, like in picture 4.

We also noticed that calculate the similar words as separate feature made them all not that relevant for label, better is, that we collapse them into one feature. After deleting many other irrelevant words we got the final feature words, like in picture 5. Every line is a set of words, which form together a feature.



picture 3: original feature words

picture 4: delete some feature words

picture 5: collapse similar words

#### **Additional feature:**



#### **Additional feature:**

Intuitively we know that the rating is most relevant to the ratio between positive and negative comments. So why don't we just calculate **how "positive" the comments overall are**?

We calculate for every paragraph the ratio between positive features and all features  $\mathbf{r}_p$ , and then calculate the average ratio over all paragraphs:  $r_{\text{all}} = \sum_{p} r_{p}$ 

The vector file as input for the svm looks like this:

```
4. 5 0 4. 238383038018905 1 0. 0 2 6. 849576910286561 3 0. 0 4 13. 45441008856036 5 13. 16077902783271 6 8. 332150383620975 3. 5 0 7. 3786905709933714 1 12. 96918750639406 2 9. 511397556565733 3 3. 586789755406759 4 12. 81977003273233 5 10. 022498110584017 6 4. 624490986492345
```

picture 7: vector file

### Other improvements:

- 1. detect the negative expression
- 2. normalize the feature due to the size of comments

## **Processing**



#### Create train and test files:

we create train and test files out of modified hotel files. In our case, we put for every location the second hotel file into test, and use the other hotel files as train files.

### **Algorithmus:**

libsvm: we use the libsvm to process the vector file. We choose the nu-svr mode from libsvm to use the whole 7 features to regression over the label.

After we got the predicted label for the test file, we use a list to store the train files, where the train hotel with most similar label with the test hotel come first.

Often, there are more than one candidates, thus we need the second step:

```
optimization finished, #iter = 176
epsilon = 3.207053034053331E-4
obj = -8.32379239282361, rho = -3.477110590353275
nSV = 41, nBSV = 7
Mean squared error = 0.47786456920716464 (regression)
Squared correlation coefficient = 1.0000000000312694 (regression)
Please enter a location (lowercase)

picture 8: example result for the first step (svm)
```

## **Processing**



### **Second step:**

because we have multiple test files (each for one location), we let user choose one location:

```
optimization finished, #iter = 176
epsilon = 3.207053034053331E-4
obj = -8.32379239282361, rho = -3.477110590353275
nSV = 41, nBSV = 7
Mean squared error = 0.47786456920716464 (regression)
Squared correlation coefficient = 1.0000000000312694 (regression)
Please enter a location (lowercase)

picture 8: example result for the first step (svm)
```

## if the location is incorrect, user must type once again until location is correct:

```
Please enter a location (lowercase)

darmstadt

The location you entered is not included, please enter a new location (lowercase)

texas

3
```

picture 9: enter location again if location isn't included

## **Processing**



we get the candidates and let user define their feature words, and calculate tfidf value for this feature among the candidates and pick up the one with highest value:

```
Please enter your feature word(s) separated with space

sea sunshine warm

??

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Dallas_Texas_3_InterContinental_Dallas.dat processing

Dallas_Texas_4_The_Magnolia_Hotel_Dallas.dat processing

Dallas_Texas_7_Hotel_Lawrence.dat processing

Dallas_Texas_8_La_Quinta_Inn_and_Suites_Dallas_Addison_Galleria.dat processing

We choose file: Dallas_Texas_7_Hotel_Lawrence.dat, because it has the highest score for the given feature words
```

picture 10: enter feature words and get the hotel returned

## **Further work**



1. the data could be cleaner after preprocessing: for example some comments in non-english languages could be detected and discarded:

- 2. we could use some more information besides the comments, for example the rating of room, value and even how many people find the comment is useful.
- 3. we could use test data from other datasets

## Resources



TripAdvisor dataset source: http://times.cs.uiuc.edu/~wang296/Data/