Problem 19

The `evaluate()` method works out how accurately the tagger performs on this text. For example, if the supplied tagged text was `[(’the’, ’DT’), (’dog’, ’NN’)]` and the tagger produced the output `[(’the’, ’NN’), (’dog’, ’NN’)]`, then the score would be 0.5. Let’s try to figure out how the evaluation method works:

1. A tagger `t` takes a list of words as input, and produces a list of tagged words as output. However, `t.evaluate()` is given correctly tagged text as its only parameter. What must it do with this input before performing the tagging?

   Strip the tags from the gold standard text.

2. Once the tagger has created newly tagged text, how might the `evaluate()` method go about comparing it with the original tagged text and computing the accuracy score?

   For each work in the tagged output, it would compare whether or not the tag of that word matches the tag of the same word from the gold standard input.

3. Now examine the source code to see how the method is implemented. Inspect `nltk.tag.api.__file__` to discover the location of the source code, and open this file using an editor.

   Source Code for `evaluate()`:

```
    def evaluate(self, gold):
        """
        Score the accuracy of the tagger against the gold
           standard.
        Strip the tags from the gold standard text, retag it
           using
        the tagger, then compute the accuracy score.

        :type gold: list(list(tuple(str, str)))
        :param gold: The list of tagged sentences to score
           the tagger on.
        :rtype: float
        """

        tagged_sents = self.tag_sents(untag(sent) for sent in
           gold)
        gold_tokens = list(chain(*gold))
        test_tokens = list(chain(*tagged_sents))
        return accuracy(gold_tokens, test_tokens)
```

Problem 20

Write code to search the Brown Corpus for particular words and phrases according to tags, to answer the following questions:

1. Produce an alphabetically sorted list of the distinct words tagged as MD.

   Code:

```
def sorted_tags():
    '''
    Produce an alphabetically sorted list of the distinct
        words tagged as MD.
    '''
    tagged_words = nltk.corpus.brown.tagged_words()
    words_of_interest = []
    for tag_pair in tagged_words:
    if tag_pair[1] == 'MD':
    words_of_interest.append(tag_pair[0].lower())
    distinct_words_of_interest =
        list(set(words_of_interest))
    distinct_sorted_words_of_interest =
        sorted(distinct_words_of_interest, key=str.lower)

    print("Distinct words tagged as MD: %s" %
        distinct_sorted_words_of_interest)
    print("Number of distinct_words_of_interest: %s" %
        len(distinct_sorted_words_of_interest))
```

Output:

```
$ python3 expanded_tagger.py
Distinct words tagged as MD: ["c'n", 'can', 'colde',
     'could', 'dare', 'kin', 'maht', 'mai', 'may',
     'maye', 'mayst', 'might', 'must', 'need', 'ought',
     'shall', 'should', 'shuld', 'shulde', 'wil', 'will',
     'wilt', 'wod', 'wold', 'wolde', 'would']
Number of distinct_words_of_interest: 26
```

2. Identify words that can be plural nouns or third person singular verbs (e.g. deals, flies).

   Code:

```
def multi_tags():
    brown_tagged = brown.tagged_words()
    data = nltk.ConditionalFreqDist((word.lower(), tag)
         for (word, tag) in brown_tagged)
    words_of_interest = []
    for word in sorted(data.conditions()):
    if len(data[word]) > 2:
        tags = [tag for (tag, _) in
             data[word].most_common()]
        if ('VBZ' in tags and 'NNS' in tags):
            words_of_interest.append(word)
    print("Words categorized as both VBZ and NNS: ")
    print(words_of_interest)
```

   Output:

```
$ python3 expanded_tagger.py
Words categorized as both VBZ and NNS:
['accounts', 'acts', 'addresses', 'aids', 'appeals',
     'associates', 'attacks', 'attempts', 'attributes',
     'backs', 'bangs', 'banks', 'bars', 'bellows',
     'benefits', 'boards', 'bridges', 'bugs', 'burns',
     'calls', 'cares', 'causes', 'centers', 'champions',
     'changes', 'charges', 'checks', 'claims', 'clouds',
’colors’, ’comments’, ’contacts’, ’contracts’,
’controls’, ’costs’, ’courts’, ’dances’, ’designs’,
’dies’, ’dishes’, ’dogs’, ’doubles’, ’dreams’,
’drifts’, ’drinks’, ’exercises’, ’exhibits’,
’faces’, ’factors’, ’falls’, ’fashions’, ’fears’,
’features’, ’feeds’, ’fields’, ’figures’, ’flies’,
’forces’, ’functions’, ’gains’, ’guides’, ’harbors’,
’helps’, ’hits’, ’holds’, ’honors’, ’hopes’,
’influences’, ’issues’, ’lands’, ’levels’, ’limits’,
’lines’, ’lists’, ’lives’, ’marches’, ’markets’,
’means’, ’meets’, ’misses’, ’moves’, ’needs’,
’notes’, ’objects’, ’offers’, ’orders’, ’pictures’,
’places’, ’plans’, ’powers’, ’practices’,
’projects’, ’purchases’, ’questions’, ’rates’,
’reasons’, ’rebels’, ’records’, ’regrets’,
’remains’, ’remarks’, ’replies’, ’reports’,
’results’, ’returns’, ’rises’, ’rolls’, ’rules’,
’sanctions’, ’services’, ’sets’, ’shares’, ’shows’,
’snows’, ’speeds’, ’sports’, ’springs’, ’stakes’,
’stands’, ’states’, ’stems’, ’steps’, ’stops’,
’studies’, ’subjects’, ’supplies’, ’supports’,
’switches’, ’tastes’, ’tests’, ’times’, ’tops’,
’toys’, ’transfers’, ’travels’, ’trusts’, ’turns’,
’uses’, ’values’, ’views’, ’visits’, ’winds’,
’works’]
```

3. Identify three-word prepositional phrases of the form IN + DET + NN (eg. in the lab).

   Code:

```
def find_phrase():
   for tagged_sent in brown.tagged_sents():
      for (w1,t1), (w2,t2), (w3,t3) in
          nltk.trigrams(tagged_sent):
         if (t1==’IN’ and t2 == ’AT’ and t3==’NN’):
            print(w1, w2, w3)
```

   Output:

```
$python find_phrase.py
[for the moment
from the curio
by a hammer
in the subcontinent
by a fish
After a while
by the process
from the idol
without the threat
to a television
to the top
in an elevator
to the dozen
of a nemesis
on the street
of the hex
into a seat
across the aisle
...]
```

4. What is the ratio of masculine to feminine pronouns?

   Output:

```
$ python3 expanded_tagger.py
Masculine pronouns: 12816
Feminine pronouns: 4108
Ratio: 3.1197663096397275
```

   Code:

```
def gendered_tags():
   tagged_words =
      nltk.corpus.brown.tagged_words(tagset=’universal’)
   masculine_pronouns = [’his’, ’hisself’,
      ’him’,’hymselfe’, ’he’,
      ’himself’,"’im",’himselfe’, ’hym’]
   feminine_pronouns = [’herself’, ’her’,’hers’,’she’,]
```

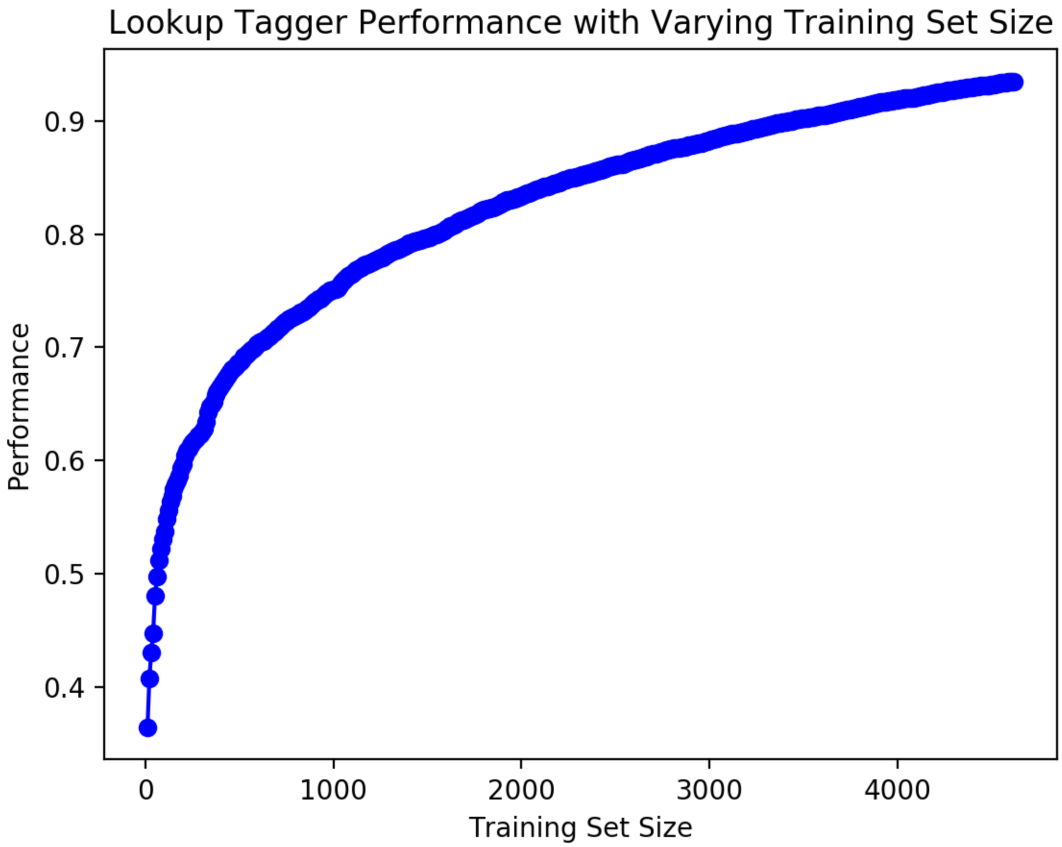
```
masculine_instances = 0
feminine_instances = 0

for tag_pair in tagged_words:
   if tag_pair[1] == 'PRON':
      if tag_pair[0].lower() in masculine_pronouns:
         masculine_instances += 1
      if tag_pair[0].lower() in feminine_pronouns:
         feminine_instances += 1

print("Masculine pronouns: %s" % masculine_instances)
print("Feminine pronouns: %s" % feminine_instances)
print("Ratio: %s" % (masculine_instances /
    feminine_instances))
```

Problem 26

4.1 plotted a curve showing change in the performance of a lookup tagger as the model size was increased. Plot the performance curve for a unigram tagger, as the amount of training data is varied.



.

Code:

```
def unigram_performance(cfd, set_size):
   brown_tagged_sents = brown.tagged_sents(categories='news')
   unigram_tagger =
       nltk.UnigramTagger(brown_tagged_sents[:set_size])
   return
       unigram_tagger.evaluate(brown.tagged_sents(categories='news'))

def display():
   import pylab
   cfd =
       nltk.ConditionalFreqDist(brown.tagged_words(categories='news'))
   set_sizes = list(range(10,
       len(brown.sents(categories='news')), 10))
```

```
    perfs = [unigram_performance(cfd, size) for size in
        set_sizes]
    pylab.plot(set_sizes, perfs, '-bo')

    pylab.title('Lookup Tagger Performance with Varying Training
        Set Size')
    pylab.xlabel('Training Set Size')
    pylab.ylabel('Performance')
    pylab.show()

display()
```