In [1]:

```
import nltk
import docx2txt
from nltk.chunk import *
from nltk.chunk.util import *
from nltk.chunk.regexp import *
```

In [2]:

```
lor_sample_1_text = docx2txt.process("LoR_Sample_1.docx")
lor_sample_2_text = docx2txt.process("LoR_Sample_2.docx")
```

In [3]:

```
print(lor_sample_1_text)
```

```
TO WHOMSOEVER IT MAY CONCERN



I am pleased to recommend MrXX for an MS in Computer Science at your esteeme
d university. I have known him since his second year. He was my student in t
he 3rd semester (2nd year), where I taught him the course of Database Manage
ment Systems.

I first got to know X in the course of Database Management Systems, CSE-200
4. In the first week of the course, I was surprised to know that X, an Elect
ronics and Instrumentation student, had taken up a computer science core cou
rse. Initially I was doubtful about a non-CS student’s approach and grasp of
the subject, but he adapted to it as naturally as a fish to water. By the ti
me the course came to an end, he had proved his mettle.

I observed that X had a keen interest and was fully involved in the course w
hen I saw his performances during the Lab sessions, where he would be able t
o grasp new concepts such as query formation and joins. He has been highly a
ctive in the technical scene of our college too with him organizing many eve
nts.

As a part of the course, students are required to develop a project, with a
fully functional Database System consisting of the concepts learnt throughou
t the semester. Despite X not being from a computer science background, his
project did not languish. He went above and beyond to make a professional da
tabase design, which included an ‘Auto-Increment’ feature using a PL/SQL seq
uence written by him, bulk insertion into the table and other features.

I was pleased to know that he applied the concepts in his internship extensi
vely to build a professional tool for Intellect Design Arena. He designed th
is tool to make the process of configuring a Logical Data Model easier and m
uch faster. It consisted of a User Interface (UI) that can replicate back-en
d tasks such as inserting data in a database at the click of a button. His t
ask was cut out for him as the tool was being built for J.P. Morgan Chase as
a client and hence there was no room for error. I am proud to say that the t
ool, which he built over a course of two months, was pushed to production at
the end of his internship.

X makes a strong candidate for your Master's program majoring in Computer Sc
ience. His proposed candidature has my endorsement without any reservations
whatsoever.
```

In [4]:

```
print(lor_sample_2_text)
```

```
LETTER OF RECOMMENDATION

I am happy to write this letter of recommendation for AAA who intends to pur
sue a Master's degree at your prestigious university. I have known him only
for the past year and it was easy to observe that he is a quick learner and
hardworking. I handled the course Natural Language Processing for him during
his sixth semester.

He has also displayed his dedication and willingness to learn on numerous oc
casions. On top of this, he is also very efficient in completing any task th
at is given to him, never one to complain irrespective of any circumstances.
I remember him submitting NLP weekly tasks well ahead of the specified time
period. Among the several tasks that were given from time to time, including
stop word removal, stemming, synsets, tweet tokenizer, working with porter s
temmer, snowball stemmer and lancaster stemmer, word lemmatizer, count vecto
rizer and cosine similarity, a few of them were quite challenging. One, in p
articular, training and testing gender-based feature sets which he had a lot
of trouble understanding. However, along with my help and a few of his frien
ds, he ultimately got the job done. Another quality that caught my attention
during my several interactions with him is that he is very percipient. He te
nds to relate everything that is taught in class to real-time situations. Th
ere was this one instance when the topic of n-gram linguistic models came u
p, he was very quick to point out that this forms the basis for numerous rea
l-world applications such as spell check and autocomplete. He is also a keen
observer often pointing out the mistakes even in his work.

During the time that I have known him, he had encountered various challenges
which he had addressed through his well-directed efforts. I also learnt that
he is capable of thinking out of the box as was the case when he started put
ting forth his ideas for his project. After quite a few briefings, he decide
d to choose the topic "Understanding word to vectors". He had initially cons
idered the TF-IDF scores concerning different input documents or statements,
after which he took the time to produce the word embeddings for each documen
t CBOW models.

Apart from his technical skills, his talent for writing and documentation we
re also quite evident when I had a look at his project report. The diversity
in his repertoire is what struck me the most. Hence, I believe that AAA has
the necessary set of skills and the perfect attitude to perform well in his
master’s programme. I am confident that he will become an important asset to
your university. I have no qualms or reservations in recommending him for ad
mission at your esteemed university. You may feel free to get in touch with
me regarding any queries with respect to his recommendation.
```

In [5]:

```
lor_1_tokens = nltk.word_tokenize(lor_sample_1_text)
lor_2_tokens = nltk.word_tokenize(lor_sample_2_text)
```

In [6]:

```
print(f"No of tokens in LoR 1: {len(lor_1_tokens)}")
print(f"No of tokens in LoR 2: {len(lor_2_tokens)}")
```

```
No of tokens in LoR 1: 446
No of tokens in LoR 2: 516
```

In [7]:

```
pos_tags_lor_1 = nltk.pos_tag(lor_1_tokens)
pos_tags_lor_2 = nltk.pos_tag(lor_2_tokens)
```

In [8]:

```
print(pos_tags_lor_1)
```

```
[('TO', 'TO'), ('WHOMSOEVER', 'VB'), ('IT', 'NNP'), ('MAY', 'NNP'), ('CONC
ERN', 'NNP'), ('I', 'PRP'), ('am', 'VBP'), ('pleased', 'JJ'), ('to', 'T
O'), ('recommend', 'VB'), ('MrXX', 'NNP'), ('for', 'IN'), ('an', 'DT'),
('MS', 'NNP'), ('in', 'IN'), ('Computer', 'NNP'), ('Science', 'NNP'), ('a
t', 'IN'), ('your', 'PRP$'), ('esteemed', 'JJ'), ('university', 'NN'),
('.', '.'), ('I', 'PRP'), ('have', 'VBP'), ('known', 'VBN'), ('him', 'PR
P'), ('since', 'IN'), ('his', 'PRP$'), ('second', 'JJ'), ('year', 'NN'),
('.', '.'), ('He', 'PRP'), ('was', 'VBD'), ('my', 'PRP$'), ('student', 'N
N'), ('in', 'IN'), ('the', 'DT'), ('3rd', 'CD'), ('semester', 'NN'), ('(',
'('), ('2nd', 'CD'), ('year', 'NN'), (')', ')'), (',', ','), ('where', 'WR
B'), ('I', 'PRP'), ('taught', 'VBD'), ('him', 'PRP'), ('the', 'DT'), ('cou
rse', 'NN'), ('of', 'IN'), ('Database', 'NNP'), ('Management', 'NNP'), ('S
ystems', 'NNPS'), ('.', '.'), ('I', 'PRP'), ('first', 'RB'), ('got', 'VB
D'), ('to', 'TO'), ('know', 'VB'), ('X', 'NNP'), ('in', 'IN'), ('the', 'D
T'), ('course', 'NN'), ('of', 'IN'), ('Database', 'NNP'), ('Management',
'NNP'), ('Systems', 'NNPS'), (',', ','), ('CSE-2004', 'NNP'), ('.', '.'),
('In', 'IN'), ('the', 'DT'), ('first', 'JJ'), ('week', 'NN'), ('of', 'I
N'), ('the', 'DT'), ('course', 'NN'), (',', ','), ('I', 'PRP'), ('was', 'V
BD'), ('surprised', 'VBN'), ('to', 'TO'), ('know', 'VB'), ('that', 'DT'),
```

In [9]:

```
chunk_rule = ChunkRule('<DT><NN.*><.*>*<NN.*>', 'chunk determiners and nouns')
chink_rule = ChinkRule('<VB.*>', 'chink verbs')

chunk_parser = RegexpChunkParser([chunk_rule, chink_rule],chunk_label='VP')
chunked_lor_1 = chunk_parser.parse(pos_tags_lor_1)
```

In [10]:

```
print(chunked_lor_1)
```

```
(S
  TO/TO
  WHOMSOEVER/VB
  IT/NNP
  MAY/NNP
  CONCERN/NNP
  I/PRP
  am/VBP
  pleased/JJ
  to/TO
  recommend/VB
  MrXX/NNP
  for/IN
  (VP
    an/DT
    MS/NNP
    in/IN
    Computer/NNP
    Science/NNP
    at/IN
    your/PRP$
    esteemed/JJ
    university/NN
    ./.
    I/PRP)
  have/VBP
  known/VBN
  (VP him/PRP since/IN his/PRP$ second/JJ year/NN ./. He/PRP)
  was/VBD
  (VP
    my/PRP$
    student/NN
    in/IN
    the/DT
    3rd/CD
    semester/NN
    (/(
    2nd/CD
    year/NN
    )/)
    ,/,
    where/WRB
    I/PRP)
  taught/VBD
  (VP
    him/PRP
    the/DT
    course/NN
    of/IN
    Database/NNP
    Management/NNP
    Systems/NNPS
    ./.
    I/PRP
    first/RB)
  got/VBD
  (VP to/TO)
```

```
know/VB
(VP
  X/NNP
  in/IN
  the/DT
  course/NN
  of/IN
  Database/NNP
  Management/NNP
  Systems/NNPS
  ,/,
  CSE-2004/NNP
  ./.
  In/IN
  the/DT
  first/JJ
  week/NN
  of/IN
  the/DT
  course/NN
  ,/,
  I/PRP)
was/VBD
surprised/VBN
(VP to/TO)
know/VB
(VP
  that/DT
  X/NNP
  ,/,
  an/DT
  Electronics/NNS
  and/CC
  Instrumentation/NNP
  student/NN
  ,/,)
had/VBD
taken/VBN
(VP
  up/RP
  a/DT
  computer/NN
  science/NN
  core/NN
  course/NN
  ./.
  Initially/NNP
  I/PRP)
was/VBD
(VP
  doubtful/JJ
  about/IN
  a/DT
  non-CS/JJ
  student/NN
  ’/NNP
  s/NN
  approach/NN
  and/CC
  grasp/NN
  of/IN
```

```
      the/DT
      subject/NN
      ,/,
      but/CC
      he/PRP)
    adapted/VBD
    (VP
      to/TO
      it/PRP
      as/RB
      naturally/RB
      as/IN
      a/DT
      fish/NN
      to/TO
      water/NN
      ./.
      By/IN
      the/DT
      time/NN
      the/DT
      course/NN)
    came/VBD
    (VP to/TO an/DT end/NN ,/, he/PRP)
    had/VBD
    proved/VBN
    (VP his/PRP$ mettle/NN ./. I/PRP)
    observed/VBD
    (VP that/IN X/NNP)
    had/VBD
    (VP a/DT keen/JJ interest/NN and/CC)
    was/VBD
    (VP fully/RB)
    involved/VBN
    (VP in/IN the/DT course/NN when/WRB I/PRP)
    saw/VBD
    (VP
      his/PRP$
      performances/NNS
      during/IN
      the/DT
      Lab/NNP
      sessions/NNS
      ,/,
      where/WRB
      he/PRP
      would/MD)
    be/VB
    (VP able/JJ to/TO)
    grasp/VB
    (VP
      new/JJ
      concepts/NNS
      such/JJ
      as/IN
      query/NN
      formation/NN
      and/CC
      joins/NNS
      ./.
      He/PRP)
```

```
    has/VBZ
    been/VBN
    (VP
      highly/RB
      active/JJ
      in/IN
      the/DT
      technical/JJ
      scene/NN
      of/IN
      our/PRP$
      college/NN
      too/RB
      with/IN
      him/PRP)
    organizing/VBG
    (VP
      many/JJ
      events/NNS
      ./.
      As/IN
      a/DT
      part/NN
      of/IN
      the/DT
      course/NN
      ,/,
      students/NNS)
    are/VBP
    required/VBN
    (VP to/TO)
    develop/VB
    (VP
      a/DT
      project/NN
      ,/,
      with/IN
      a/DT
      fully/RB
      functional/JJ
      Database/NNP
      System/NNP)
    consisting/VBG
    (VP of/IN the/DT concepts/NNS)
    learnt/VBP
    (VP throughout/IN the/DT semester/NN ./. Despite/IN X/NN not/RB)
    being/VBG
    (VP
      from/IN
      a/DT
      computer/NN
      science/NN
      background/NN
      ,/,
      his/PRP$
      project/NN)
    did/VBD
    (VP not/RB)
    languish/VB
    (VP ./. He/PRP)
    went/VBD
```

```
    (VP above/IN and/CC beyond/IN to/TO)
    make/VB
    (VP a/DT professional/JJ database/NN design/NN ,/, which/WDT)
    included/VBD
    (VP an/DT ‘/JJ Auto-Increment/JJ ’/NN feature/NN)
    using/VBG
    (VP a/DT PL/SQL/NNP sequence/NN)
    written/VBN
    (VP
      by/IN
      him/PRP
      ,/,
      bulk/NN
      insertion/NN
      into/IN
      the/DT
      table/NN
      and/CC
      other/JJ
      features/NNS
      ./.
      I/PRP)
    was/VBD
    (VP pleased/JJ to/TO)
    know/VB
    (VP that/IN he/PRP)
    applied/VBD
    (VP
      the/DT
      concepts/NNS
      in/IN
      his/PRP$
      internship/NN
      extensively/RB
      to/TO)
    build/VB
    (VP
      a/DT
      professional/JJ
      tool/NN
      for/IN
      Intellect/NNP
      Design/NNP
      Arena/NNP
      ./.
      He/PRP)
    designed/VBD
    (VP this/DT tool/NN to/TO)
    make/VB
    (VP the/DT process/NN of/IN)
    configuring/VBG
    (VP
      a/DT
      Logical/NNP
      Data/NNP
      Model/NNP
      easier/JJR
      and/CC
      much/JJ
      faster/JJR
      ./.
```

```
      It/PRP)
    consisted/VBD
    (VP
      of/IN
      a/DT
      User/NNP
      Interface/NNP
      (/(
      UI/NNP
      )/)
      that/WDT
      can/MD)
    replicate/VB
    (VP back-end/JJ tasks/NNS such/JJ as/IN)
    inserting/VBG
    (VP
      data/NNS
      in/IN
      a/DT
      database/NN
      at/IN
      the/DT
      click/NN
      of/IN
      a/DT
      button/NN
      ./.
      His/PRP$
      task/NN)
    was/VBD
    cut/VBN
    (VP out/RP for/IN him/PRP as/IN the/DT tool/NN)
    was/VBD
    being/VBG
    built/VBN
    (VP
      for/IN
      J.P./NNP
      Morgan/NNP
      Chase/NNP
      as/IN
      a/DT
      client/NN
      and/CC
      hence/NN
      there/EX)
    was/VBD
    (VP no/DT room/NN for/IN error/NN ./. I/PRP)
    am/VBP
    (VP proud/JJ to/TO)
    say/VB
    (VP that/IN the/DT tool/NN ,/, which/WDT he/PRP)
    built/VBD
    (VP over/RP a/DT course/NN of/IN two/CD months/NNS ,/,)
    was/VBD
    pushed/VBN
    (VP
      to/TO
      production/NN
      at/IN
      the/DT
```

```
    end/NN
    of/IN
    his/PRP$
    internship/NN
    ./.
    X/NNP)
  makes/VBZ
  (VP
    a/DT
    strong/JJ
    candidate/NN
    for/IN
    your/PRP$
    Master/NNP
    's/POS
    program/NN
    majoring/NN
    in/IN
    Computer/NNP
    Science/NNP
    ./.
    His/PRP$)
  proposed/VBN
  (VP candidature/NN)
  has/VBZ
  (VP
    my/PRP$
    endorsement/NN
    without/IN
    any/DT
    reservations/NNS
    whatsoever/NN)
  ./.)
```

In [11]:

```
chunked_lor_1.draw()
```

In [12]:

```
ner_lor_1 = nltk.ne_chunk(pos_tags_lor_1)
print(ner_lor_1)
```

```
  in/IN
  (ORGANIZATION Computer/NNP Science/NNP)
  at/IN
  your/PRP$
  esteemed/JJ
  university/NN
  ./.
  I/PRP
  have/VBP
  known/VBN
  him/PRP
  since/IN
  his/PRP$
  second/JJ
  year/NN
  ./.
  He/PRP
  was/VBD
  my/PRP$
  student/NN
```

In [13]:

```
ner_lor_1.draw()
```

In [14]:

```
chunk_rule = ChunkRule("<DT>?<JJ>*<NN>?", "Chunk Noun Phrases")

chink_rule = ChinkRule("<CC|IN|TO|\.>", "Chink on TO/prepositions")

chunk_parser = RegexpChunkParser([chunk_rule, chink_rule],chunk_label='NP')
chunked_lor_2 = chunk_parser.parse(pos_tags_lor_2)
```

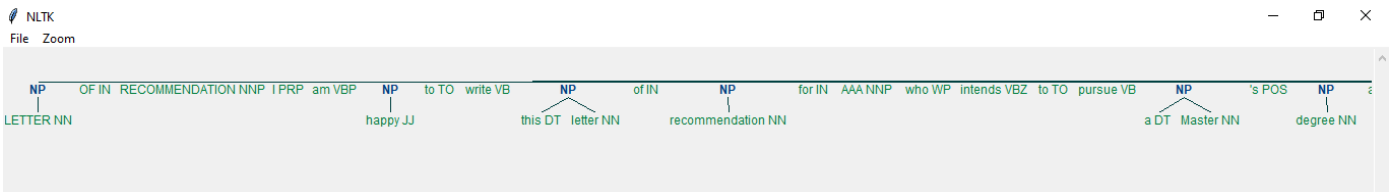
In [15]:

```
print(chunked_lor_2)
```

```
  he/PRP
  is/VBZ
  also/RB
  very/RB
  (NP efficient/JJ)
  in/IN
  completing/VBG
  (NP any/DT task/NN)
  that/WDT
  is/VBZ
  given/VBN
  to/TO
  him/PRP
  ,/,
  never/RB
  one/CD
  to/TO
  complain/VB
  (NP irrespective/JJ)
  of/IN
```

In [16]:

```
chunked_lor_2.draw()
```



In [17]:

```
ner_lor_2 = nltk.ne_chunk(pos_tags_lor_2)
print(ner_lor_2)
```

```
  this/DT
  letter/NN
  of/IN
  recommendation/NN
  for/IN
  AAA/NNP
  who/WP
  intends/VBZ
  to/TO
  pursue/VB
  a/DT
  Master/NN
  's/POS
  degree/NN
  at/IN
  your/PRP$
  prestigious/JJ
  university/NN
  ./.
  I/PRP
```

In [18]:

```
ner_lor_2.draw()
```