Word2Vec 实例

罗瀚

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Word2Vec

- Word to vector 也就是词汇转化成向量
- 将词汇映射至一个 连续的k维向量空间中，向量空间上的相似度可以用来表达文本语义上的相似度
- NLP：聚类、找同义词、词性分析等等

TensorFlow

- 谷歌基于DistBelief进行研发的第二代人工智能学习系统， TensorFlow是将复杂 的数据结构传输至人工智能神经网中进行分析和处理过程的系统。
- 安装：

  Windows:　　window64位

  Python3.5(只能是3.5)

  cuda8.0

  （可以直接安装 Python 3.5 from Anaconda，然后用pip 来安装TensorFlow）

  Linux:

  用pip来安装即可，对python 的版本也很友好

1.Salsalate

- 从NCBI中搜索salsalate并下载了225篇文献的摘要+上次课的salsalate的文本总大小145KB.

```
def read_file(filename):
    file_read = open(filename,'r').read()
    word_=re.sub("[^a-zA-Z]+", " ",file_read).lower()
    words=list(word_.split())
    return words

path='/data1/gzhang/hluo/'
file_='Clean_result2.txt'
filename=path+file_

words = read_file(filename)
```

最后得到词的总数

```
In [14]: len(words)
Out[14]: 20762
```

- 从函数build_dataset()中给words中出现过的单词做频数统计，取vocavulary_size-1的放入字典

```
def build_dataset(words):
  count = [['UNK', -1]]
  count.extend(collections.Counter(words).most_common(vocabulary_size - 1))
  dictionary = dict()
  for word, _ in count:
    dictionary[word] = len(dictionary)
  data = list()
  unk_count = 0
  for word in words:
    if word in dictionary:
      index = dictionary[word]
    else:
      index = 0
      unk_count += 1
    data.append(index)
  count[0][1] = unk_count
  reverse_dictionary = dict(zip(dictionary.values(), dictionary.keys()))
  return data, count, dictionary, reverse_dictionary

data, count, dictionary, reverse_dictionary = build_dataset(words)
```

- 从generate_batch()函数中使用skip-Gram模式来生成Word2vec训练样本

```
def generate_batch(batch_size, num_skips, skip_window):
  global data_index
  assert batch_size % num_skips == 0
  assert num_skips <= 2 * skip_window
  batch = np.ndarray(shape=(batch_size), dtype=np.int32)
  labels = np.ndarray(shape=(batch_size, 1), dtype=np.int32)
  span = 2 * skip_window + 1 # [ skip_window target skip_window ]
  buffer = collections.deque(maxlen=span)
  for _ in range(span):
    buffer.append(data[data_index])
    data_index = (data_index + 1) % len(data)
  for i in range(batch_size // num_skips):
    target = skip_window  # target label at the center of the buffer
    targets_to_avoid = [ skip_window ]
    for j in range(num_skips):
      while target in targets_to_avoid:
        target = random.randint(0, span - 1)
      targets_to_avoid.append(target)
      batch[i * num_skips + j] = buffer[skip_window]
      labels[i * num_skips + j, 0] = buffer[target]
    buffer.append(data[data_index])
    data_index = (data_index + 1) % len(data)
  return batch, labels

batch, labels = generate_batch(batch_size=8, num_skips=2, skip_window=1)
```

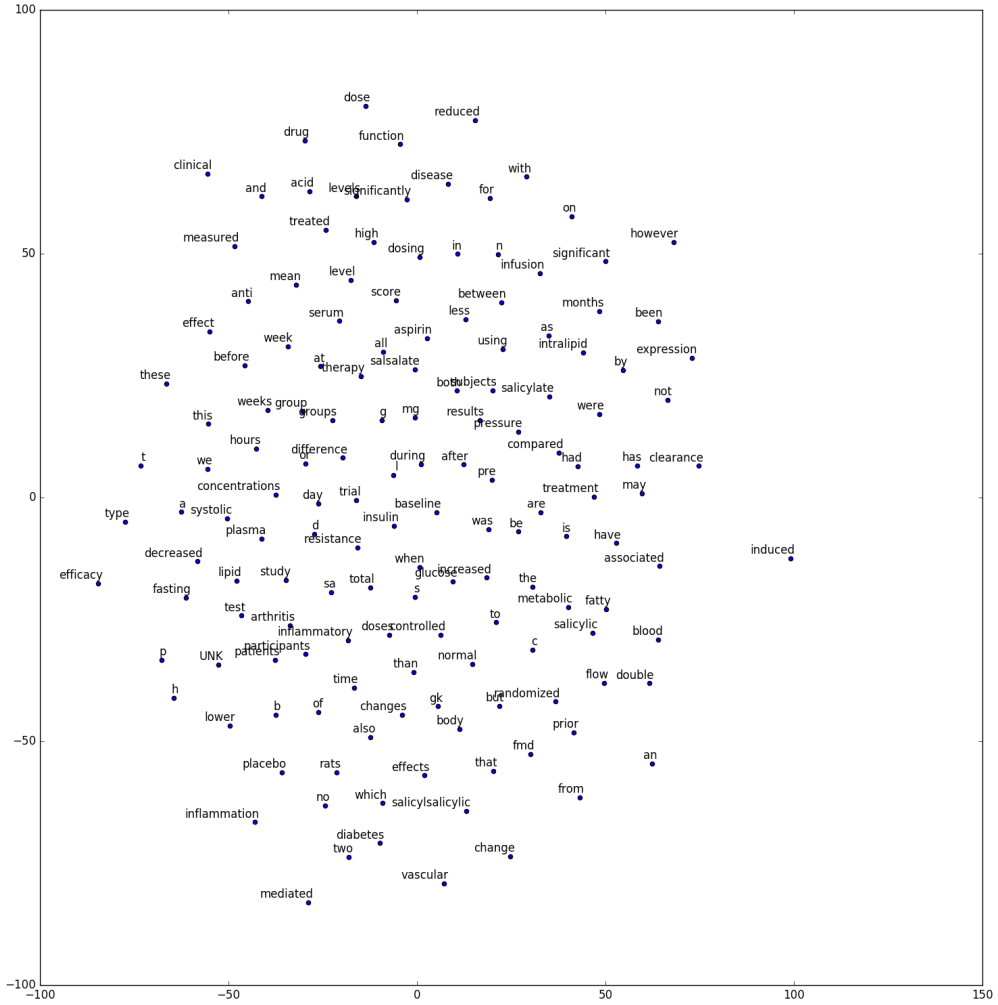
batch_size:每个批次训练的样本数
Num_skips:为每个单词生成多少个样本
skip_window:单词最远可以联系的距离

- 然后是训练的过程（代码略）,num_step 由101改为100001最后返回的final_embeddings表示的是词向量的字典

- 可视化。Plot_with_labels()
- Tsne降维：将原始的嵌入向量降到2维

```
from sklearn.manifold import TSNE
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt
tsne = TSNE(perplexity=30, n_components=2, init='pca', n_iter=5000)
#plot_only = 250
#low_dim_embs = tsne.fit_transform(final_embeddings[:plot_only, :])
#labels = [reverse_dictionary[i] for i in xrange(plot_only)]
#plot_with_labels(low_dim_embs, labels)
w=['salsalate','cuff','hours','blood','patients','medical','insulin','anemia']
i=0
ws= [[0] * 50] * 8
for j in w:
    #ws[i].append(final_embeddings[dictionary[j]])
    ws[i] = final_embeddings[dictionary[j]]
    i=i+1
low_dim_embs = tsne.fit_transform(ws)
labels=w
plot_with_labels(low_dim_embs, labels)
```

Result: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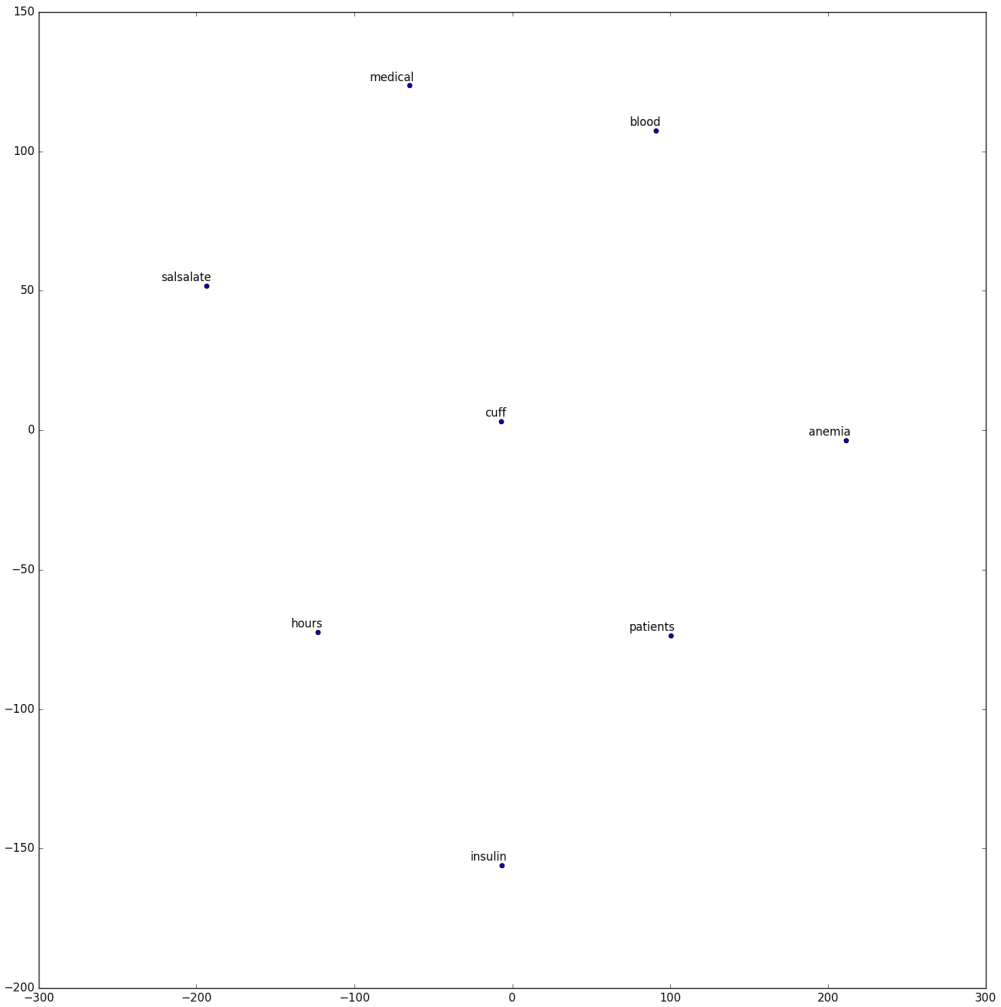

Cuff:袖口状白血球聚集

Insulin:胰岛素，文章一般和resistance一起表示抗胰岛性

Anemia:贫血症

哈利波特：

- 文本大小：6.2MB　　Words:1122750

- 来源于：

https://github.com/LouisScorpio/datamining/blob/master/tensorflow-program/nlp/word2vec/code/word2vec_harrypotter.py

- Windows: python 3.5; tensorflow-0.12.1;num_step:1000001