

Notebook

February 25, 2019

```
In [1]: # import modules & set up logging
import gensim, logging
import smart_open, os
logging.basicConfig(format='%(asctime)s : %(levelname)s : %(message)s', level=logging.DEBUG)
import datetime
import pandas as pd
import multiprocessing

# fichier incltu dans le projet
import save_notebook
```

D:\Outil\Anaconda\envs\majeure-ml-env\lib\site-packages\gensim\utils.py:1197: UserWarning: detected Windows; aliasing chunkize to chunkize_serial)

1 D  claration donn  es

```
In [2]: now = str(datetime.datetime.now()).replace(" ", "")
```

```
In [3]: word_embedding = "word2vec"
```

2 Prepare data

```
In [4]: filenames = os.listdir("../wikipedia/data")
```

```
In [ ]: #Cr       un fichier ou chaque ligne continent tout un fichier
# path="../wikipedia/data"
path="../wikipedia/data/"
with open('../data/wikipedia_informatic.txt', 'w+', encoding="utf8" ) as out_file:

    for fname in filenames:
#         print(fname)
        if "ipynb_checkpoints" in fname:
            continue
        try:
            with open(path + fname, encoding="utf8") as in_file:
                out_file.write(in_file.read().replace("\n",""))
```

```

        except:
            continue

In [ ]: # On lit et on tokenize le fichier
        with open('./data/wikipedia_informatic.txt', 'r', encoding="utf8") as f:
            wiki_vocab = f.readlines()
            wiki_vocab = [x.strip() for x in wiki_vocab]

            wiki_vocab_tokenized = []
            # for line in wiki_vocab:
            #     print(gensim.utils.simple_preprocess(line))
            # wiki_vocab_tokenized.append(gensim.utils.simple_preprocess(str(wiki_vocab)))

In [ ]: wiki_vocab_tokenized = gensim.utils.simple_preprocess(str(wiki_vocab))

```

3 Create model

```

In [ ]: # build vocabulary and train model
        model = gensim.models.Word2Vec(
            [wiki_vocab_tokenized],
            size=150,
            seed=1234,
            window=10,
            min_count=2,
            workers=multiprocessing.cpu_count())

        date_before_learning = datetime.datetime.now()
        model.train([wiki_vocab_tokenized], total_examples=len(wiki_vocab_tokenized), epochs=20)
        time_training = datetime.datetime.now() - date_before_learning

2019-02-25 20:36:48,977 : WARNING : consider setting layer size to a multiple of 4 for greater
2019-02-25 20:36:48,978 : INFO : collecting all words and their counts
2019-02-25 20:36:48,979 : INFO : PROGRESS: at sentence #0, processed 0 words, keeping 0 word types
2019-02-25 20:36:50,892 : INFO : collected 165126 word types from a corpus of 7408802 raw words
2019-02-25 20:36:50,894 : INFO : Loading a fresh vocabulary
2019-02-25 20:36:51,530 : INFO : min_count=2 retains 76249 unique words (46% of original 165126)
2019-02-25 20:36:51,532 : INFO : min_count=2 leaves 7319925 word corpus (98% of original 7408802)
2019-02-25 20:36:51,849 : INFO : deleting the raw counts dictionary of 165126 items
2019-02-25 20:36:51,854 : INFO : sample=0.001 downsamples 28 most-common words
2019-02-25 20:36:51,855 : INFO : downsampling leaves estimated 5638049 word corpus (77.0% of previous)
2019-02-25 20:36:52,178 : INFO : estimated required memory for 76249 words and 150 dimensions: 1.8 MB
2019-02-25 20:36:52,179 : INFO : resetting layer weights
2019-02-25 20:36:53,673 : INFO : training model with 4 workers on 76249 vocabulary and 150 features
2019-02-25 20:36:53,685 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,687 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,690 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,730 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,731 : INFO : EPOCH - 1 : training on 7408802 raw words (10000 effective words)

```

```

2019-02-25 20:36:53,741 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,742 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,743 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,778 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,779 : INFO : EPOCH - 2 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:53,788 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,789 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,792 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,824 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,826 : INFO : EPOCH - 3 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:53,835 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,836 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,837 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,869 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,870 : INFO : EPOCH - 4 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:53,878 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,880 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,880 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,912 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,913 : INFO : EPOCH - 5 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:53,913 : INFO : training on a 37044010 raw words (50000 effective words) took
2019-02-25 20:36:53,914 : WARNING : under 10 jobs per worker: consider setting a smaller `batch`
2019-02-25 20:36:53,915 : WARNING : Effective 'alpha' higher than previous training cycles
2019-02-25 20:36:53,916 : INFO : training model with 4 workers on 76249 vocabulary and 150 features
2019-02-25 20:36:53,932 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,933 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,934 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:53,964 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:53,965 : INFO : EPOCH - 1 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:53,966 : WARNING : EPOCH - 1 : supplied example count (1) did not equal expected
2019-02-25 20:36:53,975 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:53,976 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:53,978 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:54,007 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:54,008 : INFO : EPOCH - 2 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:54,009 : WARNING : EPOCH - 2 : supplied example count (1) did not equal expected
2019-02-25 20:36:54,020 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:54,024 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:54,026 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:54,055 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:54,056 : INFO : EPOCH - 3 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:54,057 : WARNING : EPOCH - 3 : supplied example count (1) did not equal expected
2019-02-25 20:36:54,069 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:36:54,072 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:36:54,073 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:36:54,104 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:36:54,105 : INFO : EPOCH - 4 : training on 7408802 raw words (10000 effective words)
2019-02-25 20:36:54,106 : WARNING : EPOCH - 4 : supplied example count (1) did not equal expected

```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

2019-02-25 20:37:40,819 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:40,820 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:40,821 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:40,851 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:40,852 : INFO : EPOCH - 1069 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:40,853 : WARNING : EPOCH - 1069 : supplied example count (1) did not equal exp
2019-02-25 20:37:40,864 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:40,866 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:40,867 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:40,896 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:40,897 : INFO : EPOCH - 1070 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:40,898 : WARNING : EPOCH - 1070 : supplied example count (1) did not equal exp
2019-02-25 20:37:40,906 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:40,908 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:40,908 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:40,938 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:40,938 : INFO : EPOCH - 1071 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:40,939 : WARNING : EPOCH - 1071 : supplied example count (1) did not equal exp
2019-02-25 20:37:40,950 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:40,951 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:40,952 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:40,981 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:40,982 : INFO : EPOCH - 1072 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:40,983 : WARNING : EPOCH - 1072 : supplied example count (1) did not equal exp
2019-02-25 20:37:40,991 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:40,992 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:40,998 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:41,025 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:41,027 : INFO : EPOCH - 1073 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:41,028 : WARNING : EPOCH - 1073 : supplied example count (1) did not equal exp
2019-02-25 20:37:41,039 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:41,040 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:41,041 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:41,070 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:41,071 : INFO : EPOCH - 1074 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:41,071 : WARNING : EPOCH - 1074 : supplied example count (1) did not equal exp
2019-02-25 20:37:41,086 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:41,087 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:41,088 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:41,118 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:41,119 : INFO : EPOCH - 1075 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:41,120 : WARNING : EPOCH - 1075 : supplied example count (1) did not equal exp
2019-02-25 20:37:41,129 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:41,133 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:41,134 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:41,161 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:41,162 : INFO : EPOCH - 1076 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:41,163 : WARNING : EPOCH - 1076 : supplied example count (1) did not equal exp

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

2019-02-25 20:37:52,819 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:52,820 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:52,821 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:52,853 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:52,854 : INFO : EPOCH - 1333 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:52,855 : WARNING : EPOCH - 1333 : supplied example count (1) did not equal exp
2019-02-25 20:37:52,866 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:52,867 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:52,868 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:52,899 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:52,900 : INFO : EPOCH - 1334 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:52,900 : WARNING : EPOCH - 1334 : supplied example count (1) did not equal exp
2019-02-25 20:37:52,911 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:52,912 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:52,914 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:52,944 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:52,944 : INFO : EPOCH - 1335 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:52,945 : WARNING : EPOCH - 1335 : supplied example count (1) did not equal exp
2019-02-25 20:37:52,955 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:52,962 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:52,965 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:52,986 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:52,987 : INFO : EPOCH - 1336 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:52,987 : WARNING : EPOCH - 1336 : supplied example count (1) did not equal exp
2019-02-25 20:37:52,998 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:52,999 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:53,000 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:53,033 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:53,035 : INFO : EPOCH - 1337 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:53,036 : WARNING : EPOCH - 1337 : supplied example count (1) did not equal exp
2019-02-25 20:37:53,051 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:53,053 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:53,054 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:53,085 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:53,085 : INFO : EPOCH - 1338 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:53,086 : WARNING : EPOCH - 1338 : supplied example count (1) did not equal exp
2019-02-25 20:37:53,097 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:53,098 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:53,099 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:53,128 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:53,130 : INFO : EPOCH - 1339 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:53,131 : WARNING : EPOCH - 1339 : supplied example count (1) did not equal exp
2019-02-25 20:37:53,139 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:53,140 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:53,145 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:53,170 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:53,171 : INFO : EPOCH - 1340 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:53,171 : WARNING : EPOCH - 1340 : supplied example count (1) did not equal exp

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```

2019-02-25 20:37:56,384 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:56,385 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:56,386 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:56,415 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:56,416 : INFO : EPOCH - 1413 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:56,417 : WARNING : EPOCH - 1413 : supplied example count (1) did not equal exp
2019-02-25 20:37:56,426 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:56,429 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:56,430 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:56,460 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:56,461 : INFO : EPOCH - 1414 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:56,462 : WARNING : EPOCH - 1414 : supplied example count (1) did not equal exp
2019-02-25 20:37:56,470 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:56,471 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:56,472 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:56,502 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:56,503 : INFO : EPOCH - 1415 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:56,505 : WARNING : EPOCH - 1415 : supplied example count (1) did not equal exp
2019-02-25 20:37:56,518 : INFO : worker thread finished; awaiting finish of 3 more threads
2019-02-25 20:37:56,519 : INFO : worker thread finished; awaiting finish of 2 more threads
2019-02-25 20:37:56,520 : INFO : worker thread finished; awaiting finish of 1 more threads
2019-02-25 20:37:56,551 : INFO : worker thread finished; awaiting finish of 0 more threads
2019-02-25 20:37:56,552 : INFO : EPOCH - 1416 : training on 7408802 raw words (10000 effective
2019-02-25 20:37:56,552 : WARNING : EPOCH - 1416 : supplied example count (1) did not equal exp
2019-02-25 20:37:56,562 : INFO : worker thread finished; awaiting finish of 3 more threads

```

```
In [ ]: model.save(str("model/" + now.replace(".", "-").replace(":", "-") + ".model"))
```

4 Test

```
In [ ]: result = model.wv.most_similar(positive="microsoft",topn=10)
```

```
In [ ]: print(result)
```

5 Save

```
In [ ]: import save_notebook
```

```
In [ ]: name_notebook_exported = save_notebook.save_notebook("word2vec_with_gensim.ipynb")
```

```
In [ ]: def write_result(word_embedding, time_training,name_notebook_exported, fname ):
    if not os.path.isfile(fname):
        f=open(fname, "a+")
        f.write("Nombre de mots;Model de word embedding;temps d'apprentissage;Notebook")
        f.close
    f=open(fname, "a+")
```

```
f.write("\n" + str( str(len(wiki_vocab_tokenized)) + ";" + word_embedding + ";" + str(wiki_vocab_tokenized)))  
f.close
```

```
In [ ]: write_result(word_embedding, time_training,name_notebook_exported, "resultats.csv" )
```