Master Informatique, parcours MALIA & MIASHS

Carnets de note Python pour le cours de Network Analysis for Information Retrieval

Julien Velcin, laboratoire ERIC, Université Lyon 2

Visualisation (partie 1)

In [1]:
```
import os
import numpy as np

with open(os.path.join("datasets", "Frank Herbert - Dune.txt")) as f:
    lines = [line.strip() for line in f.readlines()]
```

nuage de mots

In [3]:
```
from sklearn.feature_extraction.text import CountVectorizer

vectorizer = CountVectorizer(stop_words="english")
vectorizer.fit(lines)
X = vectorizer.transform(lines)
X = X.toarray()
features = vectorizer.get_feature_names_out()

(num_doc, num_f) = X.shape
```

In [4]:
```
# les "labels" du nuage sont les mots
cloud_labels = features
# les poids correspondent à la somme des TF selon les lignes de la matrice
cloud_weights = np.sum(X, axis=0)
# on construit un dictionnaire qui associe chaque label (mot) au poids correspondan
dictionary = dict(zip(cloud_labels, cloud_weights)) # zip "colle" le vecteur des la
# on trie par ordre décroissant
sorted_by_value = sorted(dictionary.items(), key=lambda kv: kv[1], reverse=True)

print(sorted_by_value[0:50])
```

```
[('said', 2271), ('paul', 1722), ('jessica', 901), ('thought', 620), ('baron', 593),
('duke', 576), ('man', 516), ('fremen', 514), ('hawat', 429), ('ll', 422), ('ve', 41
8), ('mother', 406), ('stilgar', 401), ('asked', 376), ('water', 374), ('kynes', 36
5), ('know', 363), ('gurney', 348), ('way', 347), ('eyes', 341), ('saw', 341), ('lik
e', 336), ('hand', 333), ('arrakis', 329), ('voice', 322), ('time', 321), ('sand', 3
02), ('men', 301), ('emperor', 275), ('looked', 274), ('face', 264), ('old', 260),
('chani', 259), ('felt', 255), ('turned', 251), ('desert', 234), ('father', 234),
('feyd', 232), ('people', 231), ('spice', 230), ('leto', 227), ('came', 223), ('plac
e', 212), ('thing', 211), ('halleck', 210), ('away', 209), ('harkonnen', 205), ('rau
tha', 202), ('dib', 200), ('muad', 200)]
```

In [7]:
```python
from wordcloud import WordCloud

limit = 50
fontcolor='#fafafa'
bgcolor = '#000000'

wordcloud = WordCloud(
    max_words=limit,
    background_color=bgcolor,
).fit_words(dictionary) # cette fois, on donne au générateur le dictionnaire constr
```

In [8]:
```python
import random
import matplotlib.pyplot as plt

fig = plt.figure()
fig.set_figwidth(14)
fig.set_figheight(18)

title = "Nuage de mots pour Dune"

plt.imshow(wordcloud)
plt.axis('off')
plt.show()
```

étude des co-occurrences

Il s'agit à présent d'étudier la co-occurrences de mots (sont-ils souvent employés ensemble ?).

Pour commencer, on va réduire la taille du vocabulaire pour ne garder que les mots les plus employés.

In [9]:
```
t_freq = np.where(cloud_weights>20)
index = t_freq[0]
X_small = X[:,index]
features_small = np.array(features)[index]
print(X_small.shape)

(_,num_f_small) = X_small.shape

print("Nombre de colonnes = mots : " + str(num_f_small))
```

```
(8608, 845)
Nombre de colonnes = mots : 845
```

In [10]:
```
np.array(features)[index][0:50]
```

Out[10]:
```
array(['10', 'accept', 'accepted', 'action', 'agreed', 'ah', 'ahead',
       'air', 'al', 'alia', 'alive', 'ancient', 'anger', 'angry',
       'animal', 'answer', 'appear', 'appeared', 'area', 'arena', 'arm',
       'arms', 'arrakeen', 'arrakis', 'aside', 'ask', 'asked', 'atreides',
       'attack', 'attention', 'aware', 'awareness', 'away', 'bad',
       'baliset', 'banker', 'barked', 'baron', 'barrier', 'basin',
       'battle', 'bed', 'began', 'begin', 'beginning', 'believe', 'bene',
       'beneath', 'bent', 'best'], dtype=object)
```

Une manière "simple" consiste à multiplier la matrice de données par elle-même, ce qui revient à estimer une similarité entre les mots.

In [11]:
```
co_occ = np.matmul(X_small.transpose(), X_small)
```

In [12]:
```
id_mot = np.where(features_small == "dune")[0][0]
scores_coocc = co_occ[id_mot,:]
dico_co_occ = dict(zip(features_small, scores_coocc))
mots_coocc = sorted(dico_co_occ.items(), key=lambda kv: kv[1], reverse=True)
print(mots_coocc[0:20])
```

```
[('dune', 60), ('sand', 17), ('paul', 14), ('man', 12), ('said', 11), ('arrakis',
9), ('face', 8), ('like', 8), ('planet', 8), ('came', 7), ('stilgar', 7), ('water',
6), ('wing', 6), ('desert', 5), ('fremen', 5), ('horizon', 5), ('just', 5), ('men',
5), ('open', 5), ('surface', 5)]
```

Ensuite, pour les besoins de la visualisation on a besoin de créer trois listes :

- (mot_1, mot_1, mot_2, mot_3...) : liste des mots "sources"
- (mot_2, mot_7, mot_7, mot_1...) : liste des mots "cibles
- (co_{1_2}, co_{1_7}, co_{2_7}, co_{3_1}...) : score de co-occurrence entre mots "sources" et "cible"

In [13]:
```
sources = []
targets = []
weights = []
for i in range(num_f_small):
    for j in range(num_f_small):
        if ((i != j) & (co_occ[i, j] > 30)):
                sources = sources + [features_small[i]]
                targets = targets + [features_small[j]]
                weights = weights + [float(co_occ[i, j])]
                # float tranforme la valeur de co-occurrence en un nombre réel
                # (nécessaire sous certains environnements)
```

In [14]:
```
import pandas as pd
# on crée des séries de données au format "pandas"
sources = pd.Series(sources)
targets = pd.Series(targets)
weights = pd.Series(weights)
```

La visualisation choisie utilise la librarie "Network" permettant de visualiser des graphes.

In [16]:
```
# cf. https://pyvis.readthedocs.io/en/latest/tutorial.html#networkx-integration

from pyvis.network import Network

net = Network(height="400px", width="100%", bgcolor="#222222", font_color="white")

# set the physics layout of the network
net.barnes_hut()

edge_data = zip(sources, targets, weights)

for e in edge_data:
    src = e[0]
    dst = e[1]
    w = e[2]
    net.add_node(src, src, title=src)
    net.add_node(dst, dst, title=dst)
    net.add_edge(src, dst, value=w)

neighbor_map = net.get_adj_list()

# add neighbor data to node hover data
for node in net.nodes:
    node["title"] += " Neighbors:<br>" + "<br>".join(neighbor_map[node["id"]])
    node["value"] = len(neighbor_map[node["id"]])

net.show_buttons(filter_=['physics'])

net.show("co-occurrences.html")
```

```
Warning: When  cdn_resources is 'local' jupyter notebook has issues displaying gra
ics on chrome/safari. Use cdn_resources='in_line' or cdn_resources='remote' if you h
ave issues viewing graphics in a notebook.
co-occurrences.html
```

Out[16]:

404

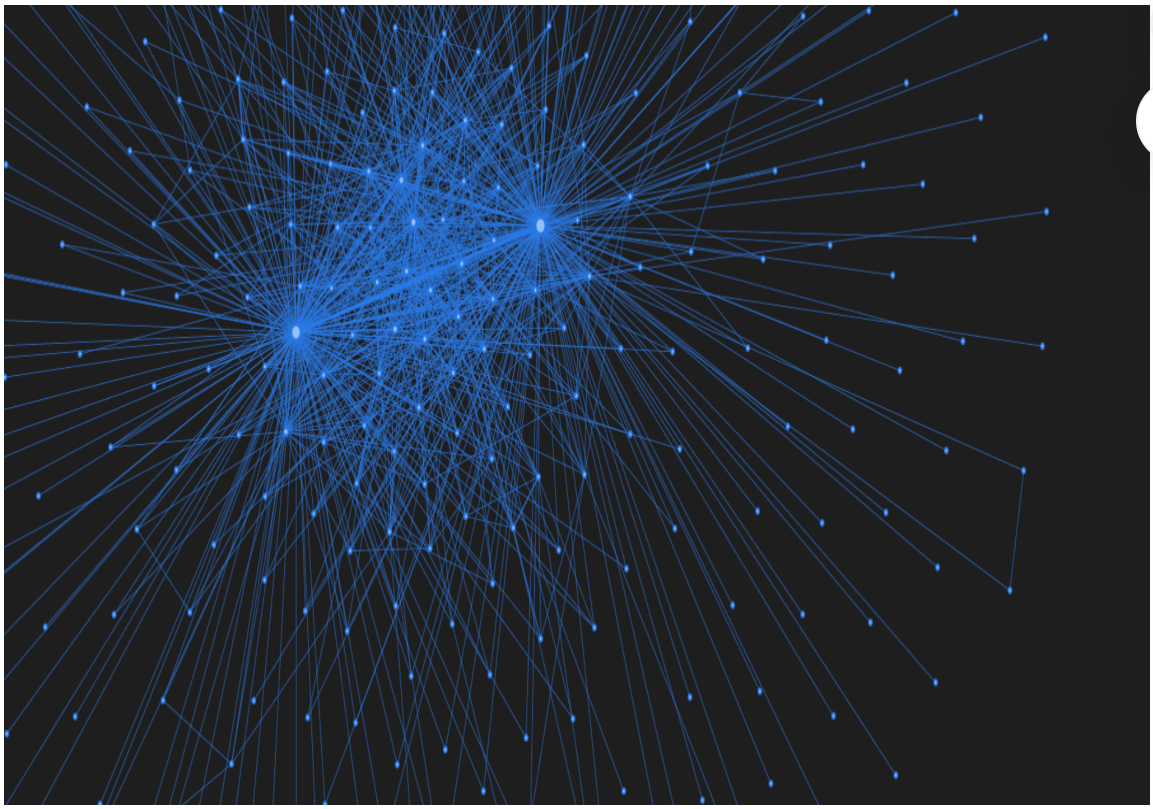
File not found

The site configured at this address does not contain the requested file.

If this is your site, make sure that the filename case matches the URL as well as any file permissions.
For root URLs (like `http://example.com/`) you must provide an `index.html` file.

Read the full documentation for more information about using **GitHub Pages**.

GitHub Status — @githubstatus



In [ ]: