222112058_Feza Raffa Arnanda_Penugasan 7

October 10, 2023

[ ]:
```
path = "C:/Users/FEZA/My Drive/00. Drive PC/1.STIS/5. Semester 5/Information␣
↪Retrieval [IR] P/berita"
```

Casefolding

[ ]:
```
def case_folding(text):
    text = text.lower()
    return text
```

Tokenisasi

[ ]:
```
import nltk
# nltk.download('punkt') # Download data yang diperlukan untuk tokenisasi
from nltk.tokenize import word_tokenize
def tokenisasi(text):
    tokens = word_tokenize(text)
    return tokens
```

Eliminasi Stopword

[ ]:
```
from nltk.corpus import stopwords
stop_words = set(stopwords.words('Indonesian'))
```

[ ]:
```
def eliminasi_stopword(token):
    return [kata for kata in token if kata not in stop_words]
```

Stemming

[ ]:
```
from Sastrawi.Stemmer.StemmerFactory import StemmerFactory
def stemming_sastrawi(tokens):
    # Membuat stemmer
    factory = StemmerFactory()
    stemmer = factory.create_stemmer()
    return [stemmer.stem(token) for token in tokens]
```

[ ]:
```
import re
import os
inverted_index = {}
doc_dict = {}
i = 1
```

```
for filename in os.listdir(path):
    if (filename.endswith('.txt')):
        file_path = os.path.join(path, filename)
        # Ekstrak angka dari nama file menggunakan regular expressions
        match = re.search(r'\d+', filename)
        if match:
            doc_id = match.group() # Mengambil angka dari nama file sebagai␣
 ↪dokumen ID
            with open (file_path, mode='r', encoding='utf-8') as file:
                text = file.read()
                hasil_case_folding = case_folding(text)
                token = tokenisasi(hasil_case_folding)
                token_bersih = eliminasi_stopword(token)
                stemm_token = stemming_sastrawi(token_bersih)
                stemm_token_final = [item for item in stemm_token if item !=␣
 ↪''] # membersihkan term kosong pada hasil stemming sebelumnya
                # Menggabungkan hasil stemming menjadi sebuah teks/paragraf
                doc_dict[doc_id] = ' '.join(stemm_token_final)
                for term in set(stemm_token_final): # penggunaan set untuk␣
 ↪mengantisipasi duplikasi term pada sebuah dokumen
                    if term in inverted_index:
                        inverted_index[term].append(doc_id)
                    else:
                        inverted_index[term] = [doc_id]
```

[ ]:
```
inverted_index
```

[ ]:
```
{'cek': ['1'],
 'siti': ['1'],
 'signifikan': ['1', '4'],
 'hijau': ['1'],
 'giat': ['1'],
 '24': ['1'],
 'tular': ['1'],
 'desember': ['1'],
 'dr': ['1', '5'],
 'wilayah': ['1', '5'],
 'p2pml': ['1'],
 'ppkm': ['1'],
 'terap': ['1'],
 'cegah': ['1'],
 'bijak': ['1'],
 'https': ['1', '2', '3', '4', '5'],
 'kab kota': ['1'],
 '2021': ['1'],
 'sehat': ['1'],
 'jakarta': ['1', '2', '3', '4', '5'],
```

```
 'sakit': ['1'],
 'bebas': ['1'],
 'picu': ['1'],
 'hitung': ['1'],
 'batas': ['1'],
 'masyarakat': ['1'],
 'langsung': ['1'],
 '-': ['1', '2', '3', '4', '5'],
 'kemenkes': ['1', '4'],
 'tarmizi': ['1'],
 'ri': ['1', '3', '4'],
 'direktur': ['1'],
 'health detik com berita-detikhealth d-5816690 wilayah-kamu-sudah-bebas-
covid-19-cek-34-kabkota-zona-hijau-terbaru': ['1'],
 '2': ['1', '3'],
 'tahap': ['1'],
 'perintah': ['1'],
 'protokol': ['1'],
 'tingkat': ['1', '4'],
 'laku': ['1'],
 'rencana': ['1', '2'],
 'menteri': ['1'],
 'mobilitas': ['1'],
 'kaji': ['1'],
 'januari': ['1', '2'],
 'covid-19': ['1', '2', '3', '4', '5'],
 'nadia': ['1'],
 'longgar': ['1'],
 'level': ['1'],
 'zona': ['1'],
 '34': ['1'],
 'kendali': ['1'],
 'baru': ['1', '3', '4'],
 '3': ['1'],
 'gantung': ['2'],
 'vaksin': ['2', '3'],
 'ada': ['2'],
 'djoerban': ['2', '3'],
 'influenza': ['2'],
 'turut': ['2'],
 'vaksinasi': ['2'],
 'booster': ['2', '3'],
 'kait': ['2', '3'],
 'idi': ['2', '3'],
 'satgas': ['2', '3'],
 'lantas': ['2'],
 'pasti': ['2'],
```

```
 'rutin': ['2'],
 'beri': ['2'],
 'prof': ['2', '3'],
 'tiga': ['2', '3'],
 'zubairi': ['2', '3'],
 'jelas': ['2'],
 '2022': ['2', '3'],
 'health detik com berita-detikhealth d-5816582 vaksin-covid-19-bakal-rutin-
setiap-tahun-tergantung-ini-penjelasannya': ['2'],
 'ketua': ['2', '3'],
 'dosis': ['2', '3'],
 'indonesia': ['2', '3', '4'],
 'dokter': ['2', '3'],
 'ikat': ['2', '3'],
 'strain': ['3'],
 'pfizer': ['3'],
 'lawan': ['3'],
 'corona': ['3', '5'],
 '1': ['3'],
 'delta': ['3', '4', '5'],
 'dasar': ['3'],
 'turun': ['3', '5'],
 'cs': ['3'],
 'sebut': ['3'],
 'health detik com berita-detikhealth d-5816534 ri-mulai-suntikkan-booster-
di-2022-masihkah-ampuh-lawan-varian-delta-cs': ['3'],
 'moderna': ['3'],
 'varian': ['3', '4', '5'],
 '1-2': ['3'],
 'pakar': ['3'],
 'aku': ['3'],
 'ikut': ['3'],
 'virus': ['3'],
 'bukti': ['3'],
 'suntik': ['3'],
 'efektivitas': ['3'],
 'singgung': ['3'],
 'alami': ['3', '4'],
 'riset': ['3'],
 'jenis': ['3'],
 'ampuh': ['3'],
 'utara': ['4'],
 'data': ['4'],
 'asal': ['4'],
 'tambah': ['4'],
 'beta': ['4'],
 '13': ['4'],
```

```
 'november': ['4'],
 'sulawesi': ['4'],
 '165': ['4'],
 'jawa': ['4'],
 'dki': ['4'],
 'total': ['4'],
 'balitbangkes': ['4'],
 'health detik com berita-detikhealth d-5812940 alert-kasus-varian-delta-
covid-19-di-dki-meningkat': ['4'],
 '90': ['4'],
 'alpha': ['4'],
 'alert': ['4'],
 '86': ['4'],
 'barat': ['4', '5'],
 '1 327': ['4'],
 'as': ['5'],
 'senin': ['5'],
 'pasca': ['5'],
 'fauci': ['5'],
 'reda': ['5'],
 'medis': ['5'],
 'area': ['5'],
 'serang': ['5'],
 'gedung': ['5'],
 'stabil': ['5'],
 'nasihat': ['5'],
 'musim': ['5'],
 '57': ['5'],
 'minggu': ['5'],
 'health detik com berita-detikhealth d-5813949 corona-di-as-mendadak-naik-lagi-
usai-serangan-delta-sempat-mereda': ['5'],
 'gelombang': ['5'],
 'laut': ['5'],
 'dadak': ['5'],
 'puncak': ['5'],
 'catat': ['5'],
 'serikat': ['5'],
 'persen': ['5'],
 'amerika': ['5'],
 'panas': ['5'],
 'kepala': ['5'],
 'nasional': ['5'],
 'timur': ['5'],
 'anthony': ['5'],
 'pasien': ['5'],
 'putih': ['5'],
 '15 11 2021': ['5']}
```

[ ]:
```
doc_dict
```

[ ]:
```
{'1': 'wilayah bebas covid-19 cek 34 kab kota zona hijau baru jakarta - perintah
rencana terap laku batas giat masyarakat ppkm level 3 hitung 24 desember 2021 2
januari 2021 menteri sehat ri bijak ppkm level 3 tahap kaji direktur cegah
kendali sakit tular langsung p2pml kemenkes ri dr siti nadia tarmizi ppkm level
3 terap covid-19 signifikan picu tingkat mobilitas longgar protokol sehat https
health detik com berita-detikhealth d-5816690 wilayah-kamu-sudah-bebas-
covid-19-cek-34-kabkota-zona-hijau-terbaru',
 '2': 'vaksin covid-19 rutin gantung jelas jakarta - beri booster dosis tiga
vaksin covid-19 indonesia rencana januari 2022 lantas ada vaksinasi covid-19
vaksinasi influenza ketua satgas covid-19 ikat dokter indonesia idi prof zubairi
djoerban pasti kait turut vaksin covid-19 booster vaksinasi covid-19 https
health detik com berita-detikhealth d-5816582 vaksin-covid-19-bakal-rutin-
setiap-tahun-tergantung-ini-penjelasannya',
 '3': 'ri suntik booster 2022 ampuh lawan varian delta cs jakarta - pakar aku
vaksin dosis 1-2 alami turun efektivitas varian corona varian delta booster
dosis tiga vaksin covid-19 indonesia 2022 jenis vaksin ikut strain virus baru
ketua satgas covid-19 ikat dokter indonesia idi prof zubairi djoerban singgung
riset kait efektivitas vaksin covid-19 dosis 1 2 sebut dasar riset efektivitas
vaksin covid-19 pfizer moderna bukti turun lawan varian delta https health detik
com berita-detikhealth d-5816534 ri-mulai-suntikkan-booster-di-2022-masihkah-
ampuh-lawan-varian-delta-cs',
 '4': 'alert varian delta covid-19 dki tingkat jakarta - data baru balitbangkes
kemenkes ri 13 november tambah varian delta tambah jawa barat 165 dki jakarta 90
sulawesi utara 86 balitbangkes dki jakarta alami tingkat varian delta signifikan
varian varian alpha varian delta beta indonesia asal dki jakarta total 1 327
https health detik com berita-detikhealth d-5812940 alert-kasus-varian-delta-
covid-19-di-dki-meningkat',
 '5': 'corona as dadak serang delta reda jakarta - covid-19 wilayah amerika
serikat as covid-19 catat stabil pasca serang varian delta musim panas kepala
nasihat medis gedung putih dr anthony fauci senin 15 11 2021 nasional turun 57
persen minggu puncak gelombang varian delta musim panas pasien covid-19 area
barat timur laut dadak https health detik com berita-detikhealth d-5813949
corona-di-as-mendadak-naik-lagi-usai-serangan-delta-sempat-mereda'}
```

Vocabulary List dari Inverted Index

[ ]:
```
vocab = list(inverted_index.keys())
print(f'Vocabulary List: {vocab}')
```

```
Vocabulary List: ['cek', 'siti', 'signifikan', 'hijau', 'giat', '24', 'tular',
'desember', 'dr', 'wilayah', 'p2pml', 'ppkm', 'terap', 'cegah', 'bijak',
'https', 'kab kota', '2021', 'sehat', 'jakarta', 'sakit', 'bebas', 'picu',
'hitung', 'batas', 'masyarakat', 'langsung', '-', 'kemenkes', 'tarmizi', 'ri',
'direktur', 'health detik com berita-detikhealth d-5816690 wilayah-kamu-sudah-
bebas-covid-19-cek-34-kabkota-zona-hijau-terbaru', '2', 'tahap', 'perintah',
'protokol', 'tingkat', 'laku', 'rencana', 'menteri', 'mobilitas', 'kaji',
```

```
'januari', 'covid-19', 'nadia', 'longgar', 'level', 'zona', '34', 'kendali',
'baru', '3', 'gantung', 'vaksin', 'ada', 'djoerban', 'influenza', 'turut',
'vaksinasi', 'booster', 'kait', 'idi', 'satgas', 'lantas', 'pasti', 'rutin',
'beri', 'prof', 'tiga', 'zubairi', 'jelas', '2022', 'health detik com berita-
detikhealth d-5816582 vaksin-covid-19-bakal-rutin-setiap-tahun-tergantung-ini-
penjelasannya', 'ketua', 'dosis', 'indonesia', 'dokter', 'ikat', 'strain',
'pfizer', 'lawan', 'corona', '1', 'delta', 'dasar', 'turun', 'cs', 'sebut',
'health detik com berita-detikhealth d-5816534 ri-mulai-suntikkan-booster-
di-2022-masihkah-ampuh-lawan-varian-delta-cs', 'moderna', 'varian', '1-2',
'pakar', 'aku', 'ikut', 'virus', 'bukti', 'suntik', 'efektivitas', 'singgung',
'alami', 'riset', 'jenis', 'ampuh', 'utara', 'data', 'asal', 'tambah', 'beta',
'13', 'november', 'sulawesi', '165', 'jawa', 'dki', 'total', 'balitbangkes',
'health detik com berita-detikhealth d-5812940 alert-kasus-varian-delta-
covid-19-di-dki-meningkat', '90', 'alpha', 'alert', '86', 'barat', '1 327',
'as', 'senin', 'pasca', 'fauci', 'reda', 'medis', 'area', 'serang', 'gedung',
'stabil', 'nasihat', 'musim', '57', 'minggu', 'health detik com berita-
detikhealth d-5813949 corona-di-as-mendadak-naik-lagi-usai-serangan-delta-
sempat-mereda', 'gelombang', 'laut', 'dadak', 'puncak', 'catat', 'serikat',
'persen', 'amerika', 'panas', 'kepala', 'nasional', 'timur', 'anthony',
'pasien', 'putih', '15 11 2021']
```

Top 3 Document Retrieval

[ ]:
```
query = 'vaksin corona jakarta'
```

Membuat term frequency

[ ]:
```
def termFrequency(vocab, query): # term frequency berdasarkan query
    tf_query = {}
    for word in vocab:
        tf_query[word] = query.count(word)
    return tf_query

tf_query = termFrequency(vocab, query)
tf_query
```

[ ]:
```
{'cek': 0,
 'siti': 0,
 'signifikan': 0,
 'hijau': 0,
 'giat': 0,
 '24': 0,
 'tular': 0,
 'desember': 0,
 'dr': 0,
 'wilayah': 0,
 'p2pml': 0,
 'ppkm': 0,
```

```
 'terap': 0,
 'cegah': 0,
 'bijak': 0,
 'https': 0,
 'kab kota': 0,
 '2021': 0,
 'sehat': 0,
 'jakarta': 1,
 'sakit': 0,
 'bebas': 0,
 'picu': 0,
 'hitung': 0,
 'batas': 0,
 'masyarakat': 0,
 'langsung': 0,
 '-': 0,
 'kemenkes': 0,
 'tarmizi': 0,
 'ri': 0,
 'direktur': 0,
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covid-19-cek-34-kabkota-zona-hijau-terbaru': 0,
 '2': 0,
 'tahap': 0,
 'perintah': 0,
 'protokol': 0,
 'tingkat': 0,
 'laku': 0,
 'rencana': 0,
 'menteri': 0,
 'mobilitas': 0,
 'kaji': 0,
 'januari': 0,
 'covid-19': 0,
 'nadia': 0,
 'longgar': 0,
 'level': 0,
 'zona': 0,
 '34': 0,
 'kendali': 0,
 'baru': 0,
 '3': 0,
 'gantung': 0,
 'vaksin': 1,
 'ada': 0,
 'djoerban': 0,
 'influenza': 0,
```

```
 'turut': 0,
 'vaksinasi': 0,
 'booster': 0,
 'kait': 0,
 'idi': 0,
 'satgas': 0,
 'lantas': 0,
 'pasti': 0,
 'rutin': 0,
 'beri': 0,
 'prof': 0,
 'tiga': 0,
 'zubairi': 0,
 'jelas': 0,
 '2022': 0,
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setiap-tahun-tergantung-ini-penjelasannya': 0,
 'ketua': 0,
 'dosis': 0,
 'indonesia': 0,
 'dokter': 0,
 'ikat': 0,
 'strain': 0,
 'pfizer': 0,
 'lawan': 0,
 'corona': 1,
 '1': 0,
 'delta': 0,
 'dasar': 0,
 'turun': 0,
 'cs': 0,
 'sebut': 0,
 'health detik com berita-detikhealth d-5816534 ri-mulai-suntikkan-booster-
di-2022-masihkah-ampuh-lawan-varian-delta-cs': 0,
 'moderna': 0,
 'varian': 0,
 '1-2': 0,
 'pakar': 0,
 'aku': 0,
 'ikut': 0,
 'virus': 0,
 'bukti': 0,
 'suntik': 0,
 'efektivitas': 0,
 'singgung': 0,
 'alami': 0,
 'riset': 0,
```

```
 'jenis': 0,
 'ampuh': 0,
 'utara': 0,
 'data': 0,
 'asal': 0,
 'tambah': 0,
 'beta': 0,
 '13': 0,
 'november': 0,
 'sulawesi': 0,
 '165': 0,
 'jawa': 0,
 'dki': 0,
 'total': 0,
 'balitbangkes': 0,
 'health detik com berita-detikhealth d-5812940 alert-kasus-varian-delta-
covid-19-di-dki-meningkat': 0,
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 'alpha': 0,
 'alert': 0,
 '86': 0,
 'barat': 0,
 '1 327': 0,
 'as': 0,
 'senin': 0,
 'pasca': 0,
 'fauci': 0,
 'reda': 0,
 'medis': 0,
 'area': 0,
 'serang': 0,
 'gedung': 0,
 'stabil': 0,
 'nasihat': 0,
 'musim': 0,
 '57': 0,
 'minggu': 0,
 'health detik com berita-detikhealth d-5813949 corona-di-as-mendadak-naik-lagi-
usai-serangan-delta-sempat-mereda': 0,
 'gelombang': 0,
 'laut': 0,
 'dadak': 0,
 'puncak': 0,
 'catat': 0,
 'serikat': 0,
 'persen': 0,
 'amerika': 0,
```

```
 'panas': 0,
 'kepala': 0,
 'nasional': 0,
 'timur': 0,
 'anthony': 0,
 'pasien': 0,
 'putih': 0,
 '15 11 2021': 0}
```

Membuat Word Document Frequency

[ ]:
```
def wordDocFre(vocab, doc_dict):
    df = {}
    for word in vocab:
        frq = 0
        for doc in doc_dict.values():
            if word in tokenisasi(doc):
                frq = frq + 1
        df[word] = frq
    return df
```

Membuat IDF

[ ]:
```
import numpy as np
def inverseDocFre(vocab, doc_fre, length): # fungsi untuk menghasilkan idf
    idf = {}
    for word in vocab:
        idf[word] = 1 + np.log((length + 1) / (doc_fre[word]+1))
    return idf
```

[ ]:
```
def termFrequencyInDoc(vocab, doc_dict):
    tf_docs = {}
    for doc_id in doc_dict.keys():
        tf_docs[doc_id] = {}
    for word in vocab:
        for doc_id, doc in doc_dict.items():
            tf_docs[doc_id][word] = doc.count(word)
    return tf_docs
```

TF-IDF

[ ]:
```
def tfidf(vocab, tf, idf_scr, doc_dict):
    tf_idf_scr = {}
    for doc_id in doc_dict.keys():
        tf_idf_scr[doc_id] = {}
    for word in vocab:
        for doc_id, doc in doc_dict.items():
            tf_idf_scr[doc_id][word] = tf[doc_id][word] * idf_scr[word]
    return tf_idf_scr
```

Matriks Term Document (TD)

[ ]:
```
tf_idf = tfidf(vocab, termFrequencyInDoc(vocab, doc_dict), inverseDocFre(vocab,␣
 ↪wordDocFre(vocab, doc_dict), len(doc_dict)), doc_dict)
# Term - Document Matrix
TD = np.zeros((len(vocab), len(doc_dict)))
for word in vocab:
    for doc_id,doc in tf_idf.items():
        ind1 = vocab.index(word)
        ind2 = list(tf_idf.keys()).index(doc_id)
        TD[ind1][ind2] = tf_idf[doc_id][word]
print(TD)
```

```
[[ 4.19722458  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 1.69314718  0.          0.          1.69314718  0.        ]
 [ 4.19722458  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 1.69314718  0.          0.          0.          1.69314718]
 [ 3.38629436  0.          0.          0.          1.69314718]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 6.29583687  0.          0.          0.          0.        ]
 [ 4.19722458  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 1.          1.          1.          1.          1.        ]
 [ 2.79175947  0.          0.          0.          0.        ]
 [ 3.38629436  0.          0.          0.          1.69314718]
 [ 4.19722458  0.          0.          0.          0.        ]
 [ 1.          1.          1.          4.          1.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 4.19722458  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [16.         18.         19.         12.         16.        ]
 [ 1.69314718  0.          0.          1.69314718  0.        ]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 8.43279065  5.62186043 15.46011619 12.64918597  7.02732554]
 [ 2.09861229  0.          0.          0.          0.        ]
 [ 2.79175947  0.          0.          0.          0.        ]
 [11.85203026  6.77258872 18.62461899  3.38629436  3.38629436]
 [ 2.09861229  0.          0.          0.          0.        ]
```

```
[ 2.09861229  0.          0.          0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 1.69314718  0.          0.          3.38629436  0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 1.69314718  1.69314718  0.          0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 1.69314718  1.69314718  0.          0.          0.        ]
[ 3.          7.          4.          2.          3.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 6.29583687  0.          0.          0.          0.        ]
[ 4.19722458  0.          0.          0.          0.        ]
[ 4.19722458  0.          2.09861229  0.          0.        ]
[ 2.09861229  0.          0.          0.          0.        ]
[ 2.81093022  0.          1.40546511  1.40546511  0.        ]
[10.49306144  0.          2.09861229  4.19722458  2.09861229]
[ 0.          4.19722458  0.          0.          0.        ]
[ 0.         11.85203026  8.4657359   0.          0.        ]
[ 0.          2.09861229  0.          0.          6.29583687]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          2.09861229  0.          0.          0.        ]
[ 0.          2.09861229  0.          0.          0.        ]
[ 0.          6.29583687  0.          0.          0.        ]
[ 0.          3.38629436  5.07944154  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          2.09861229  0.          0.          0.        ]
[ 0.          2.09861229  0.          0.          0.        ]
[ 0.          4.19722458  0.          0.          0.        ]
[ 2.09861229  4.19722458  2.09861229  2.09861229  2.09861229]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          4.19722458  0.          0.          0.        ]
[ 0.          1.69314718  5.07944154  0.          0.        ]
[ 0.          2.79175947  0.          0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  5.07944154  0.          0.        ]
[ 0.          2.81093022  2.81093022  1.40546511  0.        ]
[ 0.          1.69314718  1.69314718  0.          0.        ]
[ 0.          1.69314718  1.69314718  0.          1.69314718]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          6.29583687  0.          0.        ]
[ 0.          0.          1.69314718  0.          3.38629436]
```

```
[10.15888308 13.54517744 11.85203026 10.15888308 13.54517744]
[ 0.          0.          5.62186043  7.02732554  5.62186043]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          3.38629436  0.          1.69314718]
[ 0.          0.          4.19722458  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          2.79175947  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          7.02732554  9.83825576  2.81093022]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 2.09861229  0.          2.09861229  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          4.19722458  0.          0.        ]
[ 0.          0.          6.29583687  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          1.69314718  1.69314718  0.        ]
[ 0.          0.          4.19722458  0.          0.        ]
[ 0.          0.          2.09861229  0.          0.        ]
[ 0.          0.          4.19722458  0.          0.        ]
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[ 0.          0.          0.          2.09861229  0.        ]
[ 0.          0.          0.         10.49306144  0.        ]
[ 0.          0.          0.          2.09861229  0.        ]
[ 0.          0.          0.          4.19722458  0.        ]
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[ 2.09861229  0.          0.          2.09861229  0.        ]
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[ 0.          0.          0.          4.19722458  0.        ]
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[ 0.          0.          0.          1.69314718  1.69314718]
[ 0.          0.          0.          2.79175947  0.        ]
[10.49306144 16.78889831 12.59167373  4.19722458 18.8875106 ]
[ 0.          0.          0.          0.          2.09861229]
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[ 0.          0.          0.          0.          4.19722458]
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```

```
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          6.29583687]
[ 0.          0.          0.          0.          2.09861229]
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[ 0.          0.          0.          0.          4.19722458]
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[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          4.19722458]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.09861229]
[ 0.          0.          0.          0.          2.79175947]]
```

[ ]:
```
idf = inverseDocFre(vocab, wordDocFre(vocab, doc_dict),len(doc_dict))
```

Membuat Term - Query Matrix (TQ)

[ ]:
```
# Term - Query Matrix
TQ = np.zeros((len(vocab), 1)) # hanya 1 query
for word in vocab:
    ind1 = vocab.index(word)
    TQ[ind1][0] = tf_query[word]*idf[word]
print(TQ)
```

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[[0.        ]
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 [0.        ]
 [0.        ]
```

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[1.69314718]
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[0.        ]
```

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[1.69314718]
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```

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```

Cosine Similarity

[ ]:
```
import math
def cosine_sim(vec1, vec2):
    vec1 = list(vec1)
    vec2 = list(vec2)
    dot_prod = 0
    for i, v in enumerate(vec1):
        dot_prod += v * vec2[i]
    mag_1 = math.sqrt(sum([x**2 for x in vec1]))
    mag_2 = math.sqrt(sum([x**2 for x in vec2]))

    mag_1 = np.squeeze(mag_1)
    mag_2 = np.squeeze(mag_2)
    return dot_prod / (mag_1 * mag_2)
```

Exact Top K Document

[ ]:
```
from collections import OrderedDict
def topk(doc_dict, TD, q, k):
    relevance_scores = {}
    i = 0
    for doc_id in doc_dict.keys():
        relevance_scores[doc_id] = cosine_sim(q, TD[:, i])
        i = i + 1

    sorted_value = OrderedDict(sorted(relevance_scores.items(), key=lambda x:␣
 ↪x[1], reverse = True))
    top_k = {j: sorted_value[j] for j in list(sorted_value)[:k]}
    # penghitungan time complexity (disusun oleh banyak dokumen + proses␣
 ↪pengurutan + seleksi top k)
    time_complexity_k = len(doc_dict) + (len(doc_dict) * (len(doc_dict).
 ↪bit_length() - 1)) + k
    return top_k, time_complexity_k
```

[ ]:
```
def retriev(vocab, query, doc_dict, k):
    tf_query = termFrequency(vocab, query)
    idf = inverseDocFre(vocab, wordDocFre(vocab, doc_dict), len(doc_dict))


    TQ = np.zeros((len(vocab), 1))

    for word in vocab: # iterasi untuk pemobobotan tf-idf term-query matriks
        ind1 = vocab.index(word) # memberikan index pada tiap kata pada vocab
        TQ[ind1][0] = tf_query[word]*idf[word]
```

```
    # implementasi fungsi pembobotan tf-idf antara tiap term dalam vocab dan␣
↪tiap dokumen di dalam corpus untuk digunakan dalam konstruksi term-document␣
↪matriks
    tf_idf = tfidf(vocab, termFrequencyInDoc(vocab, doc_dict), idf, doc_dict)

    # inisialisasi term-query matriks dengan matriks 0 dengan banyak baris␣
↪sebanyak len(vocab) dan banyak kolom sebanyak len(doc_dict)
    TD = np.zeros((len(vocab), len(doc_dict)))
    for word in vocab: # iterasi untuk konstruksi term-document matriks
        for doc_id, doc in tf_idf.items():
            ind1 = vocab.index(word)
            ind2 = list(tf_idf.keys()).index(doc_id)
            TD[ind1][ind2] = tf_idf[doc_id][word]

    # implementasi fungsi pemilihan top k dokumen beserta penghitungan time␣
↪complexitinya
    top_k_results, complexity_k = topk(doc_dict, TD, TQ, k)

    # penghitungan time complexity (disusun oleh penghitungan tf_query +␣
↪pembuatan TQ + penghitungan tf-idf + pembuatan TD + penghitungan top k)
    time_complexity_main = len(vocab) + len(vocab) + (len(vocab) *␣
↪len(doc_dict)) + (len(vocab) * len(doc_dict)) + len(doc_dict) + complexity_k

    return top_k_results, TQ, TD, time_complexity_main
```

Relevance Feedback

[ ]:
```
from sklearn.decomposition import TruncatedSVD
import matplotlib.pyplot as plt
DT = TD.transpose()
print(DT)
model = TruncatedSVD(n_components=2, random_state=7).fit(DT)
DT_reduced = model.transform(DT)
QT_reduced = model.transform(TQ.transpose())
print(QT_reduced)
print(DT_reduced)
plt.scatter(DT_reduced[:, 0], DT_reduced[:, 1])
plt.scatter(QT_reduced[:, 0], QT_reduced[:, 1], color=["red"])
labels=list(doc_dict.keys())

for i, txt in enumerate(labels):
    plt.annotate(txt, (DT_reduced[i, 0], DT_reduced[i, 1]))
plt.annotate("query", (QT_reduced[0, 0], QT_reduced[0, 1]))
plt.show()
```

```
[[ 4.19722458  2.09861229  1.69314718  4.19722458  2.09861229  2.09861229
   2.09861229  2.09861229  1.69314718  3.38629436  2.09861229  6.29583687
   4.19722458  2.09861229  2.09861229  1.          2.79175947  3.38629436
```

```
  4.19722458  1.          2.09861229  4.19722458  2.09861229  2.09861229
  2.09861229  2.09861229  2.09861229 16.          1.69314718  2.09861229
  8.43279065  2.09861229  2.79175947 11.85203026  2.09861229  2.09861229
  2.09861229  1.69314718  2.09861229  1.69314718  2.09861229  2.09861229
  2.09861229  1.69314718  3.          2.09861229  2.09861229  6.29583687
  4.19722458  4.19722458  2.09861229  2.81093022 10.49306144  0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          2.09861229  0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.         10.15888308
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          2.09861229  0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          2.09861229
  0.          0.          0.          0.          0.         10.49306144
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
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[ 0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          1.          0.          0.
  0.          1.          0.          0.          0.          0.
  0.          0.          0.         18.          0.          0.
  5.62186043  0.          0.          6.77258872  0.          0.
  0.          0.          0.          1.69314718  0.          0.
  0.          1.69314718  7.          0.          0.          0.
  0.          0.          0.          0.          0.          4.19722458
 11.85203026  2.09861229  1.69314718  2.09861229  2.09861229  6.29583687
  3.38629436  1.69314718  1.69314718  1.69314718  2.09861229  2.09861229
  4.19722458  4.19722458  1.69314718  1.69314718  1.69314718  4.19722458
  1.69314718  2.79175947  1.69314718  1.69314718  2.81093022  1.69314718
  1.69314718  0.          0.          0.          0.         13.54517744
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          2.09861229
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.         16.78889831
  0.          0.          0.          0.          0.          0.
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```

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  0.          0.          0.          0.          0.          0.        ]
[ 0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          1.          0.          0.
  0.          1.          0.          0.          0.          0.
  0.          0.          0.         19.          0.          0.
 15.46011619  0.          0.         18.62461899  0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          4.          0.          0.          0.
  0.          2.09861229  0.          1.40546511  2.09861229  0.
  8.4657359   0.          1.69314718  0.          0.          0.
  5.07944154  1.69314718  1.69314718  1.69314718  0.          0.
  0.          2.09861229  1.69314718  1.69314718  1.69314718  0.
  5.07944154  0.          1.69314718  5.07944154  2.81093022  1.69314718
  1.69314718  2.09861229  2.09861229  6.29583687  1.69314718 11.85203026
  5.62186043  2.09861229  3.38629436  4.19722458  2.09861229  2.79175947
  2.09861229  7.02732554  2.09861229  2.09861229  2.09861229  2.09861229
  2.09861229  2.09861229  4.19722458  6.29583687  2.09861229  1.69314718
  4.19722458  2.09861229  4.19722458  0.          0.          0.
  0.          0.          0.          0.          0.          2.09861229
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.         12.59167373
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.        ]
[ 0.          0.          1.69314718  0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          1.          0.          0.
  0.          4.          0.          0.          0.          0.
  0.          0.          0.         12.          1.69314718  0.
 12.64918597  0.          0.          3.38629436  0.          0.
  0.          3.38629436  0.          0.          0.          0.
  0.          0.          2.          0.          0.          0.
  0.          0.          0.          1.40546511  4.19722458  0.
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  0.          2.09861229  0.          0.          0.          0.
  0.          0.          0.          0.          1.40546511  0.
  0.          0.          0.          0.          0.         10.15888308
  7.02732554  0.          0.          0.          0.          0.
  0.          9.83825576  0.          0.          0.          0.
  0.          0.          0.          0.          0.          1.69314718
  0.          0.          0.          2.09861229  2.09861229  2.09861229
  4.19722458  2.09861229  2.09861229  2.09861229  2.09861229  2.09861229
  2.09861229 10.49306144  2.09861229  4.19722458  2.79175947  2.09861229
  2.09861229  4.19722458  2.09861229  1.69314718  2.79175947  4.19722458
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   0.          0.          1.69314718  1.69314718  0.          0.
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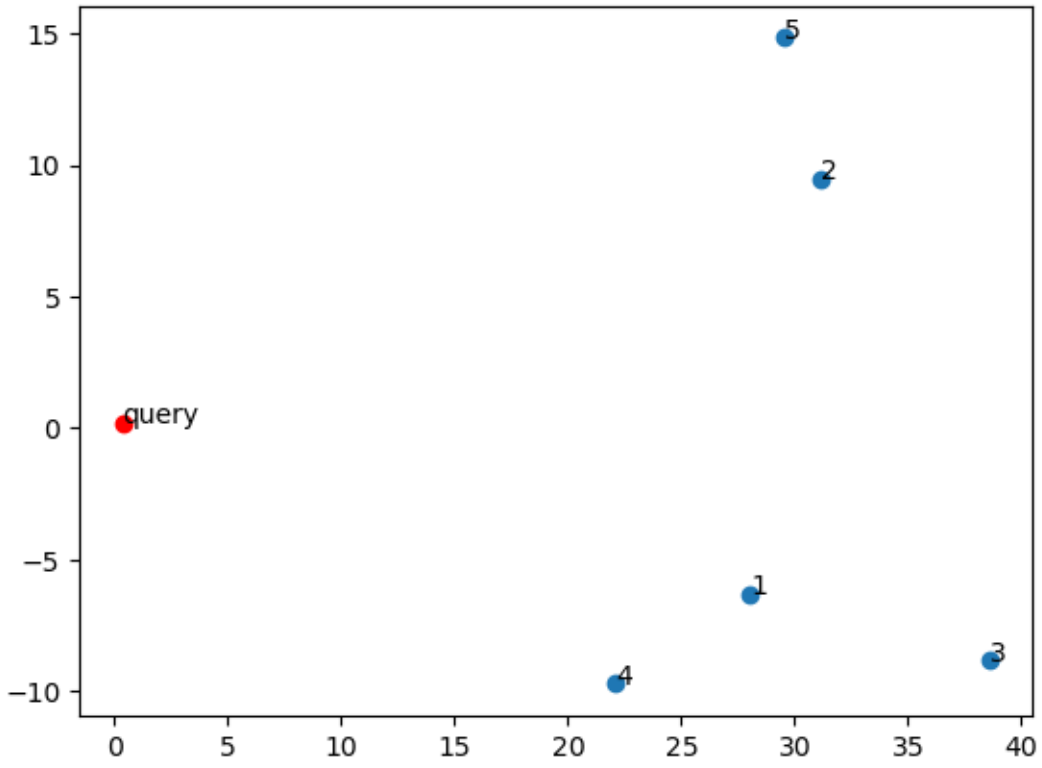
   0.          1.          0.          0.          0.          0.
   0.          0.          0.         16.          0.          0.
   7.02732554  0.          0.          3.38629436  0.          0.
   0.          0.          0.          0.          0.          0.
   0.          0.          3.          0.          0.          0.
   0.          0.          0.          0.          2.09861229  0.
   0.          6.29583687  0.          0.          0.          0.
   0.          0.          0.          0.          0.          0.
   0.          2.09861229  0.          0.          0.          0.
   0.          0.          0.          0.          0.          0.
   1.69314718  0.          0.          0.          3.38629436 13.54517744
   5.62186043  0.          1.69314718  0.          0.          0.
   0.          2.81093022  0.          0.          0.          0.
   0.          0.          0.          0.          0.          0.
   0.          0.          0.          0.          0.          0.
   0.          0.          2.09861229  0.          0.          0.
   0.          0.          0.          0.          0.          0.
   0.          0.          0.          1.69314718  0.         18.8875106
   2.09861229  2.09861229  2.09861229  4.19722458  2.09861229  2.09861229
   6.29583687  2.09861229  2.09861229  2.09861229  4.19722458  2.09861229
   2.09861229  2.79175947  2.09861229  2.09861229  6.29583687  2.09861229
   2.09861229  2.09861229  2.09861229  2.09861229  4.19722458  2.09861229
   2.09861229  2.09861229  2.09861229  2.09861229  2.09861229  2.79175947]]
[[0.36347735 0.17876281]]
[[28.02615945 -6.33101079]
 [31.19135027  9.4851499 ]
 [38.57055639 -8.84200474]
 [22.11675483 -9.73680261]
 [29.51841389 14.83707103]]
```



Hasil Top 5 Pertama Sebelum Relevance Feedback

[ ]:
```
top_5 = topk(doc_dict, TD, TQ[:, 0], 5)
print(top_5)
```

```
({'2': 0.22852766914987063, '3': 0.16614749506418533, '5': 0.07374686362135464,
'4': 0.05172409196454835, '1': 0.011143630661714601}, 20)
```

[ ]:
```
k = 5
top_5_result, TQ, TD, time = retriev(vocab, query, doc_dict, k)

print(f'\nHasil perankingan top {k} dokumen:')

i = 1
for no_doc, cosine_similarity in top_5_result.items():
    print(f'{i}. Dokumen {no_doc} dengan nilai cosine similarity =␣
 ↪{cosine_similarity}')
    i += 1
```

```
Hasil perankingan top 5 dokumen:
1. Dokumen 2 dengan nilai cosine similarity = [0.22852767]
2. Dokumen 3 dengan nilai cosine similarity = [0.1661475]
```

```
3. Dokumen 5 dengan nilai cosine similarity = [0.07374686]
4. Dokumen 4 dengan nilai cosine similarity = [0.05172409]
5. Dokumen 1 dengan nilai cosine similarity = [0.01114363]
```

[ ]:
```
rel_judgement = {
'1': 0,
'2': 1,
'3': 1,
'4': 0,
'5': 0,
}

rel_docs = []
nrel_docs = [] # inisilisasi list kosong untuk menyimpan dokumen yang relevan
for doc_id, rel in rel_judgement.items():
    if rel==1:
        rel_docs.append(doc_id)
    else:
        nrel_docs.append(doc_id)
```

[ ]:
```
rel_vecs = []
doc_ids = list(doc_dict.keys())
for doc in rel_docs:
    rel_vecs.append(DT[doc_ids.index(doc),:])

nrel_vecs = []
for doc in nrel_docs:
    nrel_vecs.append(DT[doc_ids.index(doc),:])
```

[ ]:
```
query_vecs = TQ.transpose()
alpha = 1
beta = 0.75
gamma = 0.15
# Update query vectors with Rocchio algorithm
query_vecs = alpha * query_vecs + beta * np.mean(rel_vecs, axis=0) - gamma * np.
 ↪mean(nrel_vecs, axis=0)
query_vecs[query_vecs<0] = 0 #negative value => 0
```

[ ]:
```
top_5 = topk(doc_dict, TD, query_vecs[0, :].transpose(), 5)

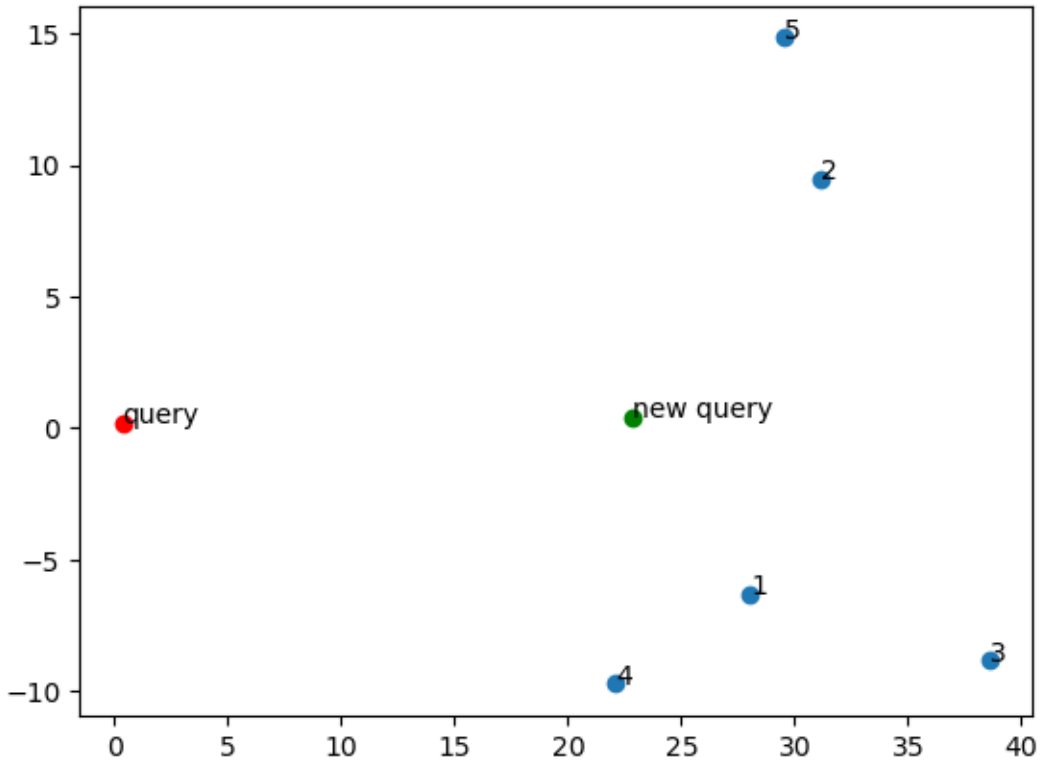
print("Hasil perankingan top 5 dokumen setelah relevance feedback:")
for doc_id, cosine_similarity in top_5[0].items():
    print(f"Dokumen {doc_id} dengan nilai cosine similarity =␣
 ↪[{cosine_similarity}]")
```

```
Hasil perankingan top 5 dokumen setelah relevance feedback:
Dokumen 3 dengan nilai cosine similarity = [0.9349650161069505]
Dokumen 2 dengan nilai cosine similarity = [0.9218725561589912]
```

```
Dokumen 5 dengan nilai cosine similarity = [0.6765286666556104]
Dokumen 1 dengan nilai cosine similarity = [0.6362395890121536]
Dokumen 4 dengan nilai cosine similarity = [0.5765607944527157]
```

Dapat dilihat bahwa terdapat perbedaan top_k document setelah dilakukan relevance feedback. Hal ini menandakan algoritma Rocchio berhasil diterapkan

[ ]:
```
QT1_reduced = model.transform(query_vecs)
plt.scatter(DT_reduced[:, 0], DT_reduced[:, 1])
plt.scatter(QT_reduced[:, 0], QT_reduced[:, 1], color=["red"])
plt.scatter(QT1_reduced[:, 0], QT1_reduced[:, 1], color=["green"])
doc_ids=list(doc_dict.keys())
for i, txt in enumerate(doc_ids):
    plt.annotate(txt, (DT_reduced[i, 0], DT_reduced[i, 1]))
plt.annotate("query", (QT_reduced[0, 0], QT_reduced[0, 1]))
plt.annotate("new query", (QT1_reduced[:, 0], QT1_reduced[:, 1]))
plt.show()
```



0.1 Query Expansion dengan Thesaurus

[ ]:
```
import nltk
nltk.download('wordnet')
nltk.download('omw-1.4')
```

```
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\FEZA\AppData\Roaming\nltk_data…
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package omw-1.4 to
[nltk_data]     C:\Users\FEZA\AppData\Roaming\nltk_data…
[nltk_data]   Package omw-1.4 is already up-to-date!
```

[ ]:
```
True
```

[ ]:
```
from itertools import chain
from nltk.corpus import wordnet
query = "information system"
expand_list = []
for term in query.split(" "):
    synonyms = wordnet.synsets(term)
    lemmas = set(chain.from_iterable([word.lemma_names() for word in synonyms]))
    print(lemmas)
    expand_list = expand_list + list(lemmas)

print(expand_list)
query_expand = query + " " + (" ".join(expand_list)).replace("_", " ")
print(query_expand)
```

```
{'entropy', 'info', 'information', 'data', 'selective_information'}
{'system_of_rules', 'system', 'organisation', 'arrangement', 'organization',
'scheme'}
['entropy', 'info', 'information', 'data', 'selective_information',
'system_of_rules', 'system', 'organisation', 'arrangement', 'organization',
'scheme']
information system entropy info information data selective information system of
rules system organisation arrangement organization scheme
```