```
General libraries being loaded
In [1]: # Python ≥3.5 is required
         import sys
        assert sys.version_info >= (3, 5)
        # Scikit-Learn ≥0.20 is required
         import sklearn
        assert sklearn.__version__ >= "0.20"
        # Common imports
         import numpy as np
         import os, time
         import pandas as pd
        # Our new Deep Learning imports
         import tensorflow as tf
        from tensorflow import keras
        # To plot nice figures
        # %matplotlib widget
         %matplotlib inline
         import matplotlib as mpl
         import matplotlib.pyplot as plt
         mpl.rc('axes', labelsize=14)
        mpl.rc('xtick', labelsize=12)
        mpl.rc('ytick', labelsize=12)
        # For plotting statistical figures
         import seaborn as sns; sns.set()
        # For speeding up numpy operations
         import cupy as cp
        # For faster numpy computation
        from numba import jit, cuda
        # For Progress Bar
        from tqdm.auto import tqdm,trange
        tqdm.pandas()
        # Vaex Dataframe Library
         import vaex as vx
        # For Pyspark activation
         import os
        os.environ["PYARROW_IGNORE_TIMEZONE"] = "1"
        # Pyspark Dataframe
        from pyspark import pandas as ps
        os.environ['KMP_DUPLICATE_LIB_OK']='True'
        Loading the Abstract Sentences for Doc2Vec Model (Gensim)
 In [2]: Article_Data_Cord_File_DF_Abstract = pd.read_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_abstract.pkl")
 In [3]: Article_Data_Cord_File_DF_Abstract['Type'] = Article_Data_Cord_File_DF_Abstract.shape[0] * ['Abstract']
In [4]: Article_Data_Cord_File_DF_Abstract.rename(columns = {'Abstract_Sentences':'Sentences'}, inplace = True)
        Loading the Body Text Sentences for Doc2Vec Model (Gensim)
In [5]: Article_Data_Cord_File_DF_Body_Text = pd.read_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_body_text.pkl")
 In [6]: Article_Data_Cord_File_DF_Body_Text['Type'] = Article_Data_Cord_File_DF_Body_Text.shape[0] * ['Body Text']
 In [7]: Article_Data_Cord_File_DF_Body_Text.rename(columns = {'Body_Text_Sentences':'Sentences'}, inplace = True)
        Loading Results of Questions from Round 1 to 5
 In [8]: Article_Data_Cord_File_DF_Result_1 = pd.read_csv(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 1\qrels-covid_d1_j0.5-1.txt", sep=' ', header=None)
        Article_Data_Cord_File_DF_Result_1['Batch'] = Article_Data_Cord_File_DF_Result_1.shape[0] * ['1']
        Article_Data_Cord_File_DF_Result_2 = pd.read_csv(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 2\qrels-covid_d2_j0.5-2.txt",sep=' ',header=None)
        Article_Data_Cord_File_DF_Result_2['Batch'] = Article_Data_Cord_File_DF_Result_2.shape[0] * ['2']
        Article_Data_Cord_File_DF_Result_2[0] = Article_Data_Cord_File_DF_Result_2[0] + Article_Data_Cord_File_DF_Result_1[0][Article_Data_Cord_File_DF_Result_1.shape[0]-1]
        Article_Data_Cord_File_DF_Result_3 = pd.read_csv(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 3\qrels-covid_d3_j0.5-3.txt",sep=' ',header=None')
        Article_Data_Cord_File_DF_Result_3['Batch'] = Article_Data_Cord_File_DF_Result_3.shape[0] * ['3']
        Article_Data_Cord_File_DF_Result_3[0] = Article_Data_Cord_File_DF_Result_3[0] + Article_Data_Cord_File_DF_Result_2[0][Article_Data_Cord_File_DF_Result_2.shape[0]-1]
        Article_Data_Cord_File_DF_Result_4 = pd.read_csv(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 4\qrels-covid_d4_j0.5-4.txt", sep=' ', header=None)
        Article_Data_Cord_File_DF_Result_4['Batch'] = Article_Data_Cord_File_DF_Result_4.shape[0] * ['4']
        Article_Data_Cord_File_DF_Result_4[0] = Article_Data_Cord_File_DF_Result_4[0] + Article_Data_Cord_File_DF_Result_3[0][Article_Data_Cord_File_DF_Result_3.shape[0]-1]
        Article_Data_Cord_File_DF_Result_5 = pd.read_csv(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 5\qrels-covid_d5_j0.5-5.txt",sep=' ',header=None)
        Article_Data_Cord_File_DF_Result_5['Batch'] = Article_Data_Cord_File_DF_Result_5.shape[0] * ['5']
        Article_Data_Cord_File_DF_Result_5[0] = Article_Data_Cord_File_DF_Result_5[0] + Article_Data_Cord_File_DF_Result_4[0][Article_Data_Cord_File_DF_Result_4.shape[0]-1]
 In [9]: Article_Data_Cord_File_DF_Result = pd.concat([Article_Data_Cord_File_DF_Result_3,Article_Data_Cord_File_DF_Result_4,Article_Data_Cord_File_DF_Result_5],ignore_index=True)
        Article_Data_Cord_File_DF_Result[0] = Article_Data_Cord_File_DF_Result[0].progress_apply(str)
                      | 0/178007 [00:00<?, ?it/s]
        Loading the Round 1 Questions for Doc2Vec Model (Gensim)
In [10]: Article_Data_Cord_File_DF_Ques_1 = pd.read_xml(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 1\topics-rnd1.xml")
In [11]: Article_Data_Cord_File_DF_Ques_1['batch'] = Article_Data_Cord_File_DF_Ques_1.shape[0] * ['1']
        Loading the Round 2 Questions for Doc2Vec Model (Gensim)
In [12]: Article_Data_Cord_File_DF_Ques_2 = pd.read_xml(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 2\topics-rnd2.xml")
In [13]: Article_Data_Cord_File_DF_Ques_2['batch'] = Article_Data_Cord_File_DF_Ques_2.shape[0] * ['2']
        Loading the Round 3 Questions for Doc2Vec Model (Gensim)
In [14]: Article_Data_Cord_File_DF_Ques_3 = pd.read_xml(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 3\topics-rnd3.xml")
In [15]: Article_Data_Cord_File_DF_Ques_3['batch'] = Article_Data_Cord_File_DF_Ques_3.shape[0] * ['3']
        Loading the Round 4 Questions for Doc2Vec Model (Gensim)
In [16]: Article_Data_Cord_File_DF_Ques_4 = pd.read_xml(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 4\topics-rnd4.xml")
In [17]: Article_Data_Cord_File_DF_Ques_4['batch'] = Article_Data_Cord_File_DF_Ques_4.shape[0] * ['4']
        Loading the Round 5 Questions for Doc2Vec Model (Gensim)
In [18]: Article_Data_Cord_File_DF_Ques_5 = pd.read_xml(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\Kaggle\Round 5\topics-rnd5.xml")
In [19]: Article_Data_Cord_File_DF_Ques_5['batch'] = Article_Data_Cord_File_DF_Ques_5.shape[0] * ['5']
         Concatenating the Round 1 to Round 5 Questions for Doc2Vec Model (Gensim)
In [20]: Article_Data_Cord_File_DF_Ques = pd.concat([Article_Data_Cord_File_DF_Ques_3,Article_Data_Cord_File_DF_Ques_4,Article_Data_Cord_File_DF_Ques_5],ignore_index=True)
In [21]: Article_Data_Cord_File_DF_Ques['number'] = list(range(1,Article_Data_Cord_File_DF_Ques.shape[0]+1))
In [22]: Article_Data_Cord_File_DF_Ques_Use = (Article_Data_Cord_File_DF_Ques).copy()
         Article_Data_Cord_File_DF_Ques_Use.rename(columns = {'number':'Doc_Id_Meta_Parse'}, inplace = True)
In [23]: Article_Data_Cord_File_DF_Ques_Use_1 = Article_Data_Cord_File_DF_Ques_Use[['Doc_Id_Meta_Parse','query']].copy()
        Article_Data_Cord_File_DF_Ques_Use_2 = Article_Data_Cord_File_DF_Ques_Use[['Doc_Id_Meta_Parse','question']].copy()
        Article_Data_Cord_File_DF_Ques_Use_3 = Article_Data_Cord_File_DF_Ques_Use[['Doc_Id_Meta_Parse', 'narrative']].copy()
        Article_Data_Cord_File_DF_Ques_Use_1.rename(columns = {'query':'Sentences'}, inplace = True)
        Article_Data_Cord_File_DF_Ques_Use_2.rename(columns = {'question':'Sentences'}, inplace = True)
        Article_Data_Cord_File_DF_Ques_Use_3.rename(columns = {'narrative':'Sentences'}, inplace = True)
        Article_Data_Cord_File_DF_Ques_Use_1['Type'] = Article_Data_Cord_File_DF_Ques_Use_1.shape[0] * ['Query']
        Article_Data_Cord_File_DF_Ques_Use_2['Type'] = Article_Data_Cord_File_DF_Ques_Use_2.shape[0] * ['Question']
        Article_Data_Cord_File_DF_Ques_Use_3['Type'] = Article_Data_Cord_File_DF_Ques_Use_2.shape[0] * ['Narrative']
In [24]: del Article_Data_Cord_File_DF_Ques_Use
        Article_Data_Cord_File_DF_Ques_Use = pd.DataFrame()
In [25]: Article_Data_Cord_File_DF_Ques_Use = pd.concat([Article_Data_Cord_File_DF_Ques_Use_1,Article_Data_Cord_File_DF_Ques_Use_2,Article_Data_Cord_File_DF_Ques_Use_3],ignore_index=True)
In [26]: Article_Data_Cord_File_DF_Ques_Use['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Ques_Use['Doc_Id_Meta_Parse'].progress_apply(str)
                      | 0/600 [00:00<?, ?it/s]
        Concatenating the Abstract, Body Text and Questions for Doc2Vec Model (Gensim)
In [27]: Article_Data_Cord_File_DF_Abstract_Body_Text_Ques = pd.concat([Article_Data_Cord_File_DF_Abstract, Article_Data_Cord_File_DF_Body_Text, Article_Data_Cord_File_DF_Ques_Use], ignore_index=True)
In [28]: Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent = Article_Data_Cord_File_DF_Abstract_Body_Text_Ques['Sentences'].to_list()
        Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Tags = Article_Data_Cord_File_DF_Abstract_Body_Text_Ques['Doc_Id_Meta_Parse'].to_list()
        Creating Tagged Documents for Doc2Vec Model (Gensim)
In [29]: import gensim
         for Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent_Sub in tqdm(Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent):
            Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent[k] = gensim.models.doc2vec.TaggedDocument(Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent_Sub, Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Tags[k])
                      | 0/979097 [00:00<?, ?it/s]
In [31]: Article_Data_Cord_File_DF_Abstract_Body_Text_Ques['Sentences_Tags'] = Article_Data_Cord_File_List_Abstract_Body_Text_Ques_Sent
        Creating Doc2Vec Model and Training it (Gensim)
In [32]: Doc2Vec_Model_Abstract_Body_Text_Ques = gensim.models.doc2vec.Doc2Vec(vector_size=100, min_count=2, epochs=20, workers=4)
In [33]: Doc2Vec_Model_Abstract_Body_Text_Ques.build_vocab(Article_Data_Cord_File_DF_Abstract_Body_Text_Ques['Sentences_Tags'].to_list())
In [34]: Doc2Vec_Model_Abstract_Body_Text_Ques.train(Article_Data_Cord_File_DF_Abstract_Body_Text_Ques.epochs)

To a contract_Body_Text_Ques.train(Article_Data_Cord_File_DF_Abstract_Body_Text_Ques.epochs)
        Loading the Abstract Tokens for Doc2Vec Model Sentence Embeddings (Gensim)
In [35]: Article_Data_Cord_File_DF_Abstract_Tokens = pd.read_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_abstract_tokens.pkl")
In [36]: Article_Data_Cord_File_DF_Abstract['Sentence Embeddings'] = Article_Data_Cord_File_DF_Abstract_Tokens['Abstract_Tokens'].progress_apply(Doc2Vec_Model_Abstract_Body_Text_Ques.infer_vector)
                      | 0/122754 [00:00<?, ?it/s]
In [37]: Article_Data_Cord_File_DF_Abstract.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_abstract_sentence_embeddings_gensim.pkl")
        Loading the Body Text Tokens for Doc2Vec Model Sentence Embeddings (Gensim)
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In [38]: Article_Data_Cord_File_DF_Body_Text_Tokens = pd.read_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_body_text_tokens.pkl") In [39]: Article_Data_Cord_File_DF_Body_Text['Sentence Embeddings'] = Article_Data_Cord_File_DF_Body_Text_Tokens['Body_Text_Tokens'].progress_apply(Doc2Vec_Model_Abstract_Body_Text_Ques.infer_vector)

| 0/855743 [00:00<?, ?it/s] In [40]: Article_Data_Cord_File_DF_Body_Text.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_body_text_sentence_embeddings_gensim.pkl")

Creating Sentence Embeddings of Questions

In [41]: Article_Data_Cord_File_DF_Ques.rename(columns = {'number':'Doc_Id_Meta_Parse', 'query':'Query', 'question':'Question', 'narrative':'Narrative', 'batch':'Batch'}, inplace = True)

In [43]: Article_Data_Cord_File_DF_Ques_Tokens = pd.DataFrame()

import tensorflow as tf

0%|

Article_Data_Cord_File_DF_Ques_Tokens['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Ques['Doc_Id_Meta_Parse'].to_list()

In [44]: Article_Data_Cord_File_DF_Ques_Tokens['Query_Tokens'] = Article_Data_Cord_File_DF_Ques['Query'].progress_apply(tf.keras.preprocessing.text.text_to_word_sequence)

Article_Data_Cord_File_DF_Ques_Tokens['Question_Tokens'] = Article_Data_Cord_File_DF_Ques['Question'].progress_apply(tf.keras.preprocessing.text.text_to_word_sequence) Article_Data_Cord_File_DF_Ques_Tokens['Narrative_Tokens'] = Article_Data_Cord_File_DF_Ques['Narrative'].progress_apply(tf.keras.preprocessing.text.text_to_word_sequence) 0%| | 0/200 [00:00<?, ?it/s]

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Article_Data_Cord_File_DF_Ques_Tokens['Batch'] = Article_Data_Cord_File_DF_Ques['Batch'].to_list()

In [46]: Article_Data_Cord_File_DF_Ques_Tokens.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_ques_tokens.pkl")

In [47]: Article_Data_Cord_File_DF_Ques.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_ques.pkl")

In [48]: Article_Data_Cord_File_DF_Ques['Query Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques_Tokens'].progress_apply(Doc2Vec_Model_Abstract_Body_Text_Ques.infer_vector) Article_Data_Cord_File_DF_Ques['Question Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques_Tokens['Question_Tokens'].progress_apply(Doc2Vec_Model_Abstract_Body_Text_Ques.infer_vector) Article_Data_Cord_File_DF_Ques['Narrative Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques_Tokens['Narrative_Tokens'].progress_apply(Doc2Vec_Model_Abstract_Body_Text_Ques.infer_vector)

| 0/200 [00:00<?, ?it/s] 0% | 0/200 [00:00<?, ?it/s] | 0/200 [00:00<?, ?it/s]

return np.concatenate((row_query,row_question,row_narrative),axis=0)

In [49]: def row_concatenate_embeddings(row_query,row_question,row_narrative):

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In [52]: Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'],x['Question S
                           | 0/200 [00:00<?, ?it/s]
In [53]: Article_Data_Cord_File_DF_Abstract_Body_Text_Ques.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_abstract_body_text_ques.pkl")
In [54]: Article_Data_Cord_File_DF_Ques.to_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df_abstract_body_text_ques_sentence_embeddings_gensim.pkl")
          Loading Cord-19 Sentence Embeddings
In [55]: from gensim.models import KeyedVectors
          Cord_19_Doc_Embeddings = KeyedVectors.load_word2vec_format(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\cord_19_embeddings_filtered.csv",no_header=True,binary=False)
In [56]: Cord_19_Doc_Embeddings_DF = pd.DataFrame()
          Cord_19_Doc_Embeddings_DF = Cord_19_Doc_Embeddings_DF.astype('object')
          Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'] = list(Cord_19_Doc_Embeddings.index_to_key)
          Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'] = Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'].fillna('')
          Cord_19_Doc_Embeddings_DF['Document Embeddings'] = list(Cord_19_Doc_Embeddings.vectors)
In [57]: Cord_19_Doc_Embeddings_DF = Cord_19_Doc_Embeddings_DF.loc[~(Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'] == ''),:].reset_index(drop=True)
          Padding the Sentence Embeddings of Questions, Abstract and Body Text to have equal Dimension
In [58]: Cord_19_Length_Concate_Ques = Cord_19_Doc_Embeddings'][0].shape[0] - Article_Data_Cord_File_DF_Ques['Concatenated Sentence Embeddings'][0].shape[0]
          Cord_19_Length_Mean_Ques = Cord_19_Doc_Embeddings'][0].shape[0] - Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'][0].shape[0]
          Cord_19_Length_Abstract = Cord_19_Doc_Embeddings_DF['Document Embeddings'][0].shape[0] - Article_Data_Cord_File_DF_Abstract['Sentence Embeddings'][0].shape[0]
          Cord_19_Length_Body_Text = Cord_19_Doc_Embeddings_DF['Document Embeddings'][0].shape[0] - Article_Data_Cord_File_DF_Body_Text['Sentence Embeddings'][0].shape[0]
In [59]: def row_padding_embeddings(row_embeddings,row_dimension):
               return np.pad(row_embeddings, (0, row_dimension), 'constant', constant_values=-1)
In [60]: Article_Data_Cord_File_DF_Ques['Concatenated Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques['Concatenated Sentence Embeddings'].progress_apply(row_padding_embeddings,args=(Cord_19_Length_Concate_Ques,))
          Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'] = Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'].progress_apply(row_padding_embeddings,args=(Cord_19_Length_Mean_Ques,))
          Article_Data_Cord_File_DF_Abstract['Sentence Embeddings'] = Article_Data_Cord_File_DF_Abstract['Sentence Embeddings'].progress_apply(row_padding_embeddings,args=(Cord_19_Length_Abstract,))
          Article_Data_Cord_File_DF_Body_Text['Sentence Embeddings'] = Article_Data_Cord_File_DF_Body_Text['Sentence Embeddings'].progress_apply(row_padding_embeddings,args=(Cord_19_Length_Body_Text,))
                            | 0/200 [00:00<?, ?it/s]
             0%|
                            | 0/200 [00:00<?, ?it/s]
             0%|
                            | 0/122754 [00:00<?, ?it/s]
                            | 0/855743 [00:00<?, ?it/s]
          Loading Titles of All Documents in Cord-19
In [61]: Article_Data_Cord_File_DF = pd.read_pickle(r"D:\UoA\Tri 2\Big Data Analysis and Projects\Week 8\archive\cord_19_embeddings\article_data_cord_19_file_df.pkl")
In [62]: Article_Data_Cord_File_DF = Article_Data_Cord_File_DF.loc[Article_Data_Cord_File_DF['Doc_Id_Meta_Parse'].isin(list(Article_Data_Cord_File_DF_Abstract['Doc_Id_Meta_Parse'].unique())),:]
          Article_Data_Cord_File_DF = Article_Data_Cord_File_DF.loc[:,['Doc_Id_Meta_Parse','Title_Meta_Parse']].reset_index(drop=True)
In [63]: import gc
          gc.collect()
          print('',end='')
          Concatening Abstract and Body Text
          Article_Data_Cord_File_DF_Abstract_Body_Text = pd.concat([Article_Data_Cord_File_DF_Abstract,Article_Data_Cord_File_DF_Body_Text],ignore_index=True)
          Filtering Cord IDS
In [65]: Article_Data_Cord_File_DF_Result.columns = ['Ques_Id_Meta_Parse','1','Doc_Id_Meta_Parse','Relevance Score','Batch']
In [66]: Article_Data_Cord_File_DF_Abstract_Body_Text = pd.merge(Article_Data_Cord_File_DF_Result[['Doc_Id_Meta_Parse']], Article_Data_Cord_File_DF_Abstract_Body_Text, on="Doc_Id_Meta_Parse", how="inner")
In [67]: Article_Data_Cord_File_DF_Abstract_Body_Text.reset_index(drop=True,inplace=True)
In [68]: Cord_19_Doc_Embeddings_DF = pd.merge(Cord_19_Doc_Embeddings_DF,Article_Data_Cord_File_DF_Result[['Doc_Id_Meta_Parse']], on="Doc_Id_Meta_Parse", how="inner")
In [69]: Cord_19_Doc_Embeddings_DF.reset_index(drop=True,inplace=True)
          Extracting Relevant Sentences (Doc2Vec Question Embedding Model)
In [70]: from scipy.spatial import distance
In [71]: from IPython.display import display, HTML
In [72]: pd.set_option('display.max_colwidth', None)
In [73]: summation = 0
           for Concat_Embeddings, Concat_Ques_ID in tqdm(zip(Article_Data_Cord_File_DF_Ques['Question Sentence Embeddings'],Article_Data_Cord_File_DF_Ques['Doc_Id_Meta_Parse']),total=Article_Data_Cord_File_DF_Ques.shape[0]):
               Concat_Embeddings = np.pad(Concat_Embeddings, (0, 668), 'constant', constant_values=-1)
               Cord_19_Doc_Embeddings_DF_Docu = pd.DataFrame()
               Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'] = Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'].copy()
               Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = Cord_19_Doc_Embeddings_DF['Document Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
               Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = 1 - Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine']
               Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.sort_values(by='Document Embeddings Cosine',ascending=False).reset_index(drop=True)
               Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.iloc[0:50]
               Cord_19_Doc_Embeddings_DF_Docu_List_ID = Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'].to_list()
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin = Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc].
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = pd.DataFrame()
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Doc_Id_Meta_Parse']
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentences'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentences']
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Type'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Type']
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentence Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = 1 - Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine']
               Article_Data_Cord_File_DF_Relevant_Sentences = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.groupby(['Doc_Id_Meta_Parse'], sort=False, as_index=False)['Sentence Embeddings Cosine'].idxmax()
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.iloc[Article_Data_Cord_File_DF_Relevant_Sentences['Sentence Embeddings Cosine'].to_list()]
               Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.reset_index(drop=True,inplace=True)
               Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'].to_list()
               Article_Data_Cord_File_DF_Docu = Article_Data_Cord_File_DF.loc[Article_Data_Cord_File_DF['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu),:]
               Article_Data_Cord_File_DF_Docu.reset_index(drop=True,inplace=True)
               Article_Data_Cord_File_DF_Docu_Rel_Sen = pd.merge(Article_Data_Cord_File_DF_Docu,Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu, on="Doc_Id_Meta_Parse", how="inner")
               Article_Data_Cord_File_List_Docu_Rel_Sen = Article_Data_Cord_File_DF_Docu_Rel_Sen['Doc_Id_Meta_Parse'].to_list()
               Article_Data_Cord_File_DF_Result_Docu = Article_Data_Cord_File_DF_Result.loc[(Article_Data_Cord_File_DF_Result['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Docu_Rel_Sen)),:]
               sum_sub = Article_Data_Cord_File_DF_Result_Docu['Relevance Score'][0:10].sum()
               summation = summation+sum_sub
           print('\n')
           print('\033[1m' + 'The Relevance Score of Question Sentence Embedding is:' + '\033[0m' + '\n')
          print(summation)
          print('\n')
                           | 0/200 [00:00<?, ?it/s]
          The Relevance Score of Question Sentence Embedding is:
          Extracting Relevant Sentences (Doc2Vec Mean Embedding Model)
In [74]: summation = 0
           for Concat_Embeddings, Concat_Ques_ID in tqdm(zip(Article_Data_Cord_File_DF_Ques['Mean Sentence Embeddings'],Article_Data_Cord_File_DF_Ques['Doc_Id_Meta_Parse']),total=Article_Data_Cord_File_DF_Ques.shape[0]);
               Cord_19_Doc_Embeddings_DF_Docu = pd.DataFrame()
```

In [50]: Article_Data_Cord_File_DF_Ques['Concatenated Sentence Embeddings'],x['Question Sentence Embeddings'

| 0/200 [00:00<?, ?it/s]

In [51]: def row_mean_embeddings(row_query,row_question,row_narrative):

return np.mean((row_query,row_question,row_narrative),axis=0)

```
Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'] = Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'].copy()
    Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = Cord_19_Doc_Embeddings_DF['Document Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
    Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = 1 - Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine']
    Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.sort_values(by='Document Embeddings Cosine',ascending=False).reset_index(drop=True)
    Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.iloc[0:50]
    Cord_19_Doc_Embeddings_DF_Docu_List_ID = Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin = Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc].reset_index(drop=True)
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = pd.DataFrame()
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Doc_Id_Meta_Parse']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentences'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentences']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Type'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Type']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentence Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = 1 - Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine']
    Article_Data_Cord_File_DF_Relevant_Sentences = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.groupby(['Doc_Id_Meta_Parse'], sort=False, as_index=False)['Sentence Embeddings Cosine'].idxmax()
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.iloc[Article_Data_Cord_File_DF_Relevant_Sentences['Sentence Embeddings Cosine'].to_list()]
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.reset_index(drop=True,inplace=True)
    Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Docu = Article_Data_Cord_File_DF.loc[Article_Data_Cord_File_DF['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu),:]
    Article_Data_Cord_File_DF_Docu.reset_index(drop=True,inplace=True)
    Article_Data_Cord_File_DF_Docu_Rel_Sen = pd.merge(Article_Data_Cord_File_DF_Docu,Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu, on="Doc_Id_Meta_Parse", how="inner")
    Article_Data_Cord_File_List_Docu_Rel_Sen = Article_Data_Cord_File_DF_Docu_Rel_Sen['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Result_Docu = Article_Data_Cord_File_DF_Result.loc[(Article_Data_Cord_File_DF_Result['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Docu_Rel_Sen)),:]
    sum_sub = Article_Data_Cord_File_DF_Result_Docu['Relevance Score'][0:10].sum()
    summation = summation+sum_sub
print('\n')
print('\033[1m' + 'The Relevance Score of Mean Sentence Embedding is:' + '\033[0m' + '\n')
print(summation)
print('\n')
             0/200 [00:00<?, ?it/s]
```

Extracting Relevant Sentences (Doc2Vec Concatenated Embedding Model)

The Relevance Score of Mean Sentence Embedding is:

600

```
for Concat_Embeddings, Concat_Ques_ID in tqdm(zip(Article_Data_Cord_File_DF_Ques['Concatenated Sentence Embeddings'],Article_Data_Cord_File_DF_Ques['Doc_Id_Meta_Parse']),total=Article_Data_Cord_File_DF_Ques.shape[0]):
    Cord_19_Doc_Embeddings_DF_Docu = pd.DataFrame()
    Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'] = Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'].copy()
    Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = Cord_19_Doc_Embeddings_DF['Document Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
    Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = 1 - Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine']
    Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.sort_values(by='Document Embeddings Cosine',ascending=False).reset_index(drop=True)
    Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.iloc[0:50]
    Cord_19_Doc_Embeddings_DF_Docu_List_ID = Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Abstract_Body_Text.Fin = Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc[(Article_Data_Cord_File_DF_Abstract_Body_Text.loc].
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = pd.DataFrame()
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Doc_Id_Meta_Parse']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentences'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentences']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Type'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Type']
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentence Embeddings'].apply(distance.cosine, args=(Concat_Embeddings,))
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = 1 - Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine']
    Article_Data_Cord_File_DF_Relevant_Sentences = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.groupby(['Doc_Id_Meta_Parse'], sort=False, as_index=False)['Sentence Embeddings Cosine'].idxmax()
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.iloc[Article_Data_Cord_File_DF_Relevant_Sentences['Sentence Embeddings Cosine'].to_list()]
    Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.reset_index(drop=True,inplace=True)
    Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Docu = Article_Data_Cord_File_DF.loc[Article_Data_Cord_File_DF['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu),:]
    Article_Data_Cord_File_DF_Docu.reset_index(drop=True,inplace=True)
    Article_Data_Cord_File_DF_Docu_Rel_Sen = pd.merge(Article_Data_Cord_File_DF_Docu,Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu, on="Doc_Id_Meta_Parse", how="inner")
    Article_Data_Cord_File_List_Docu_Rel_Sen = Article_Data_Cord_File_DF_Docu_Rel_Sen['Doc_Id_Meta_Parse'].to_list()
    Article_Data_Cord_File_DF_Result_Docu = Article_Data_Cord_File_DF_Result.loc[(Article_Data_Cord_File_DF_Result['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Docu_Rel_Sen)),:]
    sum_sub = Article_Data_Cord_File_DF_Result_Docu['Relevance Score'][0:10].sum()
    summation = summation+sum_sub
print('\033[1m' + 'The Relevance Score of Concatenated Sentence Embedding is:' + '\033[0m' + '\n')
print(summation)
print('\n')
  0%|
              | 0/200 [00:00<?, ?it/s]
The Relevance Score of Concatenated Sentence Embedding is:
```

```
if Cord_19_User_Input == 'Close':
elif Cord_19_User_Input == 'List All Questions':
  display(HTML(Article_Data_Cord_File_DF_Ques[['Question']].copy().to_html()))
elif ~(Article_Data_Cord_File_DF_Ques['Question'].isin([Cord_19_User_Input]).any()):
  print("\nPlease Enter Another Question, the Sentence Embeddings does not exist for this Question")
   continue
else:
Cord_19_Doc_Embeddings_DF_Docu = pd.DataFrame()
Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'] = Cord_19_Doc_Embeddings_DF['Doc_Id_Meta_Parse'].copy()
Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings'].progress_apply(distance.cosine, args=(Article_Data_Cord_File_DF_Ques.loc[Article_Data_Cord_File_DF_Ques.loc[Article_Data_Cord_File_DF_Ques.loc[Article_Data_Cord_File_DF_Ques.loc],))
Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine'] = 1 - Cord_19_Doc_Embeddings_DF_Docu['Document Embeddings Cosine']
Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.sort_values(by='Document Embeddings Cosine',ascending=False).reset_index(drop=True)
Cord_19_Doc_Embeddings_DF_Docu = Cord_19_Doc_Embeddings_DF_Docu.iloc[0:50]
Cord_19_Doc_Embeddings_DF_Docu_List_ID = Cord_19_Doc_Embeddings_DF_Docu['Doc_Id_Meta_Parse'].to_list()
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin = Article_Data_Cord_File_DF_Abstract_Body_Text['Doc_Id_Meta_Parse'].isin(Cord_19_Doc_Embeddings_DF_Docu_List_ID),:].reset_index(drop=True)
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = pd.DataFrame()
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Doc_Id_Meta_Parse']
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentences'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Sentences']
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Type'] = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin['Type']
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings'].reset_index(drop=True)[0],))

Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings'].reset_index(drop=True)[0],))

Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine'] = 1 - Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Sentence Embeddings Cosine']
Article_Data_Cord_File_DF_Relevant_Sentences = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.groupby(['Doc_Id_Meta_Parse'], sort=False, as_index=False)['Sentence Embeddings Cosine'].idxmax()
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.iloc[Article_Data_Cord_File_DF_Relevant_Sentences['Sentence Embeddings Cosine'].to_list()]
Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu.reset_index(drop=True,inplace=True)
Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu = Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu['Doc_Id_Meta_Parse'].to_list()
Article_Data_Cord_File_DF_Docu = Article_Data_Cord_File_DF.loc[Article_Data_Cord_File_DF['Doc_Id_Meta_Parse'].isin(Article_Data_Cord_File_List_Abstract_Body_Text_Fin_Docu),:]
Article_Data_Cord_File_DF_Docu.reset_index(drop=True,inplace=True)
Article_Data_Cord_File_DF_Docu_Rel_Sen = pd.merge(Article_Data_Cord_File_DF_Docu,Article_Data_Cord_File_DF_Abstract_Body_Text_Fin_Docu, on="Doc_Id_Meta_Parse", how="inner")
print('\033[1m' + 'The Loaded Meta Dataset is:' + '\033[0m' + '\n')
display(HTML(Article_Data_Cord_File_DF_Docu_Rel_Sen.loc[0:9,['Title_Meta_Parse','Sentences']].to_html()))
print('\n')
```

0 1 2 3	what is	Question s the origin of COVID-19
3	how does the coronavirus respond to will SARS-CoV2 infected people develop immunity? Is cre	changes in the weather
4	what cause what drugs have been active against SARS-CoV or SARS-C	es death from Covid-19? CoV-2 in animal studies?
5 6	what types of rapid testing for Covid-19	tibodies to coronavirus?
7 8	how has lack of testing availability led to underreporting of true	e incidence of Covid-19? OVID-19 affected Canada
9 10	has social distancing had an impact on slowing the what are the guidelines for triaging patients info	
11 12	what are best practices in hospitals and at home in r	
13 14	what evidence is there related to CC how long can the coronavir	
15 16	how long does coronavirus rer are there any clinical trials avail	
17 18	what are the best masks for preventing what type of hand sanitizer is need.	g infection by Covid-19?
19	are patients taking Angiotensin-converting enzyme inhibitors (ACE) at incre	eased risk for COVID-19?
21	are cardiac complications likely in put what kinds of complications related to COVID-19 are associ	patients with COVID-19?
23	what kinds of complications related to COVID-19 are a	associated with diabetes
24 25		symptoms of Covid-19?
26 27	what is known about those infected with Covid-19 what evidence is there for the value of hydroxychloroqui	,
28 wh 29	nich SARS-CoV-2 proteins-human proteins interactions indicate potential for drug targets. Are there approved drugs that can be repurposed bas is remdesivir an effective	
30 31	what is how does the coronavirus respond to	s the origin of COVID-19 changes in the weather
32 33	will SARS-CoV2 infected people develop immunity? Is crew	oss protection possible? es death from Covid-19?
34 35	what drugs have been active against SARS-CoV or SARS-C	
36 37	are there serological tests that detect an	
38 39	how has CO has social distancing had an impact on slowing t	VID-19 affected Canada he spread of COVID-19?
40	what are the guidelines for triaging patients inf	fected with coronavirus?
41 42 43	what are best practices in hospitals and at home in respect to the transmission what evidence is there related to CC	n routes of coronavirus?
43 44 45	what evidence is there related to CC how long can the coronavirus rer	rus live outside the body
45 46	how long does coronavirus rer are there any clinical trials avail	able for the coronavirus
47 48	what are the best masks for preventing what type of hand sanitizer is need	ed to destroy Covid-19?
49 50	are patients taking Angiotensin-converting enzyme inhibitors (ACE) at incre what are the mortality rates overall and	d in specific populations
51 52	are cardiac complications likely in positions what kinds of complications related to COVID-19 are associ	ated with hypertension?
53 54	what kinds of complications related to COVID-19 are a	
55 56	what are the initial what is known about those infected with Covid-19	symptoms of Covid-19? but are asymptomatic?
57 58 wh	what evidence is there for the value of hydroxychloroquinich SARS-CoV-2 proteins-human proteins interactions indicate potential for drug targets. Are there approved drugs that can be repurposed based	_
59 60	is remdesivir an effective How does the coronavirus	treatment for COVID-19
61 62	Does SARS-CoV-2 have any subtypes, What vaccine candidates are bei	
63 64	What are the longer-term complications of those who r	recover from COVID-19?
65 66		s the origin of COVID-19
67	will SARS-CoV2 infected people develop immunity? Is cre	oss protection possible?
68 69	what drugs have been active against SARS-CoV or SARS-C	
70 71	what types of rapid testing for Covid-19	·
72 73	how has lack of testing availability led to underreporting of true	e incidence of Covid-19? OVID-19 affected Canada
74 75	has social distancing had an impact on slowing the social distance had a social dist	
76 77	what are best practices in hospitals and at home in r	
78 79	what evidence is there related to CC how long can the coronavir	
80 81	how long does coronavirus rer are there any clinical trials avail	
82 83	what are the best masks for preventing what type of hand sanitizer is need	-
84 85	are patients taking Angiotensin-converting enzyme inhibitors (ACE) at incre	eased risk for COVID-19?
86 87	are cardiac complications likely in possible what kinds of complications related to COVID-19 are associ	patients with COVID-19?
88	what kinds of complications related to COVID-19 are a	associated with diabetes
89 90		symptoms of Covid-19?
91 92	what is known about those infected with Covid-19 what evidence is there for the value of hydroxychloroquin	ne in treating Covid-19?
93 wh 94	nich SARS-CoV-2 proteins-human proteins interactions indicate potential for drug targets. Are there approved drugs that can be repurposed bas	sed on this information?
95	How does the coronavirus	
96	Does SARS-CoV-2 have any subtypes,	treatment for COVID-19 differ from seasonal flu?
97	Does SARS-CoV-2 have any subtypes, What vaccine candidates are bei What are the longer-term complications of those who re	treatment for COVID-19 differ from seasonal flu? and if so what are they? ing tested for Covid-19?
97 98 99	What vaccine candidates are bei	differ from seasonal flu? and if so what are they? ing tested for Covid-19? recover from COVID-19?
97 98 99 00	What vaccine candidates are bei What are the longer-term complications of those who r What new public datasets are availab	differ from seasonal flu? and if so what are they? ing tested for Covid-19? recover from COVID-19? fole related to COVID-19? for the SARS-CoV-2 spike? for the SARS-CoV-2 spike?
97 98 99 00 01 02	What vaccine candidates are being what are the longer-term complications of those who really what new public datasets are availabed. What is the protein structure of the world what is the protein structure of the world what is the result of phylogenetic analysis of SARS-Company when the world what is the result of phylogenetic analysis of SARS-Company when the world what is the result of phylogenetic analysis of SARS-Company when the world when the wo	differ from seasonal flu? and if so what are they? ing tested for Covid-19? recover from COVID-19? fle related to COVID-19? f the SARS-CoV-2 spike? oV-2 genome sequence? esis of COVID-19 cases? rome on the COVID-19?
97 98 99 00 01 02 03 04	What vaccine candidates are being what are the longer-term complications of those who reall what new public datasets are available. What is the protein structure of what is the result of phylogenetic analysis of SARS-Co. What is the mechanism of inflammatory response and pathogen what is the mechanism of cytokine storm synd. What are the observed mutations in the SARS-CoV-2 genome and how often on the same control of those who reall what is the mechanism of cytokine storm synd.	differ from seasonal flu? and if so what are they? ing tested for Covid-19? recover from COVID-19? fle related to COVID-19? f the SARS-CoV-2 spike? oV-2 genome sequence? esis of COVID-19 cases? rome on the COVID-19? do the mutations occur?
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	Question	
156	are there serological tests that detect antibodies to coronavirus?	
157	how has lack of testing availability led to underreporting of true incidence of Covid-19	
158	how has COVID-19 affected Canada	
159	has social distancing had an impact on slowing the spread of COVID-19	
160	what are the guidelines for triaging patients infected with coronavirus	
161	what are best practices in hospitals and at home in maintaining quarantine	
162	what are the transmission routes of coronavirus?	
163	what evidence is there related to COVID-19 super spreader	
164	how long can the coronavirus live outside the boo	
165	how long does coronavirus remain stable on surfaces?	
166	are there any clinical trials available for the coronavirus	
167	what are the best masks for preventing infection by Covid-19?	
168	what type of hand sanitizer is needed to destroy Covid-19?	
169	are patients taking Angiotensin-converting enzyme inhibitors (ACE) at increased risk for COVID-19?	
170	what are the mortality rates overall and in specific populations	
171	are cardiac complications likely in patients with COVID-19?	
172	what kinds of complications related to COVID-19 are associated with hypertension?	
173	what kinds of complications related to COVID-19 are associated with diabetes	
174	which biomarkers predict the severe clinical course of 2019-nCOV infection?	
175	what are the initial symptoms of Covid-19?	
176	what is known about those infected with Covid-19 but are asymptomatic?	
177	what evidence is there for the value of hydroxychloroquine in treating Covid-19?	
178	which SARS-CoV-2 proteins-human proteins interactions indicate potential for drug targets. Are there approved drugs that can be repurposed based on this information?	
179	is remdesivir an effective treatment for COVID-19	
180	How does the coronavirus differ from seasonal flu?	
181	Does SARS-CoV-2 have any subtypes, and if so what are they?	
182	What vaccine candidates are being tested for Covid-19?	
183	What are the longer-term complications of those who recover from COVID-19?	
184	What new public datasets are available related to COVID-19?	
185	What is the protein structure of the SARS-CoV-2 spike?	
186	What is the result of phylogenetic analysis of SARS-CoV-2 genome sequence?	
187	What is the mechanism of inflammatory response and pathogenesis of COVID-19 cases?	
188	What is the mechanism of cytokine storm syndrome on the COVID-19?	
189	What are the observed mutations in the SARS-CoV-2 genome and how often do the mutations occur?	
190	What are the impacts of COVID-19 among African-Americans that differ from the rest of the U.S. population?	
191	Does Vitamin D impact COVID-19 prevention and treatment?	
192	How has the COVID-19 pandemic impacted violence in society, including violent crimes?	
193	How much impact do masks have on preventing the spread of the COVID-19?	
194	How has the COVID-19 pandemic impacted mental health?	
195	what evidence is there for dexamethasone as a treatment for COVID-19	
196	what are the health outcomes for children who contract COVID-19	
197	what are the benefits and risks of re-opening schools in the midst of the COVID-19 pandemic?	
198	do individuals who recover from COVID-19 show sufficient immune response, including antibody levels and T-cell mediated immunity, to prevent re-infection?	

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The Loaded Meta Dataset is:

Sentences	Title_Meta_Parse
The recruitment target is 378 patients, recruited from up to 17 sites across Scotland, England and Wales.	0 Nasal Airway Obstruction Study (NAIROS): a phase III, open-label, mixed-methods, multicentre randomised controlled trial of septoplasty versus medical management of a septal deviation with nasal obstruction
These developments provide opportunities to think about biodefense preparedness in new and unique ways.	1 Big Data and Biodefense: Prospects and Pitfalls
increases substrate uptake if the signal surpasses induction threshold, but it does not produce the signal.	2 Simulation Based Exploration of Bacterial Cross Talk Between Spatially Separated Colonies in a Multispecies Biofilm Community
The features of EdNet are domain-agnostic, allowing EdNet to be easily extended to different domains.	3 EdNet: A Large-Scale Hierarchical Dataset in Education
We assume that all building services and business processes are needed/active at the time of the assessment.	4 Putting Attacks in Context: A Building Automation Testbed for Impact Assessment from the Victim's Perspective
Parisa Ghelichkhani: 0000-0003-3763-7999 Maryam Esmaeili: 0000-0002-4798-2270\nNo fund has been received.	5 Prone Position in Management of COVID-19 Patients; a Commentary
The second round of open-inquiry projects were completed start-to-finish under pandemic restrictions.	6 A pandemic-resilient open-inquiry physical science lab course which leverages the Maker movement
The same functional separation may apply even when non-technical teams are internal to an organization.	7 Principles to Practices for Responsible AI: Closing the Gap
However, until now, there is no report in regard to pulmonary function in discharged COVID-19 survivors.	8 Abnormal pulmonary function in COVID-19 patients at time of hospital discharge
Participants were invited to share questions through an online portal prior to and during the webinar.	9 Coronavirus concerns: What do women with gynecologic cancer need to know during the COVID-19 crisis?

what is known about an mRNA vaccine for the SARS-CoV-2 virus?