CWordTM Toolkit Usage on the Holy Bible (CUV)

This Jupyter notebook demonstrates how to use the package "CWordTM" on the Holy Bible (Chinese Union Version - Traditional Chinese):

1. Utility Features
2. Text Visualization - Word Cloud
3. Text Summarization
4. Pivot Table
5. OT Quotes
6. Topic Modeling - LDA and BERTopic

In [1]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
# Import the Package CWordTM
import cwordtm
from cwordtm import *
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\User\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\User\AppData\Roaming\nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\User\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     C:\Users\User\AppData\Roaming\nltk_data...
[nltk_data]   Package averaged_perceptron_tagger is already up-to-
[nltk_data]       date!
```

1. Utility Features

In [3]:
```
# Load the whole Bible
bible = "cuv.csv"
cdf = util.load_word(bible, info=True)
```

```
Loading file 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\cuv.csv' ...

Dataset Information:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 31102 entries, 0 to 31101
Data columns (total 9 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   book        31102 non-null  object
 1   book_no     31102 non-null  int64
 2   chapter     31102 non-null  int64
 3   verse       31102 non-null  int64
 4   text        31102 non-null  object
 5   testament   31102 non-null  int64
 6   category    31102 non-null  object
 7   cat         31102 non-null  object
 8   cat_no      31102 non-null  int64
dtypes: int64(5), object(4)
memory usage: 2.1+ MB
```

Extract Partial Scripture

In [4]:
```
# Extract OT Scripture
otdf = util.extract(cdf, testament=0)
```

```
otdf.head()
```

Out[4]:

	book	book_no	chapter	verse	text	testament	category	cat	cat_no
0	Gen	1	1	1	起初　神創造天地。	0	Torah	tor	0
1	Gen	1	1	2	地是空虛混沌．淵面黑暗．　神的靈運行在水面上。	0	Torah	tor	0
2	Gen	1	1	3	神說、要有光、就有了光。	0	Torah	tor	0
3	Gen	1	1	4	神看光是好的、就把光暗分開了。	0	Torah	tor	0
4	Gen	1	1	5	神稱光為晝、稱暗為夜．有晚上、有早晨、這是頭一日。	0	Torah	tor	0

In [5]:
```
# Extract Gospels (The first four book in NT)
gos = util.extract(cdf, category='gos')
gos.head()
```

Out[5]:

	book	book_no	chapter	verse	text	testament	category	cat	cat_no
23145	Mat	40	1	1	亞伯拉罕的後裔、大衛的子孫、耶穌基督的家譜．〔後裔子孫原文都作兒子下同〕	1	Gospel	gos	5
23146	Mat	40	1	2	亞伯拉罕生以撒．以撒生雅各．雅各生猶大和他的弟兄．	1	Gospel	gos	5
23147	Mat	40	1	3	猶大從他瑪氏生法勒斯和謝拉．法勒斯生希斯崙．希斯崙生亞蘭．	1	Gospel	gos	5
23148	Mat	40	1	4	亞蘭生亞米拿達．亞米拿達生拿順．拿順生撒門．	1	Gospel	gos	5
23149	Mat	40	1	5	撒門從喇合氏生波阿斯．波阿斯從路得氏生俄備得．俄備得生耶西．	1	Gospel	gos	5

In [6]:
```
# Extract the Book of Romans
rom = util.extract(cdf, book='Rom')
rom.head()
```

Out[6]:

	book	book_no	chapter	verse	text	testament	category	cat	cat_no
27930	Rom	45	1	1	耶穌基督的僕人保羅、奉召為使徒、特派傳　神的福音．	1	Pauline Epistles	pau	7
27931	Rom	45	1	2	這福音是　神從前藉眾先知、在聖經上所應許的、	1	Pauline Epistles	pau	7
27932	Rom	45	1	3	論到他兒子我主耶穌基督．按肉體說、是從大衛後裔生的、	1	Pauline Epistles	pau	7
27933	Rom	45	1	4	按聖善的靈說、因從死裡復活、以大能顯明是　神的兒子。	1	Pauline Epistles	pau	7
27934	Rom	45	1	5	我們從他受了恩惠、並使徒的職分、在萬國之中叫人為他的名信服真道．	1	Pauline Epistles	pau	7

In [7]:
```
# Extract Verse 28 of Chapter 8 of Romans
rom8_28 = util.extract(cdf, book='Rom', chapter=8, verse=28)
rom8_28.text
```

Out[7]:
```
28143    我們曉得萬事都互相效力、叫愛　神的人得益處、就是按他旨意被召的人。
Name: text, dtype: object
```

In [8]:
```
# Another way to extract Rom 8:28
rom8_28 = util.extract2(cdf, filter='Rom 8:28')
rom8_28.text
```

Out[8]:
```
28143    我們曉得萬事都互相效力、叫愛　神的人得益處、就是按他旨意被召的人。
Name: text, dtype: object
```

In [9]:
```
# Extract Rom 8:1~10
rom8_1_10 = util.extract2(cdf, filter='Rom 8:1-10')
```

```
list(rom8_1_10.text)
```

Out[9]:
```
['如今那些在基督耶穌裡的、就不定罪了。',
 '因為賜生命聖靈的律、在基督耶穌裡釋放了我、使我脫離罪和死的律了。',
 '律法既因肉體軟弱、有所不能行的、\u3000神就差遣自己的兒子、成為罪身的形狀、作了贖罪祭、在肉體中定了罪案．',
 '使律法的義、成就在我們這不隨從肉體、只隨從聖靈的人身上。',
 '因為隨從肉體的人、體貼肉體的事．隨從聖靈的人、體貼聖靈的事。',
 '體貼肉體的就是死．體貼聖靈的乃是生命平安．',
 '原來體貼肉體的、就是與\u3000神為仇．因為不服\u3000神的律法、也是不能服。',
 '而且屬肉體的人、不能得\u3000神的喜歡。',
 '如果\u3000神的靈住在你們心裡、你們就不屬肉體、乃屬聖靈了．人若沒有基督的靈、就不是屬基督的。',
 '基督若在你們心裡、身體就因罪而死、心靈卻因義而活．']
```

2. Text Visualization - Word Cloud

In [10]:
```
# Extract the NT Scripture for Word Cloud
text_list = util.get_text_list(cdf[cdf.testament==1])   # load New Testament Scripture
text_list[:10]
```

Out[10]:
```
['亞伯拉罕的後裔、大衛的子孫、耶穌基督的家譜．〔後裔子孫原文都作兒子下同〕',
 '亞伯拉罕生以撒．以撒生雅各．雅各生猶大和他的弟兄．',
 '猶大從他瑪氏生法勒斯和謝拉．法勒斯生希斯崙．希斯崙生亞蘭．',
 '亞蘭生亞米拿達．亞米拿達生拿順．拿順生撒門．',
 '撒門從喇合氏生波阿斯．波阿斯從路得氏生俄備得．俄備得生耶西．',
 '耶西生大衛王。大衛從烏利亞的妻子生所羅門．',
 '所羅門生羅波安．羅波安生亞比雅．亞比雅生亞撒．',
 '亞撒生約沙法．約沙法生約蘭．約蘭生烏西亞．',
 '烏西亞生約坦．約坦生亞哈斯．亞哈斯生希西家．',
 '希西家生瑪拿西．瑪拿西生亞們．亞們生約西亞．']
```

In [11]:
```
# White background with no image mask
viz.chi_wordcloud(text_list)
```

```
Building prefix dict from the default dictionary ...
Loading model from cache C:\Users\User\AppData\Local\Temp\jieba.cache
Loading Chinese vocabulary 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\bible_vocab.txt' ...
Loading model cost 0.592 seconds.
Prefix dict has been built successfully.
Building prefix dict from C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\dictionary\dict.txt.big.txt ...
Dumping model to file cache C:\Users\User\AppData\Local\Temp\jieba.ufaf52121053d30f6b6740fa1422773b4.cache
Loading model cost 1.243 seconds.
Prefix dict has been built successfully.
C:\Dev\Anaconda3\envs\aiml\lib\site-packages\wordcloud\wordcloud.py:106: MatplotlibDeprecationWarning: The get_cmap function was deprecated in Matplotlib 3.7 and will be removed two minor releases later. Use ``matplotlib.colormaps[name]`` or ``matplotlib.colormaps.get_cmap(obj)`` instead.
  self.colormap = plt.cm.get_cmap(colormap)
```

In [12]:
```
# Use internal image mask
viz.chi_wordcloud(text_list, bg='black', image=1)
```

```
Building prefix dict from C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\dictionary\dict.txt.big.txt ...
Loading model from cache C:\Users\User\AppData\Local\Temp\jieba.ufaf52121053d30f6b6740fa1422773b4.cache
Loading Chinese vocabulary 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\bible_vocab.txt' ...
Loading model cost 0.991 seconds.
Prefix dict has been built successfully.
C:\Dev\Anaconda3\envs\aiml\lib\site-packages\wordcloud\wordcloud.py:106: MatplotlibDeprecationWarning: The get_cmap function was deprecated in Matplotlib 3.7 and will be removed two minor releases later. Use ``matplotlib.colormaps[name]`` or ``matplotlib.colormaps.get_cmap(obj)`` instead.
  self.colormap = plt.cm.get_cmap(colormap)
```

3. Text Summarization

In [13]:
```
# Extract and summarize Chapter 8 of Romans
rom8 = util.extract2(cdf, 'Rom 8')
ta.summary_chi(rom8)
```

```
Building prefix dict from C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\dictionary\dict.txt.big.txt ...
Loading model from cache C:\Users\User\AppData\Local\Temp\jieba.ufaf52121053d30f6b6740fa1422773b4.cache
Loading Chinese vocabulary 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\bible_vocab.txt' ...
Loading model cost 1.001 seconds.
Prefix dict has been built successfully.
```

Out[13]:
```
['因為隨從肉體的人、體貼肉體的事．隨從聖靈的人、體貼聖靈的事',
 '而且屬肉體的人、不能得神的喜歡',
 '如果神的靈住在你們心裡、你們就不屬肉體、乃屬聖靈了．人若沒有基督的靈、就不是屬基督的']
```

4. Pivot Table

Show Bible Scripture Statistics through a Pivot Table

In [14]:
```
pivot.stat(cdf, chi=True)
```

```
Book category information can be shown by invoking 'util.bible_cat_info()'
```

Out[14]:

			chapter	verse	text
category	**book_no**	**book**			
Torah	**1**	**Gen**	50	1533	51460
	2	**Exo**	40	1213	40057
	3	**Lev**	27	859	29228
	4	**Num**	36	1288	41654
	5	**Deu**	34	959	35904
...	**...**	**...**	...	...	...
General Epistles	**65**	**Jud**	1	25	1030
Sub-Total			34	735	25960
Apocalypse	**66**	**Rev**	22	404	15606
Sub-Total			22	404	15606
	Total		1189	31102	1062163

77 rows × 3 columns

In [15]:
```
util.bible_cat_info()
```

Out[15]:

	category	cat	book_list	nbooks
0	Torah	tor	Gen Exo Lev Num Deu	5
1	OT History	oth	Jos Jug Rut 1Sa 2Sa 1Ki 2Ki 1Ch 2Ch Ezr Neh Est	12
2	Ketuvim	ket	Job Psm Pro Ecc Son	5
3	Major Prophets	map	Isa Jer Lam Eze Dan	5
4	Minor Prophets	mip	Hos Joe Amo Oba Jon Mic Nah Hab Zep Hag Zec Mal	12
5	Gospel	gos	Mat Mak Luk Jhn	4
6	NT History	nth	Act	1
7	Pauline Epistles	pau	Rom 1Co 2Co Gal Eph Phl Col 1Ts 2Ts 1Ti 2Ti Ti...	13
8	General Epistles	epi	Heb Jas 1Pe 2Pe 1Jn 2Jn 3Jn Jud	8
9	Apocalypse	apo	Rev	1

5. OT Quotes

Identify Cited Sources in OT Scripture for some NT verses

In [16]:
```
rom10 = util.extract2(cdf, 'Rom 10')
quot.show_quot(rom10, lang='chi')
```

```
Building prefix dict from C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\dictionary\dict.txt.big.txt ...
Loading model from cache C:\Users\User\AppData\Local\Temp\jieba.ufaf52121053d30f6b6740fa1422773b4.cache
Loading Chinese vocabulary 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\bible_vocab.txt' ...
Loading file 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\cuv.csv' ...
Loading file 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\book_categories.csv' ...
( 1) 羅 10:5 摩西寫著說、『人若行那出於律法的義、就必因此活著。』
Loading model cost 1.017 seconds.
Prefix dict has been built successfully.
( 2) 羅 10:6 惟有出於信心的義如此說、『你不要心裡說、誰要升到天上去呢．就是要領下基督來．
( 3) 羅 10:8 他到底怎麼說呢．他說、『這道離你不遠、正在你口裡、在你心裡。』就是我們所傳信主的道。
( 4) 羅 10:11 經上說、『凡信他的人、必不至於羞愧。』
( 5) 羅 10:13 因為『凡求告主名的、就必得救。』
( 6) 羅 10:15 若沒有奉差遣、怎能傳道呢．如經上所記、『報福音傳喜信的人、他們的腳蹤何等佳美。』
( 7) 羅 10:16 只是人沒有都聽從福音．因為以賽亞說、『主阿、我們所傳的有誰信呢。』
     -> 0.6723 賽 53:1    我們所傳的、〔或作所傳與我們的〕有誰信呢．耶和華的膀臂向誰顯露呢。
( 8) 羅 10:18 但我說、人沒有聽見麼．誠然聽見了．『他們的聲音傳遍天下、他們的言語傳到地極。』
( 9) 羅 10:19 我再說、以色列人不知道麼．先有摩西說、『我要用那不成子民的、惹動你們的憤恨．我要用那無知的民、觸動你們的怒氣。』
     -> 0.5403 申 32:21    他們以那不算為神的、觸動我的憤恨、以虛無的神、惹了我的怒氣、我也要以那不成子民的、觸動他們的憤恨、以愚昧的國民、惹了他們的怒氣。
(10) 羅 10:20 又有以賽亞放膽說、『沒有尋找我的、我叫他們遇見．沒有訪問我的、我向他們顯現。』
     -> 0.6651 賽 65:1    素來沒有訪問我的、現在求問我．沒有尋找我的、我叫他們遇見．沒有稱為我名下的、我對他們說、我在這裡、我在這裡。
(11) 羅 10:21 至於以色列人、他說、『我整天伸手招呼那悖逆頂嘴的百姓。』
     -> 0.6086 賽 65:2    我整天伸手招呼那悖逆的百姓、他們隨自己的意念行不善之道．
```

6. Topic Modeling

LDA Model

In [17]:
```
# Build an LDA Model on the NT Scripture
bible = "cuv.csv"
lda = tm.lda_process(bible, cat=2, chi=True, eval=True, timing=True)
```

```
Loading Bible 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\cuv.csv' ...
Corpus loaded!
Text preprocessed!
Text trained!
If no visualization is shown,
  you may execute the following commands to show the visualization:
    > import pyLDAvis
    > pyLDAvis.display(lda.vis_data)
Visualization prepared!

Topics from LDA Model:
[(0,
  '0.018*"說" + 0.010*"基督" + 0.010*"神" + 0.009*"兒子" + 0.007*"耶穌" + 0.007*"作" + '
  '0.006*"不要" + 0.005*"聖靈" + 0.005*"主" + 0.005*"知道"'),
 (1,
  '0.024*"神" + 0.013*"基督" + 0.011*"說" + 0.010*"知道" + 0.010*"沒有" + 0.007*"事" + '
  '0.007*"律法" + 0.006*"榮耀" + 0.006*"作" + 0.006*"耶穌基督"'),
 (2,
  '0.006*"起誓" + 0.005*"文士" + 0.005*"法利賽人" + 0.004*"說" + 0.004*"有禍" + '
  '0.004*"假冒" + 0.004*"為善" + 0.004*"不要" + 0.004*"事" + 0.003*"先知"'),
 (3,
  '0.014*"生" + 0.011*"說" + 0.006*"主" + 0.006*"馬利亞" + 0.005*"天使" + 0.005*"沒有" + '
  '0.005*"神" + 0.005*"事" + 0.004*"作" + 0.004*"撒迦利亞"'),
 (4,
  '0.015*"神" + 0.008*"說" + 0.007*"律法" + 0.007*"作" + 0.006*"沒有" + 0.006*"不可" + '
  '0.005*"主" + 0.004*"一個" + 0.004*"喫" + 0.004*"事"'),
 (5,
  '0.015*"神" + 0.012*"說" + 0.008*"保羅" + 0.007*"看見" + 0.007*"作" + 0.006*"沒有" + '
  '0.005*"天使" + 0.004*"地上" + 0.004*"獸" + 0.004*"死"'),
 (6,
  '0.004*"神" + 0.004*"帳幕" + 0.004*"血" + 0.004*"有人" + 0.004*"弟兄們" + 0.004*"喫" + '
  '0.004*"偶像" + 0.004*"基督" + 0.004*"知道" + 0.003*"不可"'),
 (7,
  '0.055*"說" + 0.040*"耶穌" + 0.011*"一個" + 0.010*"門徒" + 0.009*"沒有" + 0.008*"告訴" '
  '+ 0.008*"看見" + 0.007*"事" + 0.006*"知道" + 0.005*"眾人"'),
 (8,
  '0.020*"說" + 0.006*"沒有" + 0.006*"妻子" + 0.006*"保羅" + 0.006*"作" + 0.005*"丈夫" + '
  '0.005*"神" + 0.005*"天使" + 0.005*"事" + 0.005*"一個"'),
 (9,
  '0.012*"神" + 0.011*"說" + 0.009*"基督" + 0.007*"復活" + 0.006*"沒有" + 0.005*"死" + '
  '0.005*"事" + 0.005*"受" + 0.004*"面前" + 0.004*"不可"')]

Model Evaluation Scores:
  Coherence: 0.290330005285814
  Perplexity: -8.018575847416145
  Topic diversity: 0.004784750953389151
  Topic size distribution: 0.010178117048346057

Finished 'lda_process' in 20.2270 secs
```

In [18]:
```python
# Show LDA Model Visualization
import pyLDAvis
pyLDAvis.display(lda.vis_data)
```

Out[18]:

BERTopic Model

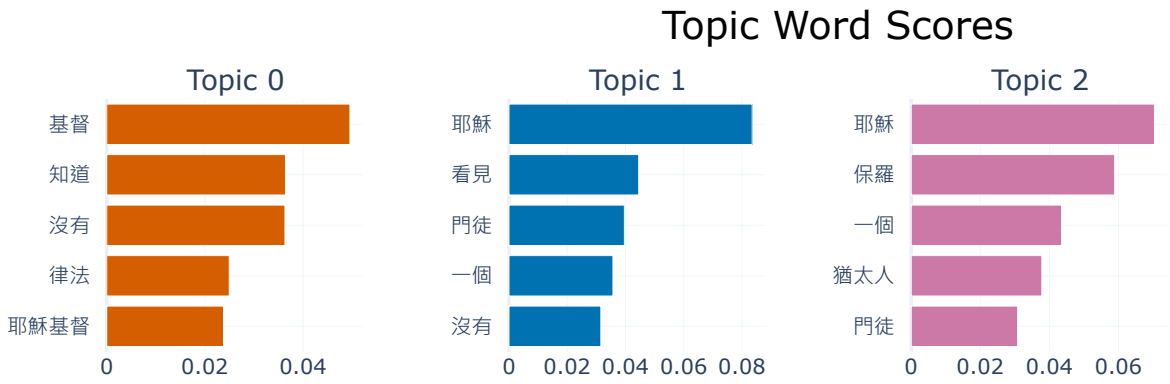
In [19]:
```python
# Build a BERTopic Model on the NT Scripture
btm = tm.btm_process(bible, cat=2, chi=True, eval=True, timing=True)
```

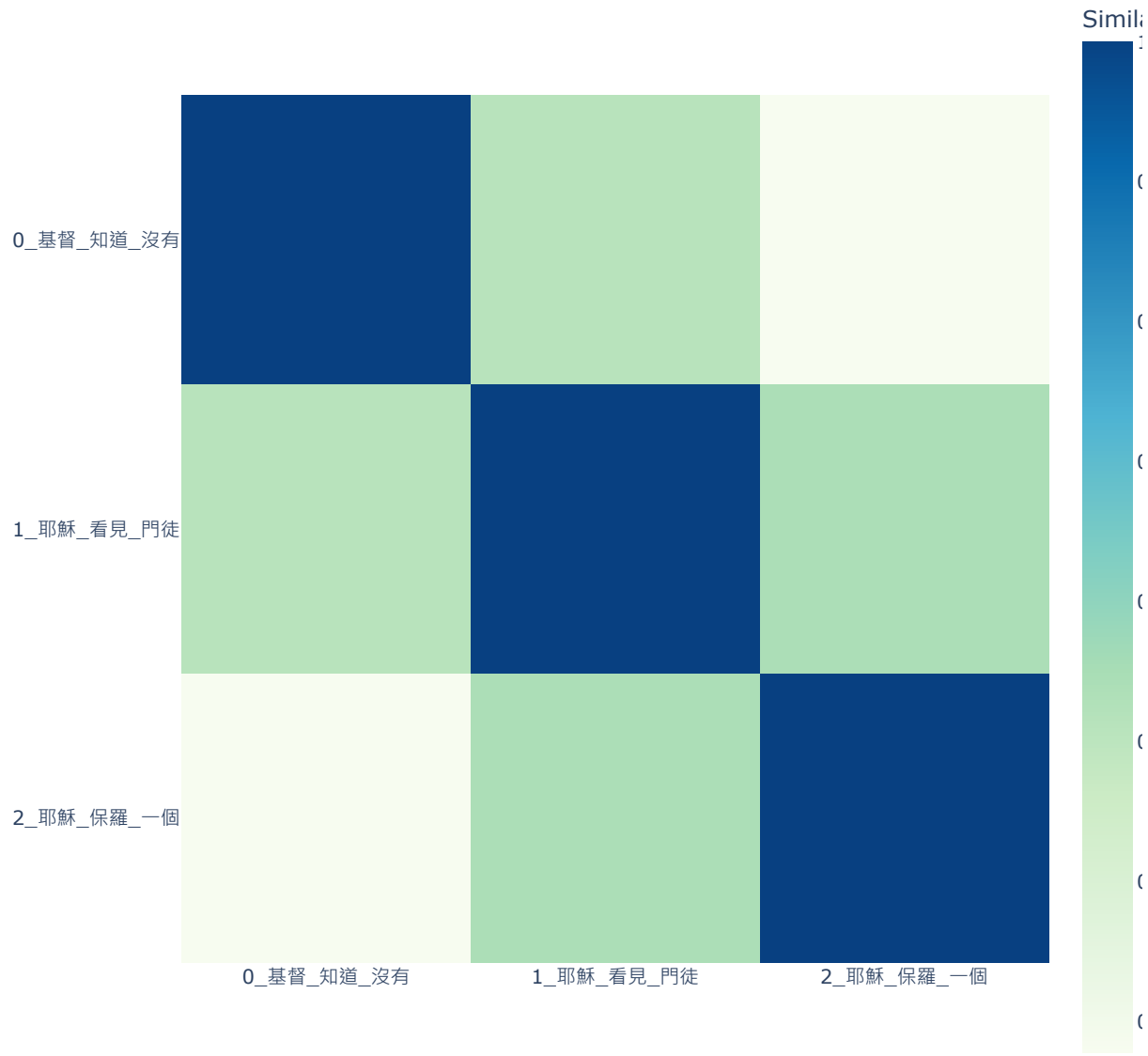
```
Loading Bible 'C:\Dev\Anaconda3\envs\aiml\lib\site-packages\cwordtm\data\cuv.csv' ...
Corpus loaded!
Chinese text preprocessed!
Text trained!

Topics from BERTopic Model:
Topic 0: 基督 | 知道 | 沒有 | 律法 | 耶穌基督 | 耶穌 | 榮耀 | 乃是 | 不可 | 聖靈
Topic 1: 耶穌 | 看見 | 門徒 | 一個 | 沒有 | 告訴 | 聽見 | 天使 | 知道 | 天上
Topic 2: 耶穌 | 保羅 | 一個 | 猶太人 | 門徒 | 彼拉多 | 沒有 | 眾人 | 祭司長 | 看見

Model Evaluation Scores:
  Coherence: 0.41062507286821665

BERTopic Model Visualization:
** No Intertopic Distance Map shown for your text!
```






```
 If no visualization is shown,
   you may execute the following commands one-by-one:
     btm.model.visualize_topics()
     btm.model.visualize_barchart()
     btm.model.visualize_heatmap()

Finished 'btm_process' in 45.6343 secs
```