# Final Project Step 5 Topic Models

```
Course:   DS 5001
Module:   Final
Date:     8 May 2022
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Purpose:  This notebook will utlize the data created in step 2 to get
topic models.
```

In [1]:

```
data_home = "data"
local_lib = "code"
OHCO = ['book_id', 'chap_num', 'para_num', 'sent_num', 'token_num']
SENTS = OHCO[:4]
PARAS = OHCO[:3]
CHAPS = OHCO[:2]
BOOKS = OHCO[:1]
```

In [2]:

```
import pandas as pd
import numpy as np
import plotly_express as px
from sklearn.decomposition import LatentDirichletAllocation as LDA
import sys; sys.path.append(local_lib)
from topicmodel import TopicModel
%matplotlib inline
```

In [3]:

```
LIB = pd.read_csv(f"{data_home}/LIB.csv").set_index(OHCO[:1])
CORPUS = pd.read_csv(f"{data_home}/CORPUS.csv").set_index(OHCO)
VOCAB = pd.read_csv(f"{data_home}/VOCAB.csv").set_index("term_str")
BOW = pd.read_csv(f"{data_home}/BOW.csv").rename(columns = {"Unnamed: 2": "term_str"}).
TFIDF = pd.read_csv(f"{data_home}/TFIDF.csv").set_index(CHAPS)
DOC = pd.read_csv(f"{data_home}/DOC.csv").set_index(CHAPS)
```

In [4]:

```
DOC = DOC.join(LIB, on='book_id')
top2000 = VOCAB.loc[VOCAB["max_pos"].isin(["NN","NNS", "VB", "VBD", "VBG", "VBN", "VBP"
SIGS = top2000.index
```

In [5]:

```
max_iter = 10
X = BOW.n.unstack(fill_value=0)[SIGS]
tm = TopicModel(X)
tm.n_topics = 10
tm.n_terms = 2000
```

In [6]:

```
tm.X
```

Out[6]:

| | term_str | easy | present | fool | big | loved | darkness | steps | shut | age | living | ... | intended |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| book_id | chap_num | | | | | | | | | | | | |
| 1 | 1 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 3.0 | 0.0 | 0.0 | 0.0 | 2.0 | ... | 0.0 |
| | 2 | 1.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | ... | 0.0 |
| | 3 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 0.0 | 0.0 | 2.0 | 2.0 | ... | 0.0 |
| | 4 | 1.0 | 0.0 | 2.0 | 5.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | ... | 0.0 |

| | term_str | easy | present | fool | big | loved | darkness | steps | shut | age | living | ... | intended |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **book_id** | **chap_num** | | | | | | | | | | | | |
| | **5** | 1.0 | 0.0 | 0.0 | 1.0 | 4.0 | 6.0 | 1.0 | 0.0 | 1.0 | 2.0 | ... | 0.0 |
| **...** | **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **26654** | **13** | 1.0 | 2.0 | 0.0 | 0.0 | 4.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | ... | 0.0 |
| | **14** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | ... | 0.0 |
| | **15** | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | ... | 0.0 |
| | **16** | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 1.0 | ... | 0.0 |
| | **17** | 1.0 | 1.0 | 0.0 | 2.0 | 1.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | ... | 0.0 |

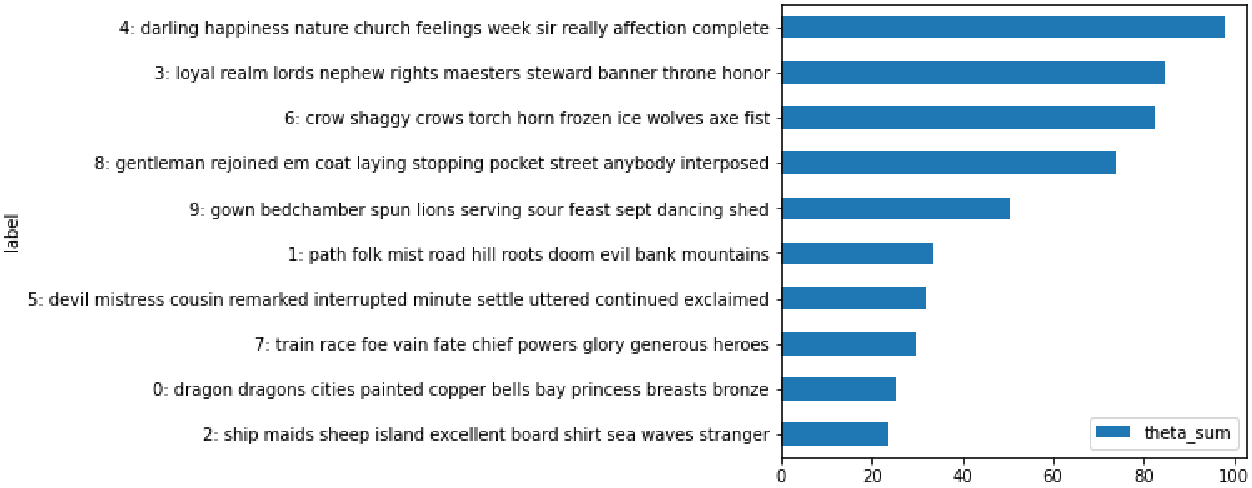
533 rows × 2000 columns

In [7]:
```
tm.get_model()
```

In [8]:
```
tm.describe_topics()
```

In [9]:
```
tm.get_model_stats()
```

In [10]:
```
%matplotlib inline
tm.plot_topics()
```



In [11]:
```
tm.TOPIC.sort_values(by = "theta_sum", ascending = False).head()
```

Out[11]:

| | phi_sum | theta_sum | h | top_terms_rel | top_terms | label |
|---|---|---|---|---|---|---|
| **topic_id** | | | | | | |
| **4** | 65898.574097 | 97.717663 | 10.00 | darling happiness nature church feelings week ... | sir room yes quite house cried course children... | 4: darling happiness nature church feelings we... |
| **3** | 83015.138055 | 84.782980 | 9.91 | loyal realm lords nephew rights maesters stewa... | king father men brother lady son boy red gods ... | 3: loyal realm lords nephew rights maesters st... |

| | phi_sum | theta_sum | h | top_terms_rel | top_terms | label |
|---|---|---|---|---|---|---|
| **topic_id** | | | | | | |
| **6** | 74808.481766 | 82.472930 | 9.90 | crow shaggy crows torch horn frozen ice wolves... | men wall horse sword cold water blood feet hed... | 6: crow shaggy crows torch horn frozen ice wol... |
| **8** | 44638.315175 | 73.849773 | 9.75 | gentleman rejoined em coat laying stopping poc... | replied boy dear gentleman door got room looki... | 8: gentleman rejoined em coat laying stopping ... |
| **9** | 41714.446678 | 50.255888 | 9.63 | gown bedchamber spun lions serving sour feast ... | lady father sister wine door girl gold boy hai... | 9: gown bedchamber spun lions serving sour fea... |

In [12]:

```
LIB
```

Out[12]:

| | book_title | book_file | chap_regex | book_le |
|---|---|---|---|---|
| **book_id** | | | | |
| **1** | A Game of Thrones, by RR Martin | corpus/MARTIN_A_GAME_OF_THRONES-pg1.txt | [A-Z]+[A-Z]+[A-Z]+ | 29 |
| **2** | A Clash of Kings, by RR Martin | corpus/MARTIN_A_CLASH_OF_KINGS-pg2.txt | [A-Z]+[A-Z]+[A-Z]+ | 32 |
| **3** | A Storm of Swords, by RR Martin | corpus/MARTIN_A_STORM_OF_SWORDS-pg3.txt | [A-Z]+[A-Z]+[A-Z]+ | 41 |
| **4** | The Fellowship of the Ring, by JRR Tolkien | corpus/TOLKIEN_THE_FELLOWSHIP_OF_THE_RING-pg4.txt | _Chapter | 18 |
| **16** | Peter Pan, by James M. Barrie | corpus/BARRIE_PETER_PAN-pg16.txt | ((Chapter)\s+\D+) | 4 |
| **730** | Oliver Twist, by Charles Dickens | corpus/DICKENS_OLIVER_TWIST-pg730.txt | ((CHAPTER)\s+\D+) | 16 |
| **768** | Wuthering Heights, by Emily Brontë | corpus/BRONTE_WUTHERING_HEIGHTS-pg768.txt | ((CHAPTER)\s+\D+) | 11 |
| **1260** | Jane Eyre, by Charlotte Brontë | corpus/BRONTE_JANE_EYRE-pg1260.txt | ((CHAPTER)\s+\D+)\|PREFACE | 19 |
| **1400** | Great Expectations, by Charles Dickens | corpus/DICKENS_GREAT_EXPECTATIONS-pg1400.txt | ((Chapter)\s+\D+) | 18 |

| | book_title | book_file | chap_regex | book_le |
|---|---|---|---|---|
| **book_id** | | | | |
| **1727** | The Odyssey, by Homer | corpus/HOMER_THE_ODYSSEY-pg1727.txt | ((BOOK)\s+\D+) | 11 |
| **6130** | The Iliad, by Homer | corpus/HOMER-THE-ILIAD-pg6130.txt | ((BOOK)\s+\D+) | 15 |
| **26654** | Peter and Wendy, by James Matthew Barrie | corpus/BARRIE_PETER_AND_WENDY-pg26654.txt | ((CHAPTER)\s+\D+) | 4 |

In [16]:

```
group_col = 'author'
df = tm.THETA.join(LIB[group_col]).groupby(group_col).mean()
df.style.background_gradient()
```

Out[16]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **author** | | | | | | | | | | |
| **Charles Dickens** | 0.002800 | 0.033934 | 0.003457 | 0.004505 | 0.194960 | 0.064570 | 0.012596 | 0.011092 | 0.669085 | 0.00 |
| **Charles Dickens** | 0.001992 | 0.035530 | 0.014412 | 0.008097 | 0.376252 | 0.010574 | 0.021429 | 0.000806 | 0.507254 | 0.02 |
| **Charlotte Brontë** | 0.003921 | 0.070976 | 0.006616 | 0.010970 | 0.727808 | 0.098067 | 0.007662 | 0.032265 | 0.036124 | 0.00 |
| **Emily Brontë** | 0.003861 | 0.029891 | 0.007618 | 0.003890 | 0.210264 | 0.666408 | 0.006814 | 0.008521 | 0.056340 | 0.00 |
| **Homer** | 0.005023 | 0.015167 | 0.381482 | 0.009298 | 0.036095 | 0.000868 | 0.004920 | 0.510420 | 0.032835 | 0.00 |
| **JRR Tolkien** | 0.004264 | 0.793100 | 0.006570 | 0.021593 | 0.068601 | 0.025450 | 0.022661 | 0.010761 | 0.033679 | 0.01 |
| **James M. Barrie** | 0.000217 | 0.059004 | 0.050472 | 0.000217 | 0.666798 | 0.000217 | 0.114558 | 0.023476 | 0.048622 | 0.03 |
| **RR Martin** | 0.100709 | 0.022533 | 0.006957 | 0.338433 | 0.015326 | 0.003368 | 0.308938 | 0.008190 | 0.004777 | 0.19 |

In [14]:

```
PHI = tm.PHI
TOPIC = tm.TOPIC
THETA = tm.THETA
```

In [15]:

```
PHI.to_csv("data/PHI.csv")
TOPIC.to_csv("data/TOPIC.csv")
THETA.to_csv("data/THETA.csv")
```

In [ ]: