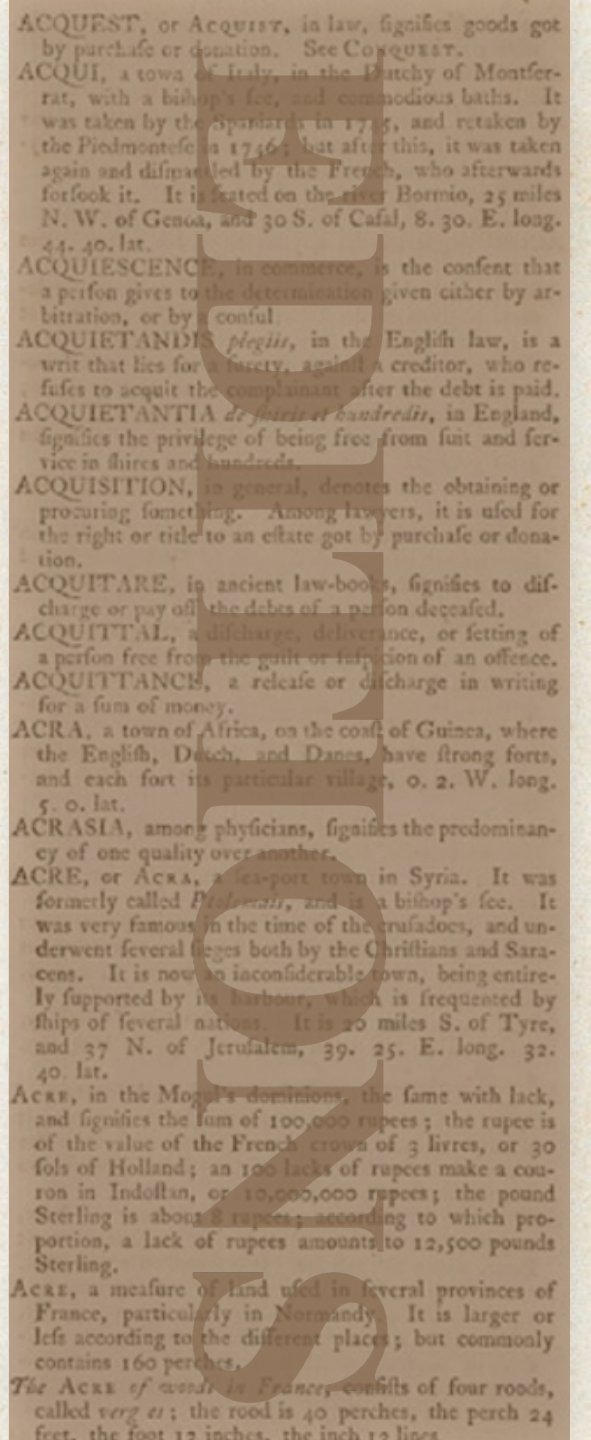
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ACRE, in the Mogul's dominions, the ſame with lack, and ſignifies the ſum of 100,000 rupees; the rupee is of the value of the French crown of 3 livres, or 30 ſols of Holland; an 100 lacks of rupees make a couron in Indoſtan, or 10,000,000 rupees; the pound Sterling is about 8 rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds Sterling.
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Encyclopaedia Britannica

DS4D Group 14

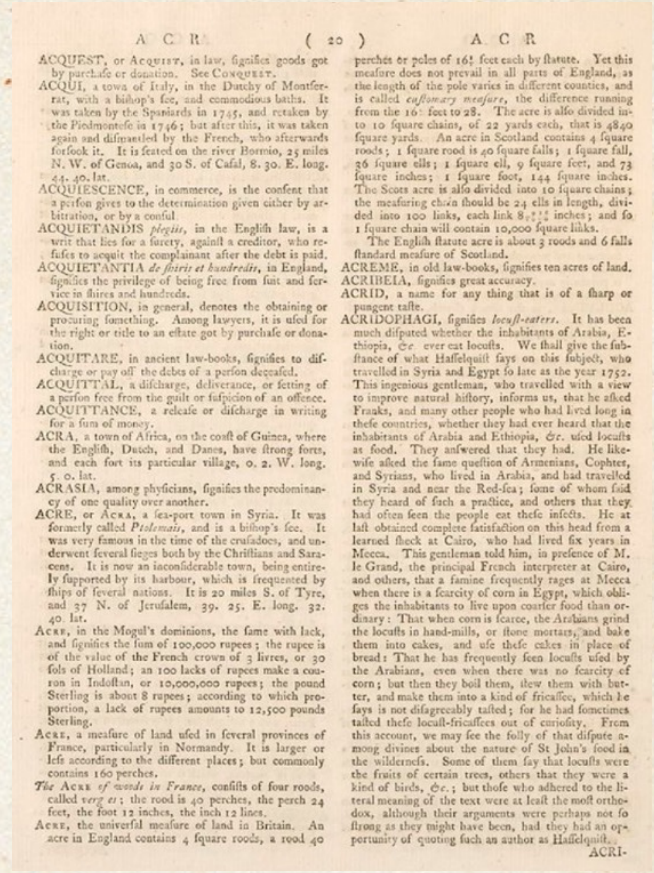
Visual Interactive Projection Installation

Dake Wang, Keren He, Qiuyue Ding, Shijie Chen, Yuhan Ma

Text data comes from OCR

Our text data comes from scanned copies of early encyclopedias. The earliest edition comes from 250 years ago (printing fades, missing), and there are 195 volumes in total. You can imagine how messy the results after scanning are

Original sample



A C R (20) A C R

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ACRE, the univerſal meaſure of land in Britain. An acre in England contains 4 ſquare roods, a rood 40 perches or poles of 16½ feet each by ſtatute. Yet this meaſure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *cuſtomary meaſure*, the difference running from the 16½ feet to 28. The acre is alſo divided into 10 ſquare chains, of 22 yards each, that is 4840 ſquare yards. An acre in Scotland contains 4 ſquare roods; 1 ſquare rood is 40 ſquare falls; 1 ſquare fall, 36 ſquare ells; 1 ſquare ell, 9 ſquare feet, and 73 ſquare inches; 1 ſquare foot, 144 ſquare inches. The Scots acre is alſo divided into 10 ſquare chains; the meaſuring chain ſhould be 24 ells in length, divided into 100 links, each link 8,712 inches; and ſo 1 ſquare chain will contain 10,000 ſquare links.

The Engliſh ſtatute acre is about 3 roods and 6 falls ſtandard meaſure of Scotland.

ACREMER, in old law-books, ſignifies ten acres of land.

ACRIBELIA, ſignifies great accuracy.

ACRID, a name for any thing that is of a ſharp or pungent taſte.

ACRIDOPHAGI, ſignifies *locuſt-eaters*. It has been much diſputed whether the inhabitants of Arabia, Ethiopia, &c. ever eat locuſts. We ſhall give the ſubſtance of what Haſſelquiſt ſays on this ſubject, who travelled in Syria and Egypt ſo late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia and Ethiopia, &c. uſed locuſts as food. They anſwered that they had. He likewiſe aſked the ſame queſtion of Armenians, Cophter, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red-ſea; ſome of whom ſaid they heard of ſuch a practice, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſheck at Cairo, who had lived ſix years in Mecca. This gentleman told him, in preſence of M. le Grand, the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary: That when corn is ſcarce, the Arabians grind the locuſts in hand-mills, or ſtone mortars, and bake them into cakes, and uſe theſe cakes in place of bread: That he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; but then they boil them, ſtew them with butter, and make them into a kind of fricaſſee, which he ſays is not diſagreeably taſted; for he had ſometimes taſted theſe locuſt-fricaſſees out of curioſity. From this account, we may ſee the folly of that diſpute among divines about the nature of St John's food in the wilderneſs. Some of them ſay that locuſts were the fruits of certain trees, others that they were a kind of birds, &c.; but thoſe who adhered to the literal meaning of the text were at leaſt the moſt orthodox, although their arguments were perhaps not ſo ſtrong as they might have been, had they had an opportunity of quoting ſuch an author as Haſſelquiſt.

ACRI-

Original sample

Edition 1	**1771**	**Edition 5**	**1817**
Edition 2	**1784**	**Edition 6**	**1823**
Edition 3	**1797**	**Edition 7**	**1842**
Edition 4	**1810**	**Edition 8**	**1860**

1. Text Cleanup

1. Clean up each edition's entries

```
# The first half of each chapter of the encyclopedia
word=""
word_dict={}
whole_sent=""
for sent in df_files_content["text"]:
    # If a sentence does not match the entry, it will
    res=re.match(r"[A-Z]+,",sent)
    if res is None:
        whole_sent+=sent
    else:
        # If a sentence matches the entry, save the p
        word_dict[word]=whole_sent
        word=res.group().strip(",")
        whole_sent=sent.replace(word+",","")

# Add the last entry
word_dict[word]=whole_sent
```

A. Clean up entries

```
# This is all the extracted entries

word_dict.keys()
```

```
dict_keys(['', 'SCO', 'AABAM', 'AADE',
ACATUAIA', 'ABACH', 'ABACO', 'ABACOT',
N', 'ABADIR', 'ABACRE', 'ABAFT', 'ABAI
A', 'ABARTICULATION', 'ABAS', 'ABAISED
EMENT', 'ABATIS', 'ABAVO', 'ABB', 'ABB
T', 'ABBREVIATION', 'ABBREVIATOR', 'ABI
RY', 'ABDALS', 'ABDELAVI', 'ABDEST',
LIANS', 'ABELMOSCH', 'ABENSBURG', 'ABE
'ABERRATION', 'ABERYSWITH', 'ABESTA',
L', 'ABIB', 'ABIES', 'ABILITY', 'ABING
BLACTATION', 'ABLACQUEATION', 'ABLATIV
ION', 'ABO', 'ABOARD', 'ABOLITION', 'A
RTION', 'ABORTIVE', 'ABOY', 'ABRA', 'A
BRAUM', 'ABRASAX', 'ABRAX', 'ABREAST',
```

B. All entries

```
df_encyclopedia_all.iloc[100:110,:]
```

	text	version
ABRA	a filver coin of Poland, in value nearly equivalent to an Englifli Hulling.	1
ABRACADABRA	a magical word or fpell, which being written as many times as the word contains letters, and omitting the lad letter of the former every time, was, in the ages of ignorance and fuperdition, vvyrn about the neck, as an antidote againd agues andfeveral other difeaies ABRAHAM'r balm, in botany, See Cannabis.	1
ABRAHAMITES	an order of monks exterminated - for idolatry by Theophilus in the ninth century. Alfo the name of another fedt of heretics who had adopted the errors of Paulus. See Paulicians.	1
ABRAMIS	an obfclete name for the filh cyprinus. See Cyprinus, B Abrasa, A B R (6 ABRASA, in furgery, ulcers, where the lkin is fo tender and lax as to render them fubjeft to abrafion.	1
ABRASION	in medicine, the corroding of any part by acrid humours or medicines.	1
ABRAUM	an obfolete name of a certain fpecies of clay, called by fome authors Adamic earth, on account of its red colour.	1
ABRASAX	or Abraxas, a myftical term found in the ancient theology and philofophy of Balilides's followers	1

C. Collect all entries of each edition

2. Clean OCR's noise

```
stop_words=stopwords.words('english')


def clean_text(text):

    # Remove all non-English letters directly
    patten=r'[^a-z]'
    text=re.sub(patten,' ',text.lower())

    # Replace multiple consecutive spaces with 1 space
    text_list = re.sub(r'\s+', ' ', text).split()

    # Remove stop words
    text_list=[word for word in text_list if ((word not in stop_words) and len(word)>3)]
    return " ".join(text_list)
```

D. Keep cleaning

```
df_encyclopedia_all["text_clean"]=df_encyclopedia_all["text"].apply(clean_text)

df_encyclopedia_all.iloc[100:110,:]
```

	text	version	text_clean
ABRA	a filver coin of Poland, in value nearly equivalent to an Englifli Hulling.	1	filver coin poland value nearly equivalent englifli hulling
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ABRAHAMITES	an order of monks exterminated - for idolatry by Theophilus in the ninth century. Alfo the name of another fedt of heretics who had adopted the errors of Paulus. See	1	order monks exterminated idolatry theophilus ninth century alfo name another fedt heretics

E. Output examples

2. Using Topic Modeling and LDA to Analyze Encyclopedia

Wenbo Li, Le Sun, Yuanyong Feng, and Dakun Zhang. 2008. Smoothing LDA model for text categorization. In Proceedings of the 4th Asia information retrieval conference on Information retrieval technology (AIRS'08). Springer-Verlag, Berlin, Heidelberg, 83–94.

LDA model

```
from sklearn.feature_extraction.text import CountVectorizer

count = CountVectorizer(stop_words='english',
                        min_df=20,
                        max_df=0.1,
                        max_features=5000)
X = count.fit_transform(df_encyclopedia_all['text_clean'].values)
```

```
from sklearn.decomposition import LatentDirichletAllocation

lda = LatentDirichletAllocation(n_components=10,
                                random_state=123)

X_topics = lda.fit_transform(X)
```

A. LDA model

Extract representative vocabulary for each topic

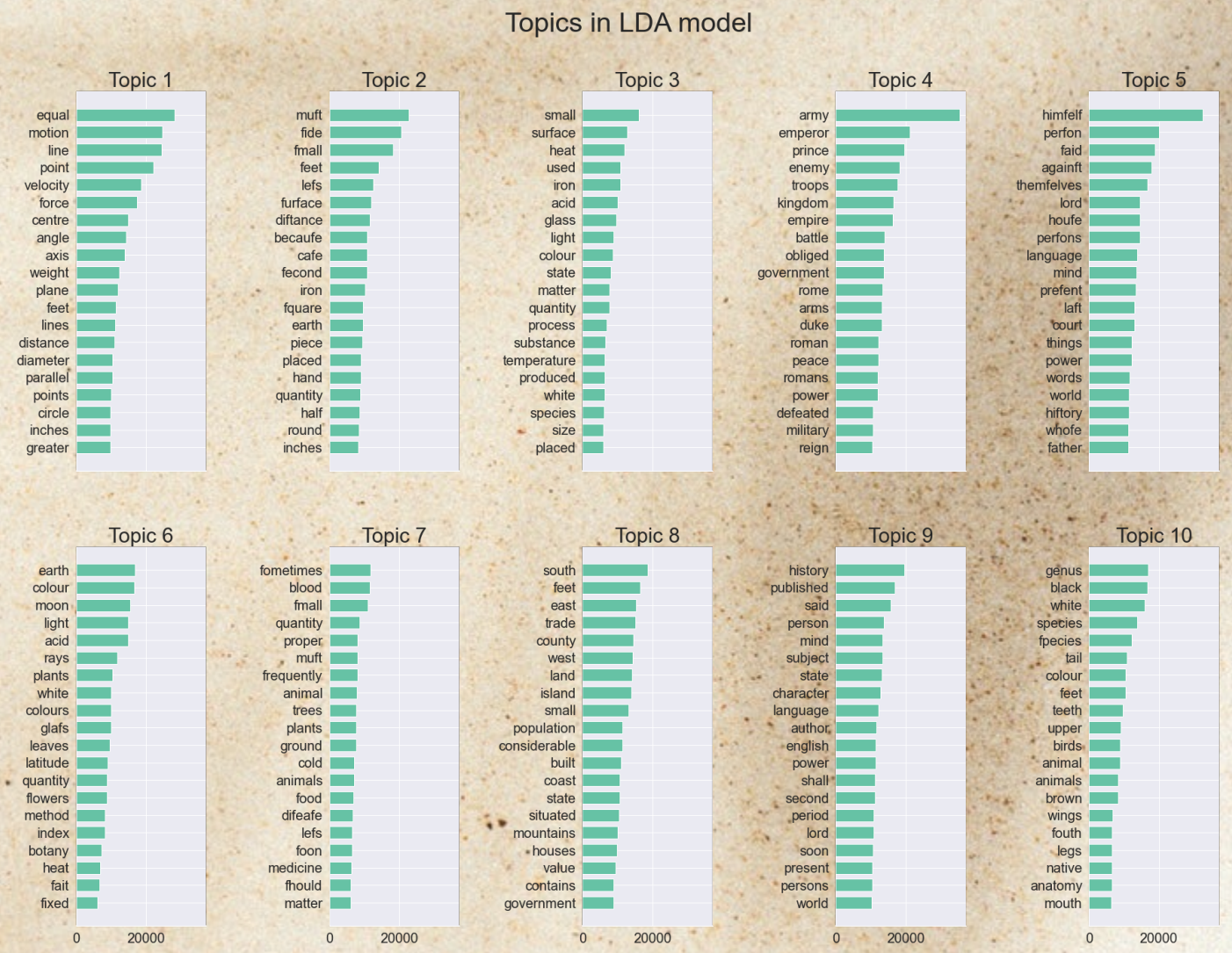
- Here are the top 20 important vocabularies for each topic

```
n_top_words = 20
feature_names = count.get_feature_names()

for topic_idx, topic in enumerate(lda.components_):
    print("Topic %d:" % (topic_idx + 1))
    print(" ".join([feature_names[i] for i in topic.argsort()[:-n_top_words - 1:-1]]))
```

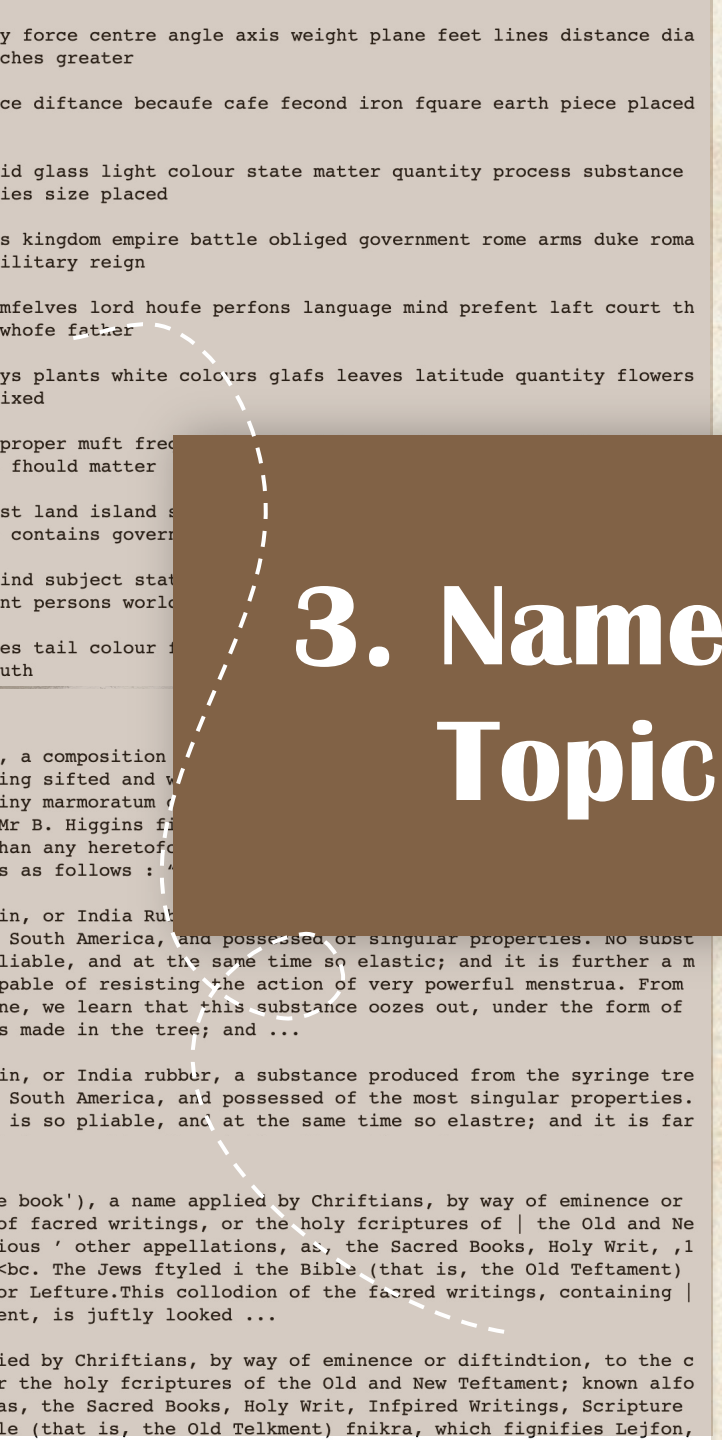
```
Topic 1:
equal motion line point velocity force centre angle axis weight plane feet lines distance dia
meter parallel points circle inches greater
Topic 2:
muft fide fmall feet lefs furface diftance becaufe cafe fecond iron fquare earth piece placed
hand quantity half round inches
Topic 3:
small surface heat used iron acid glass light colour state matter quantity process substance
temperature produced white species size placed
Topic 4:
army emperor prince enemy troops kingdom empire battle obliged government rome arms duke roma
n peace romans power defeated military reign
Topic 5:
himfelf perfon faid againft themfelves lord houfe perfons language mind prefent laft court th
```

B. 20 Important Vocabularies for Each Topic

```python
def plot_top_words(model, feature_names, n_top_words, title):
    fig, axes = plt.subplots(2, 5, figsize=(30, 20), sharex=True)
    axes = axes.flatten()
    for topic_idx, topic in enumerate(model.components_):
        top_features_ind = topic.argsort()[:-n_top_words - 1:-1]
        top_features = [feature_names[i] for i in top_features_ind]
        weights = topic[top_features_ind]

        ax = axes[topic_idx]
        ax.barh(top_features, weights, height=0.7)
        ax.set_title(f'Topic {topic_idx +1}',
                     fontdict={'fontsize': 30})
        ax.invert_yaxis()
        ax.tick_params(axis='both', which='major', labelsize=20)
        for i in 'top right left'.split():
            ax.spines[i].set_visible(False)
        fig.suptitle(title, fontsize=40)

    plt.subplots_adjust(top=0.9, bottom=0.05, wspace=0.95, hspace=0.2)
    plt.show()
```



A. 10 Topics and Their Words Frequency



3. Name Each Topic

Topic 3 — Materials science

Topic 4 — Military & Royal Family

Topic 5 — Politics & Church

Topic 6 — Anatomy

Topic 7 — Trade

Topic 8 — Cultural

Topic 8

Trade

south, feet, east, **trade**, county, west, land, **island**, small, population, considerable, built, coast, state, situated, mountains, houses, **value**, contains, government, islands, british, extent, london, nearly, rivers, **bank, market, money**, house, chief, chiefly, building, produce, **corn**, soil, present, various, district, numerous, square, english, towns, extensive, western, northern, states, course, eastern, **cotton**

1.

Sample 1

a town situated on the isthmus of Panama. See Panama.PORTO FERRAJO, the capital of the Island of Elba, in the province of Pisa, and the duchy of Tuscany^ celebrated as the residence of Napoleon during his banishment to that island. It is situated on a tongue of land running into the sea, and forming a small bay. It is fortified, and contains two churches, an hospital, 600 houses, with 3120 inhabitants, who depend chiefly upon some salt works and the tunny fishery. Lat. 42. 49. 6. Long. 9. 20. 1 ...

2.

Sample 2

or Newburgh, a borough-town of North Wales, in the island of Anglesey, and hundred of Menai, 257 miles from London, and twelve from Beaumaris. It uas once the residence of the princes of Anglesey, and a corporation founded by Edward I. There is a market, which is held on Tuesday. The population amounted in 1801 to 599, in 1811 to 750, in 1821 to 756, and in 1831 to 804.NEW BRUNSWICK, a British province of North America, situated between the parallels of 45. 5. and 48. 4.30. north latitude, and ...

3.

Sample 3

or Carmarthenshire (Welsh Caerfyrddiri), a maritime county in South Wales, is bounded on the north by Cardigan, on the east by Brecon, on the south by Glamorgan and the Bristol Channel, and on the west by Pembroke. Its greatest length is from S.W. to N.E., about 52 miles; its greatest breadth, S.E. to N.W., about 28 miles. It possesses an area of 947 square miles, or 606,331 acres, and is thus the largest of all the Welsh counties. It contains 77 parishes, and is in the diocese of St David's. I ...

4. Count the Distribution of entries for each topic by edition

```
# In the same version, calculate the proportion of the number of entries for each topic

df_version_topic.div(df_version_topic.sum(axis=1),axis=0)
```

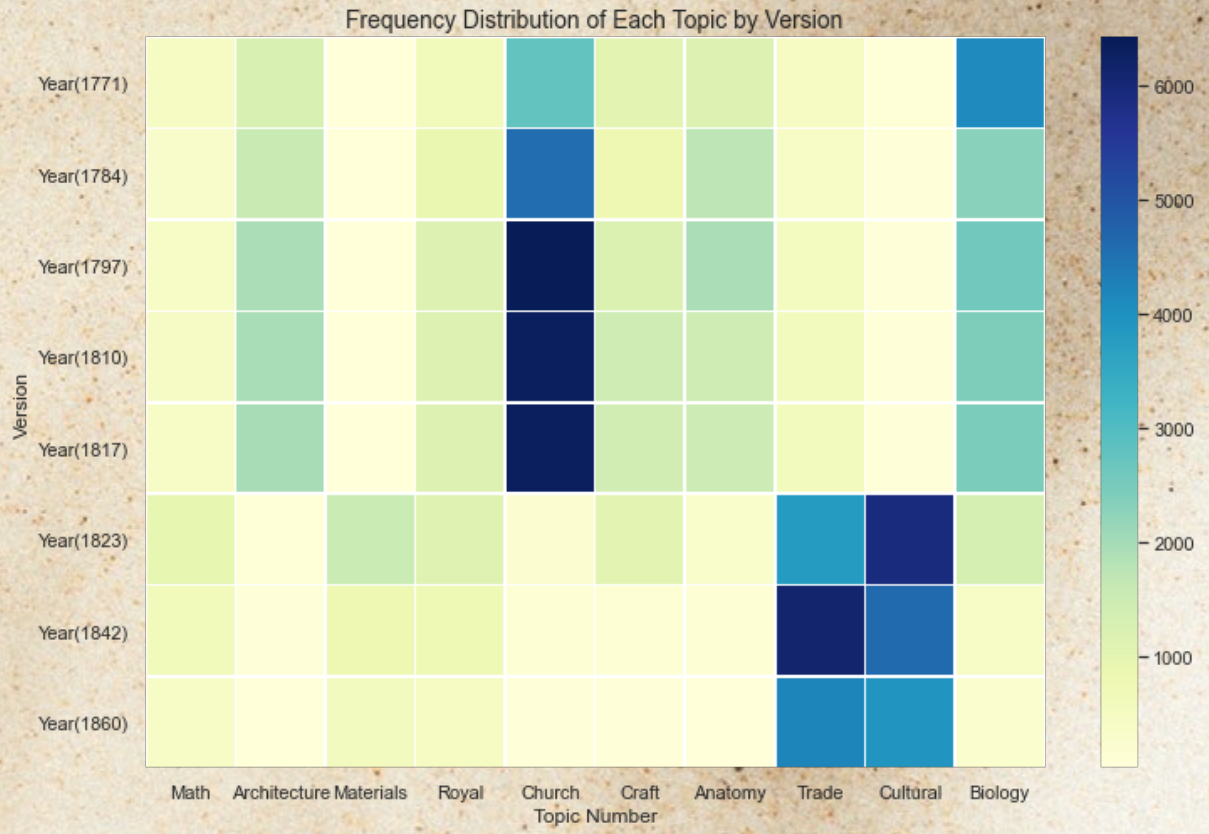
topic	0	1	2	3	4	5	6	7	8	9
version										
1	0.040850	0.105102	0.002563	0.054412	0.229968	0.084512	0.095923	0.039114	0.006037	0.341520
2	0.025595	0.123563	0.002205	0.071665	0.362262	0.061033	0.135769	0.031107	0.004725	0.182076
3	0.025297	0.118584	0.001715	0.072951	0.393667	0.074727	0.119258	0.031422	0.003430	0.158949
4	0.026834	0.122412	0.001877	0.072246	0.397198	0.092763	0.093388	0.036279	0.004128	0.152874

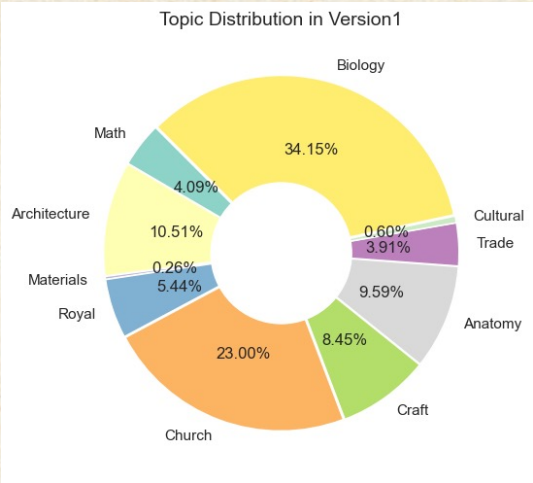
A. Percentage of entries

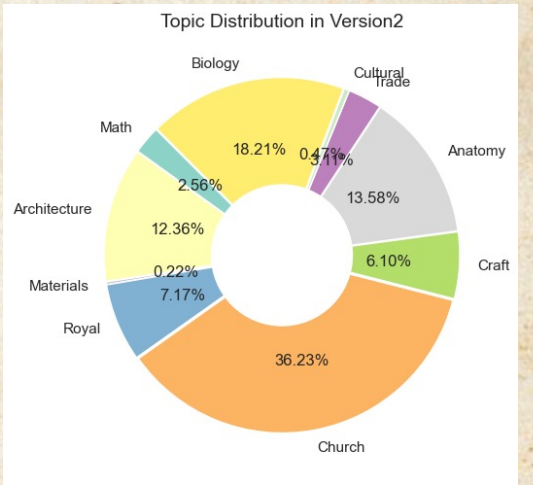
```
# Name the theme and visualize it
topic_labels=["Math","Architecture","Materials","Royal","Church","Craft","Anatomy","T

plt.figure(figsize=(12,8))
sns.heatmap(df_version_topic, cmap="YlGnBu",linewidths=.5)

plt.xlabel("Topic Number",fontsize=12)
plt.xticks([x+0.5 for x in range(10)],topic_labels)

plt.ylabel("Version",fontsize=12)
plt.yticks([x+0.5 for x in range(8)],
           ['Year(1771)','Year(1784)','Year(1797)','Year(1810)','Year(1817)','Year(18
           rotation=0)

plt.title("Frequency Distribution of Each Topic by Version",fontsize=14)
```

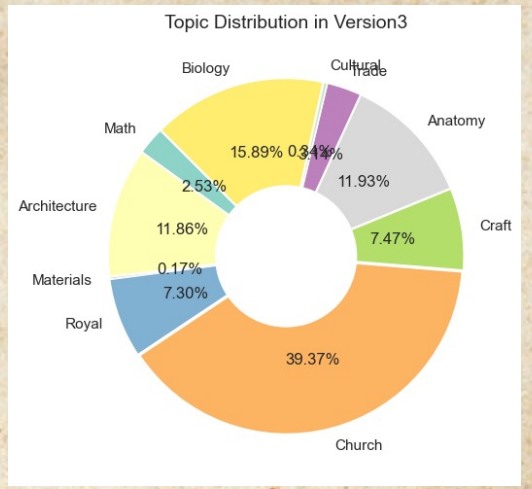
```
Text(0.5, 1.0, 'Frequency Distribution of Each Topic by Version')
```

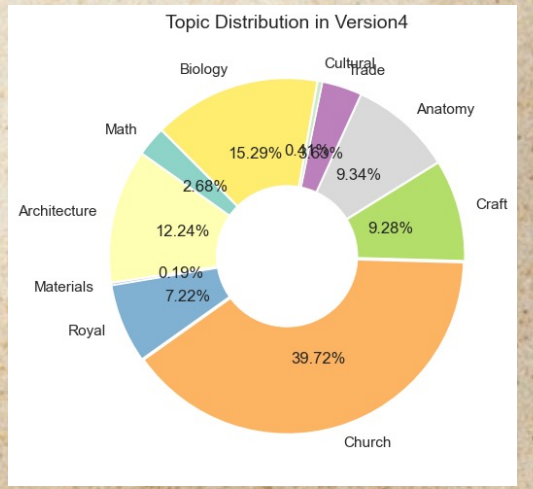
A. Percentage of Visualized Entries

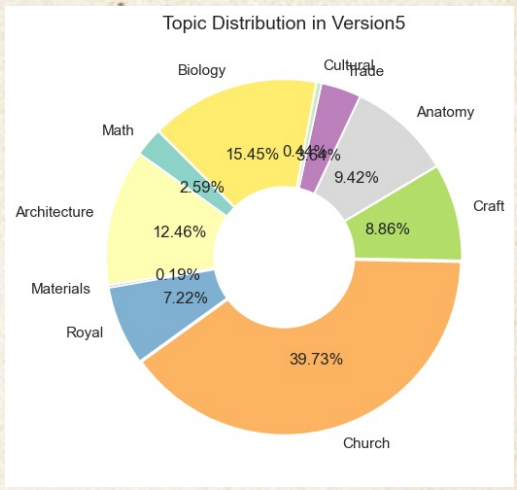


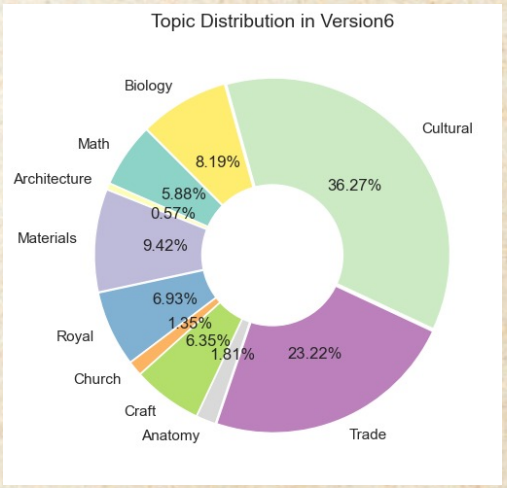


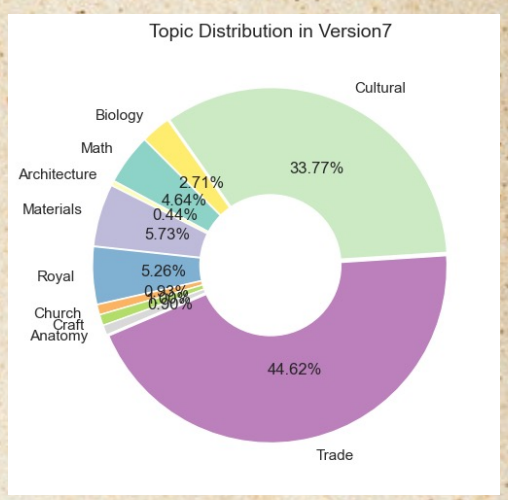


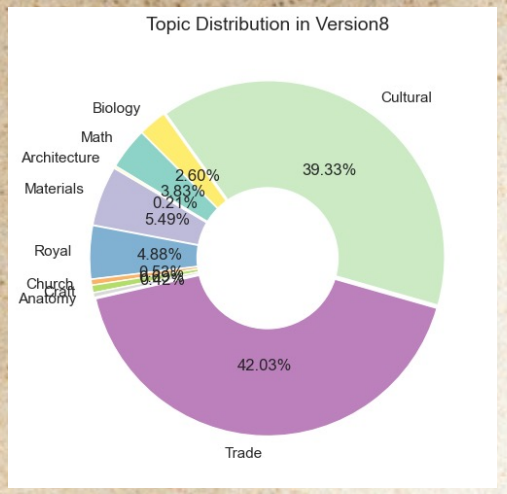












Percentage of Topics per Edition

5. Theme river

ThemeRiver™: In Search of Trends, Patterns, and Relationships

Susan Havre, Beth Hetzler, and Lucy Nowell
Battelle Pacific Northwest Division
Richland, Washington 99352 USA
1+509+375-6948

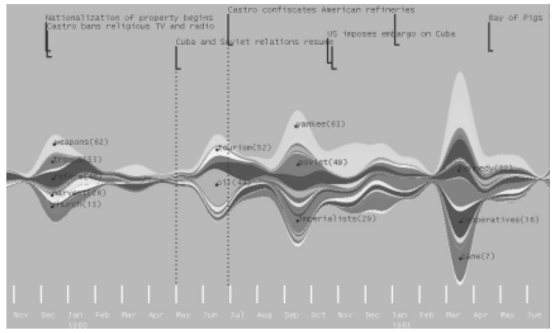


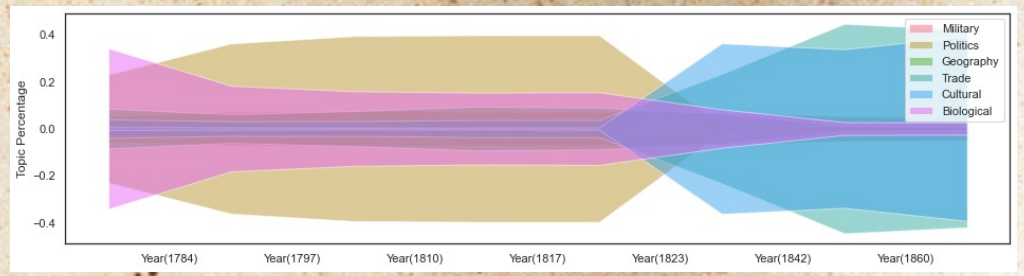
Figure 1: ThemeRiver showing Castro data from November 1959 through June 1961.

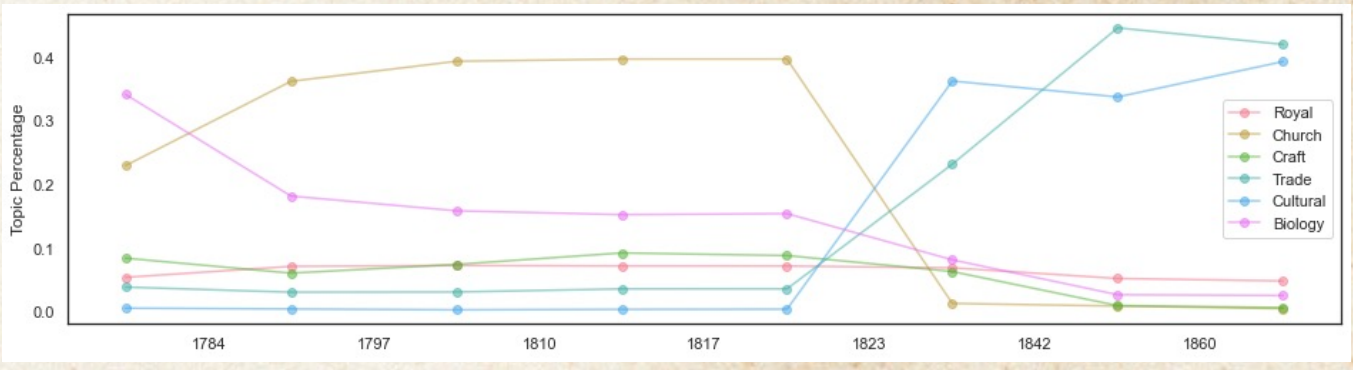
A. Reference

Havre, Susan L. et al. "ThemeRiver: In Search of Trends, Patterns, and Relationships." (1999).*

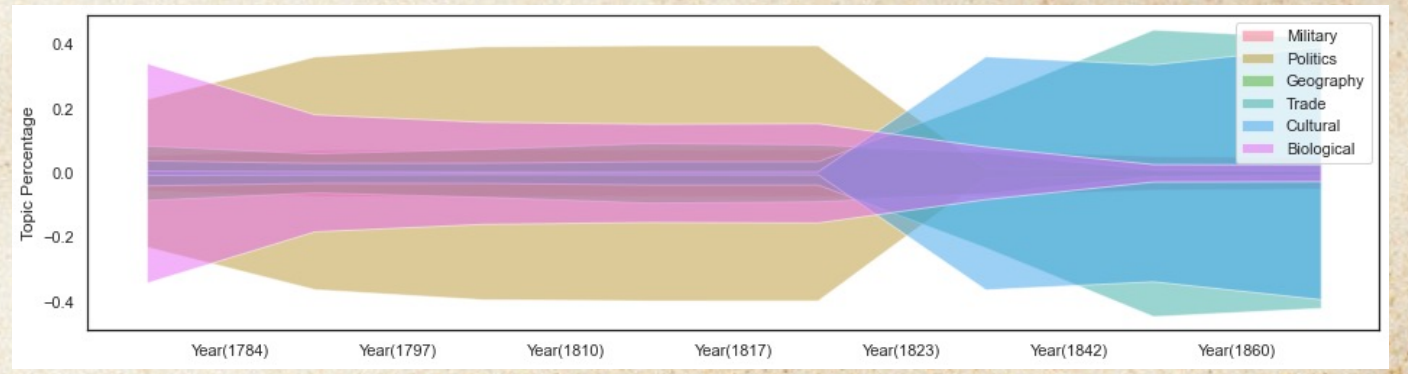
B. "Theme River" in Encyclopedia Britannica

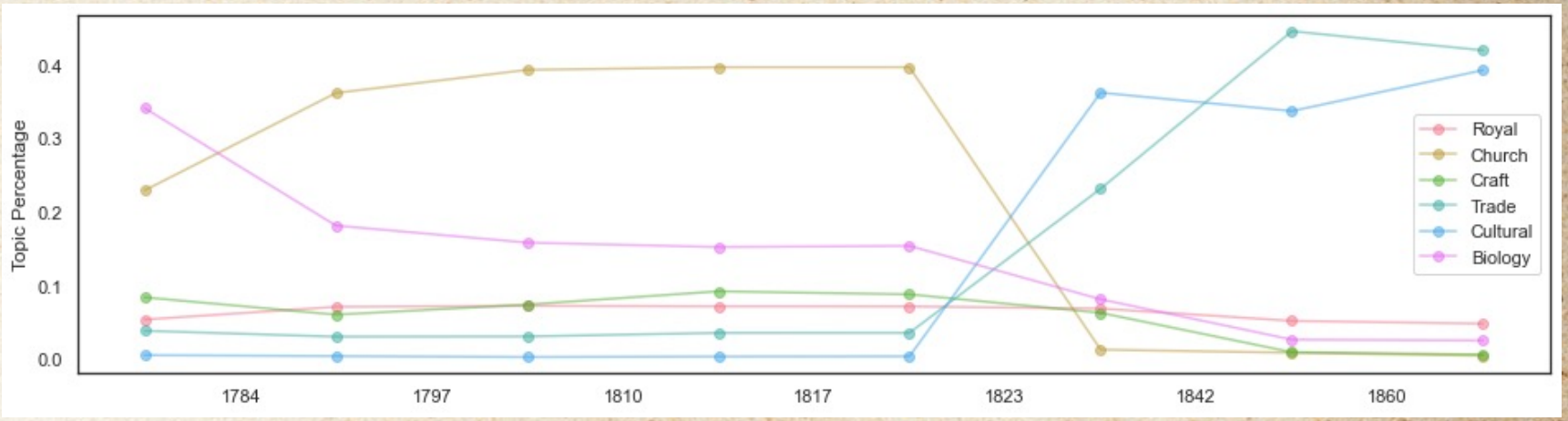
```
sns.set_theme(style="white",palette=sns.color_palette("husl"))

topic_labels=["Math","Spots","Chemical","Military","Politics","Geography","Agricultural","Trade

df_topic_pct=df_version_topic.div(df_version_topic.sum(axis=1),axis=0)
plt.figure(figsize=(16,4))
plt.xticks([x+0.5 for x in range(8)],
           ['Year(1771)','Year(1784)','Year(1797)','Year(1810)','Year(1817)','Year(1823)','Year
           rotation=0)

for i in [3,4,5,7,8,9]:
    plt.fill_between(x=df_topic_pct.index,
                     y1=df_topic_pct.iloc[:,i],
                     y2=-1*df_topic_pct.iloc[:,i],
                     alpha=0.5,label=topic_labels[i])

plt.legend()
plt.ylabel("Topic Percentage",fontsize=12)
```

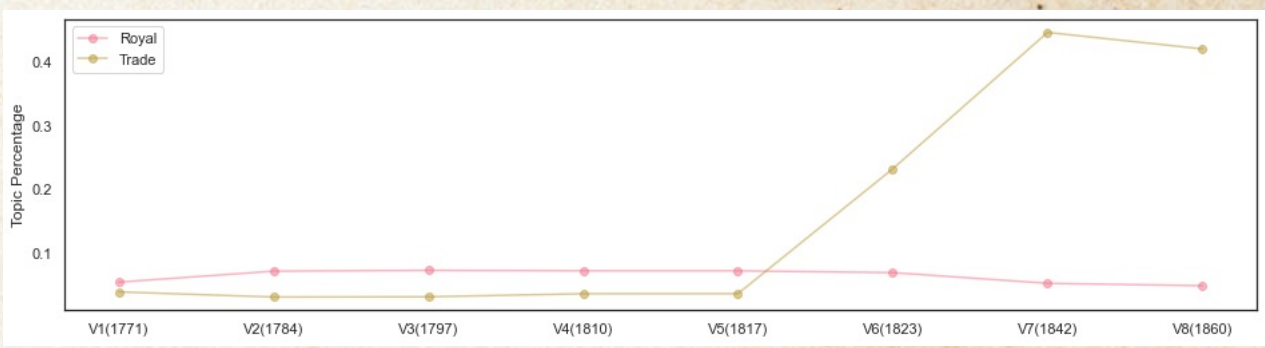


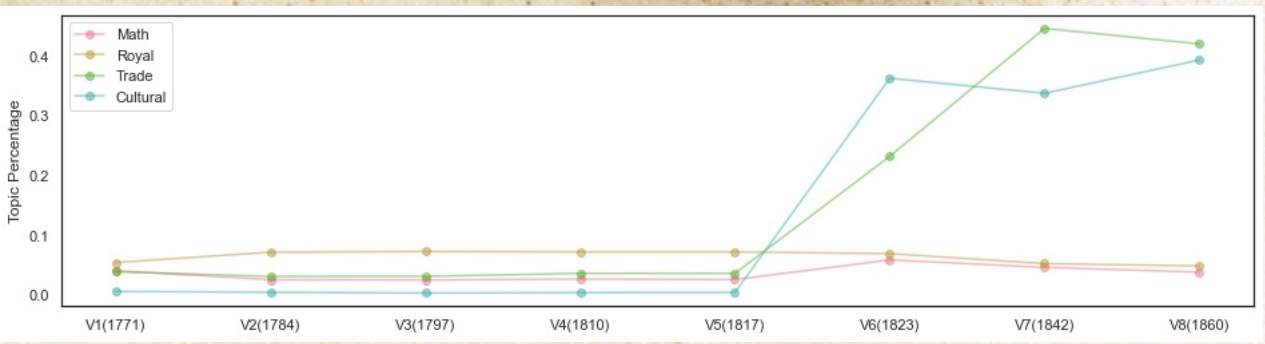


C. Theme change line chart

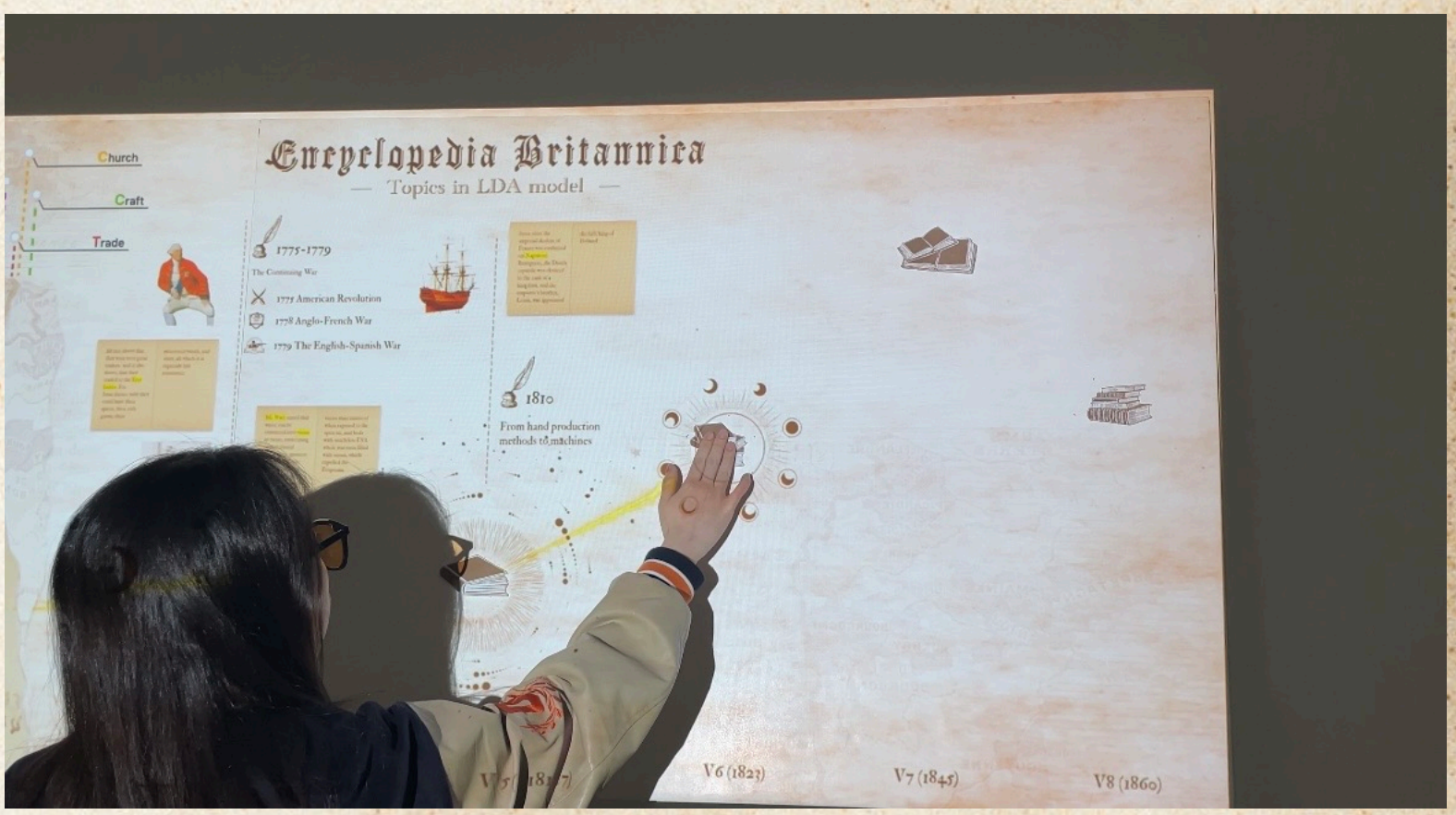

Topic Percentage
0.4
0.2
0.0
−0.2
−0.4
Year(1784)
Year(1797)
Year(1810)
Year(1817)
Year(1823)
Year(1842)
Year(1860)
Military
Politics
Geography
Trade
Cultural
Biological


Topic Percentage
0.4
0.3
0.2
0.1
0.0
1784
1797
1810
1817
1823
1842
1860
Royal
Church
Craft
Trade
Cultural
Biology


Topic Percentage
0.4
0.3
0.2
0.1
V1(1771)
V2(1784)
V3(1797)
V4(1810)
V5(1817)
V6(1823)
V7(1842)
V8(1860)
Royal
Trade


Topic Percentage
0.4
0.3
0.2
0.1
0.0
V1(1771)
V2(1784)
V3(1797)
V4(1810)
V5(1817)
V6(1823)
V7(1842)
V8(1860)
Math
Royal
Trade
Cultural

6. Interactive Board - Arduino and Pressure Sensor



Encyclopedia Britannica

— Topics in LDA model —

Royal
Church
Biology
Craft
Cultural
Trade

1771
1784
1797
1810
1817
1823
1842
1860

1775-1779

The Continuing War

- 1775 American Revolution
- 1778 Anglo-French War
- 1779 The English-Spanish War

All this shows that they were very great traders : and it also shows, that they traded to the East Indies. For from thence only they could have these spices, these rich gums, these sweetened woods, and ivory, all which it is expressly 356 commerce.

Mr Watt stated that water can be converted into steam as vacuo, concerning cannot demed without the greatest scepticism. If the evaporatr is even found much more easily diffusion as vacuo than unless of when exposed to the open air, and boils with much less EVA whole was soon filled with steam, which expelled the Empessas.

Soon after the imperial decrees of France was conferred on Napoleon Bonaparte, the Dutch republic was elevated to the rank of a kingdom, and the emperor's brother, Louis, was appointed the fifth king of Holland.

1832

Reform Decree
Giving political rights to the industrial bourgeoisie

1825

World's first public passenger railway, the Stoughton & Darlington Railway, opens

1810

From hand production methods to machines

1840

The First Opium War

1845

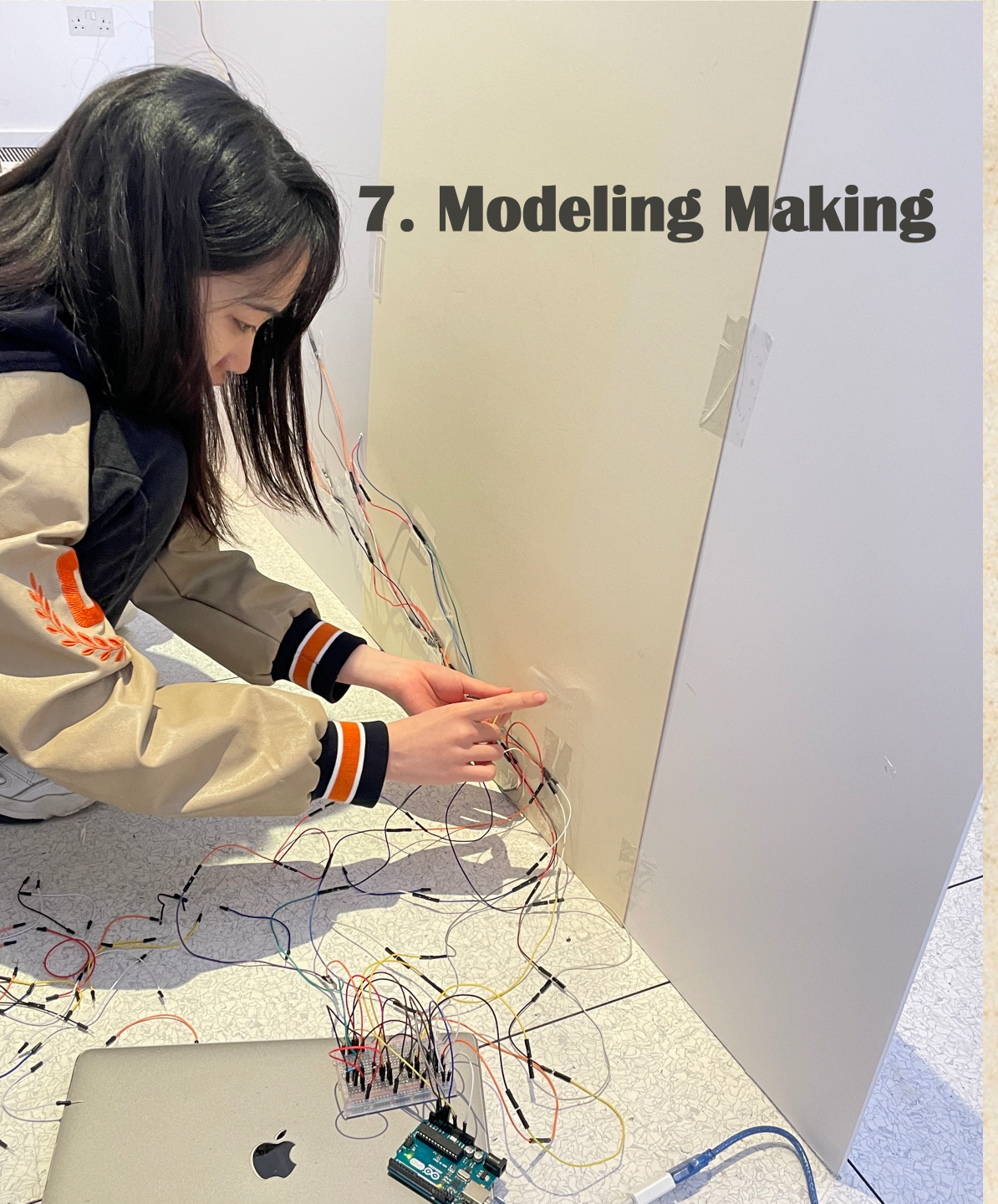
The Great Irish Famine

The Queen of England is either queen regent, queen consort, or queen dowager. The queen regent, regnant, or sovereign, is the who holds the crown in her own right, as Queen Elizabeth, Queen Anne, and our present sovereign Queen Victoria.

A commission appointed by the English government in 1848 with the view of promoting the public health in England and Wales, which, in that and the preceding year had suffered seriously from the invasion of cholera.

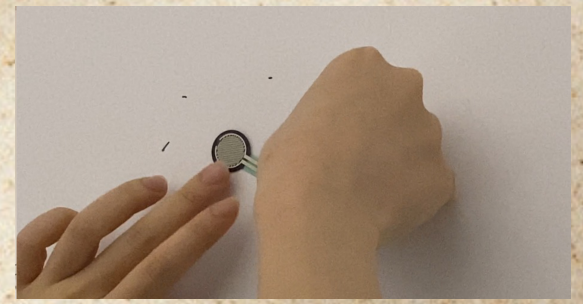
Royal
Church
Craft
Trade
Cultural
Biology

V2 (1784) V3 (1797) V4 (1810) V5 (1817) V6 (1823) V7 (1845) V8 (1860)



7. Modeling Making

01.
Sticker sensors



02.
Circuit connections

03.
Masking sensors