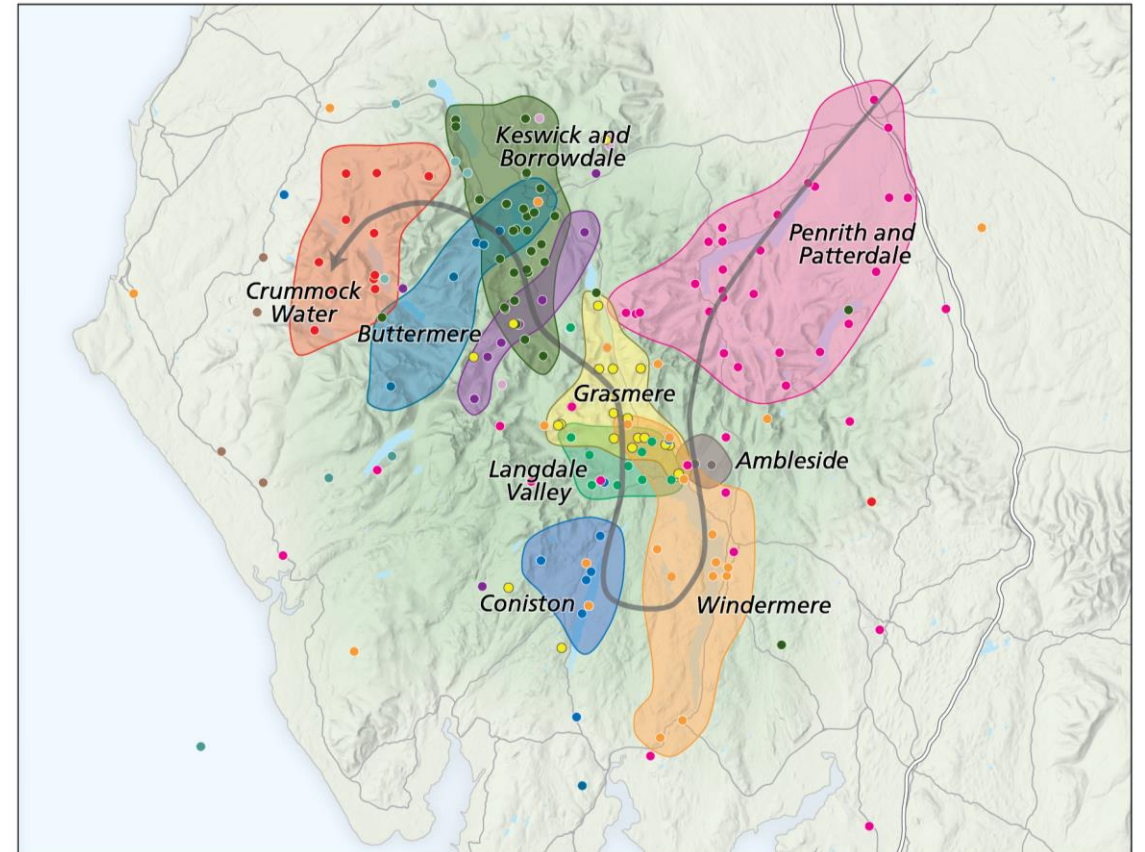


TOWARDS AN EXTENSIBLE FRAMEWORK FOR UNDERSTANDING SPATIAL NARRATIVES

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<https://spacetime narratives.github.io/>

Our Project

- Spatial narratives help us to organize experiences and give them meaning.
- Previous approaches 'textual geographies' focus on geoparsing identifying place names and allocating them to coordinates.
- Limited to named places with coordinates, and have little concept of time.
- Often omits vague, imprecise, and ambiguous, e.g. “*the camp*”, or “*the hills in the distance*”, and relative locations such as “*near to*”, “*on the left*”, “*north of*” or “*a few hours’ journey from*”.
- Leaves out experience, emotion, and memory accompanying the geography.
- We aim to gain more insight from textual data beyond the toponyms and introduce an extensible framework for extracting, analyzing, and visualizing spatial elements

Project Objective

Given a piece of writing, can we extract and build a narrative around:

- **Locations:**
 - Texts often use toponyms (place names) for locations often reduced to a coordinate for mapping.
- **Locale:**
 - Usually nouns for geographical features such as 'house', 'lake', 'mountain' etc. often vague or ambiguous and cannot be directly mapped in Euclidean space.
- **Sense of place:**
 - subjective and emotional expressions by a person that make the place a unique community or landscape.
 - Events that occur at a place will contribute to this.
 - Various forms of date, time, and other temporal references

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Corpora: CLDW and HST

Corpus of the Lake District Writing

- Comprises 80 texts and around 1.5 million
- Texts originally created between 1622 – 1900
- Containing travel literature, fiction, histories, letters, and diaries.
- Includes works by well-known Lake Poets
 - e.g. William Wordsworth and Samuel Taylor Coleridge.
- Also accounts by prominent writers such as Daniel Defoe and Celia Fiennes

Holocaust Survivor's Testimonies

- Contains 1k transcripts of survivor interviews; approx 21m words/tokens
- Each comprises a series of interviewer's questions and the survivors' answers
- Chronicles the survivors' Holocaust experience
- Duration = ~ 2hrs: 20% pre-war life; 60% wartime experience; 20% post-war
- Highlights sites of incarceration or hiding serving as anchors that describe survivors' wartime trajectories.

Defining and Labelling Spatial Entities

- **PLNAME:** Any mention of a specific placename (toponym) e.g. *'Penrith', 'Keswick'*
- **GEONOUN:** geographical feature nouns e.g. *'river', 'road', 'waterfall'*
- **EVENT:** descriptions of events or activities e.g. *'ride', 'walk', 'excursion'*
- **EMOTION:** expressions of sentiments and emotions. For example e.g. *'delightful excursions', 'pleasant walk', or 'horrible ravines'*
- **DATE | TIME:** references to dates e.g. *'March 1803', 'the beginning of the century'*) and time e.g. *'10 o'clock', 'late in the evening'*)
- **PERSON:** proper names and references to people
- **DISTANCE:** expressions of distance measures *'about four miles'*

*We are also considering:

- **spatial prepositions** (*above, behind, below, through, within*)
- **locative adverbs** (*alongside, downtown, homewards, southward, up-country*)
- **movements:** mostly verbs indicating a change in location (*cross, walk, etc*)



Spatial Entities - Example

Category	Description	Example	Source
PLNAME	Place names	From Penrith two roads lead to Pooley Bridge	CLDW
GEONOUN	Geo feature nouns	Cross the bridge , and take the first road to the right.	CLDW
TIME	Temporal references	If I survive tonight , I will remember the 9th of April	HST
DATE	Date mentions	Americans will probably be here the following day .	HST
EVENT	Events or activities	You lost your brother and father in the Holocaust ?	HST
MOVEMENT	Movements	Cross the bridge, and take the first road to the right.	CLDW
SPPREP	Spatial preposition	Carleton Hall is near to it on the left.	CLDW
LOCADV	Locative adverb	I wasn't here , I was sleepwalking	HST
DISTANCE	Distance measure	Lowther Castle is about four miles from this bridge.	CLDW
EMOTION	Sentiments	The march is a nightmare , completely obliterated .	HST

Key Tasks

Corpus annotation

Annotate the corpus to reflect the occurrence of spatial elements of interest: *toponyms, geo nouns, emotions, events, time*

Spatial entity extraction

Develop NLP techniques to appropriately identify, extract, and categorize these elements.

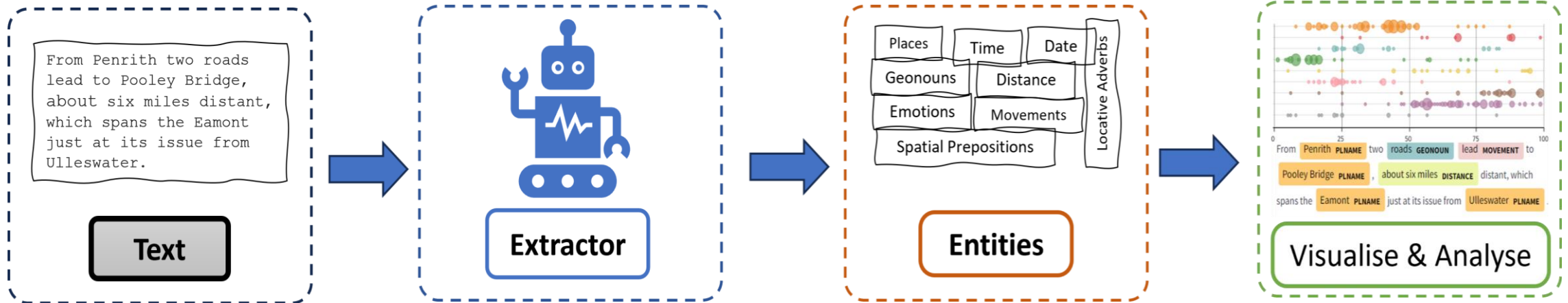
Spatial visualization

Add a user-friendly visualization interface to the extraction tool to look at the special entities

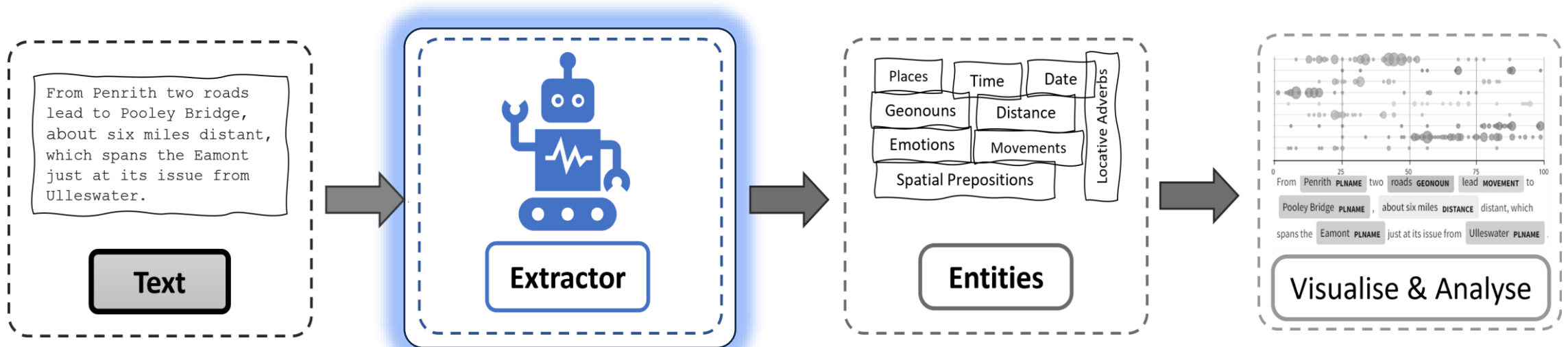
Analysis

Perform analysis on the extracted entities to build a narrative

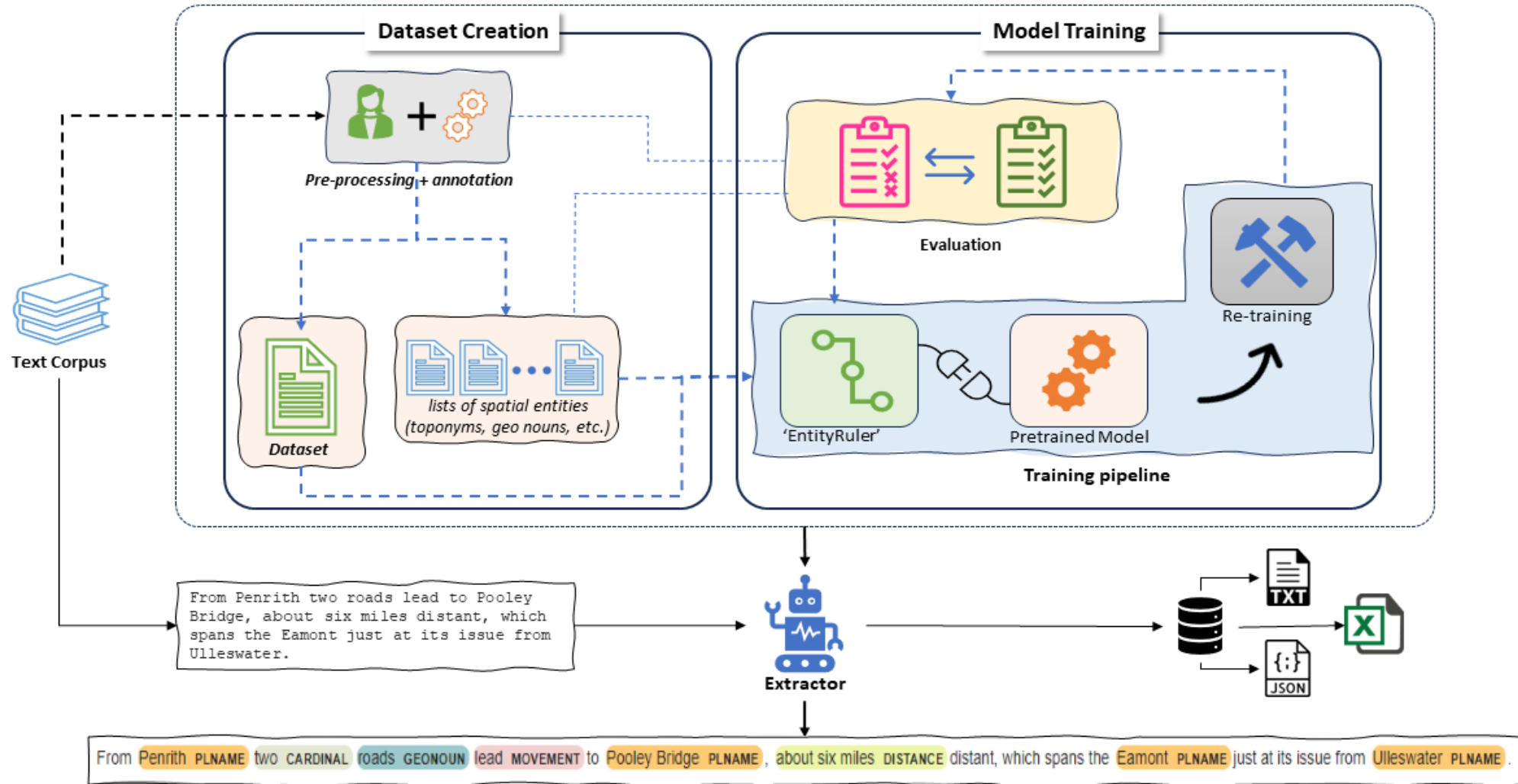
Proposed Framework



Proposed Framework



Building the Entity Extractor





Evaluation

Entity Category	CLDW			HST		
	Regex	SpaCy	Ext	Regex	SpaCy	Ext
PLNAME	85.76	87.33	90.20	52.34	71.61	72.86
GEONOUN	82.44	–	85.78	78.51	–	68.33
LOCADV	61.55	–	63.85	55.94	–	57.07
DISTANCE	67.73	73.25	79.29	60.75	63.60	68.08

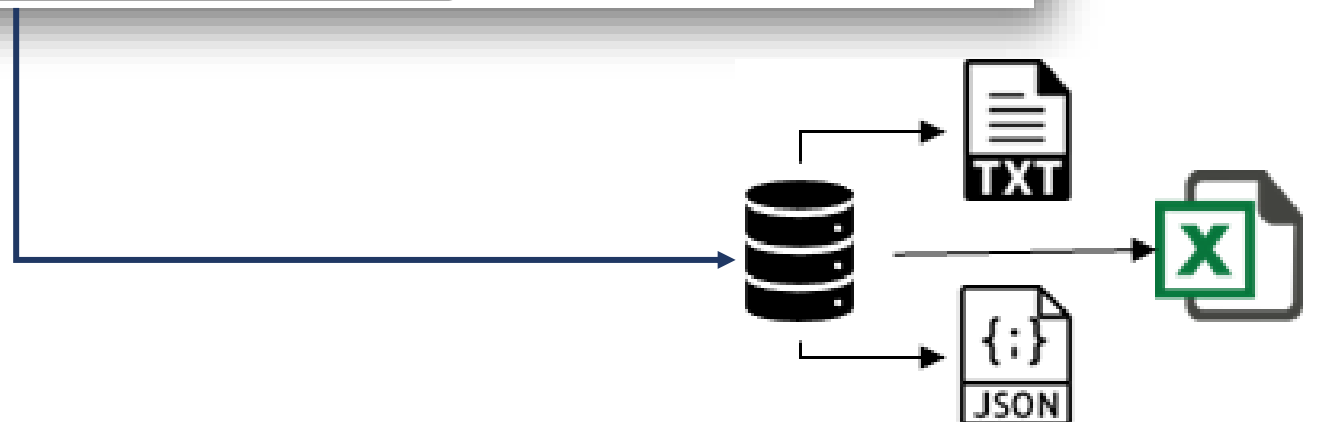
Visualisations

- **Sentence 1:** *From Penrith two roads lead to Pooley Bridge, about six miles distant, which spans the Eamont just at its issue from Ulleswater.*

From **Penrith PLNAME** two **roads GEONOUN** lead **MOVEMENT** to **Pooley Bridge PLNAME** , **about six miles DISTANCE** distant, which spans the **Eamont PLNAME** just at its issue from **Ulleswater PLNAME**

- **Sentence 2:** *Carleton Hall is near to Eamont Bridge on the left.*

Carleton Hall PLNAME is **near LOCADV** to **Eamont Bridge PLNAME** on the **left LOCADV** .

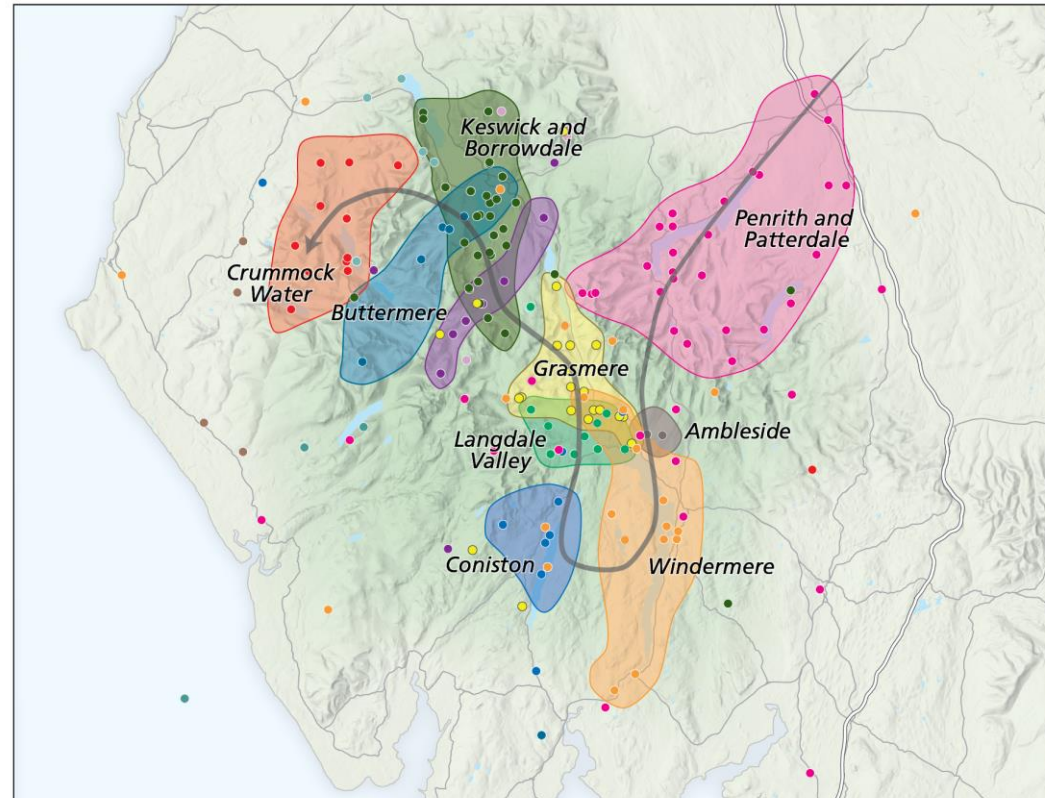


Visualisations

Spatio-Textual Regions

The English Lakes (1857), Thomas Nelson & Sons

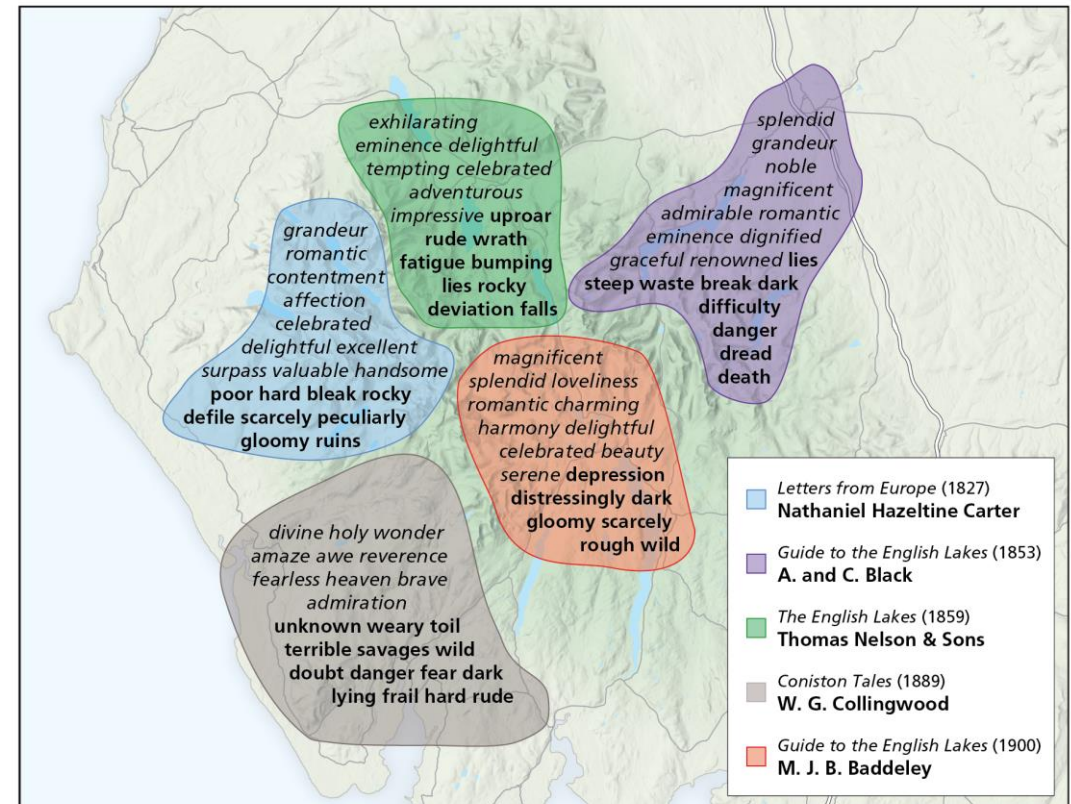
• Toponyms (by STR)
 ← Narrative sequence



Distinctive Spatio-Textual Regions by Author

Most frequent positive and negative sentiment words by STR

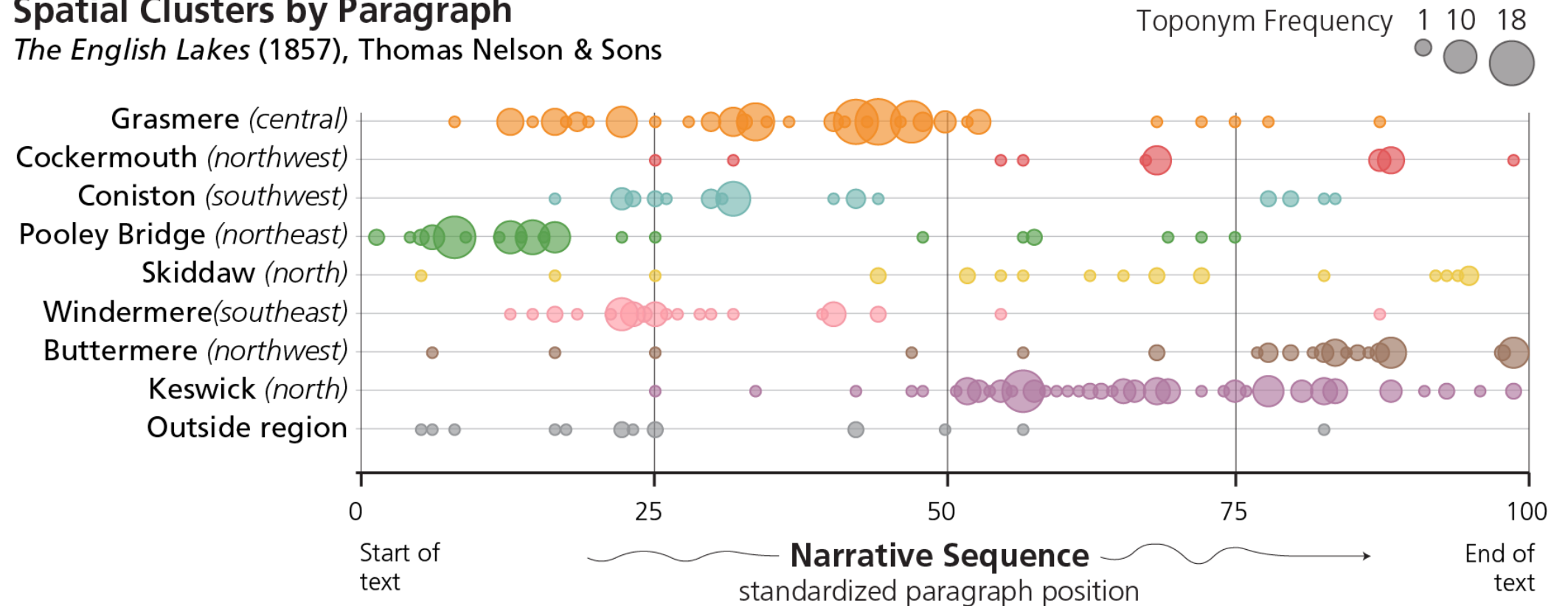
Positive sentiment words
 Negative sentiment words



Visualisations

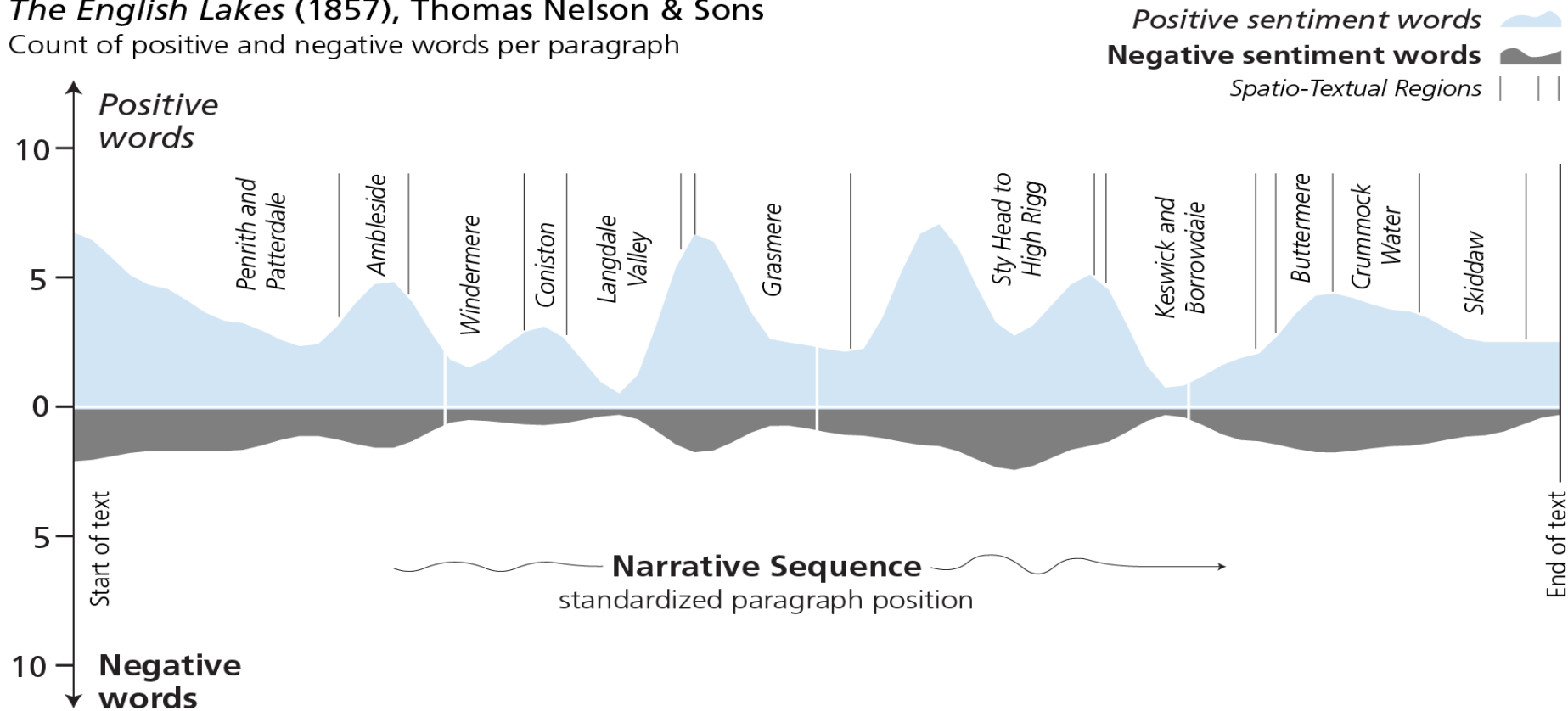
Spatial Clusters by Paragraph

The English Lakes (1857), Thomas Nelson & Sons



Visualisations

Sentiment by narrative sequence and STR
The English Lakes (1857), Thomas Nelson & Sons
 Count of positive and negative words per paragraph





Relationships and Ontology Design

QSR-based relations	Interpretations
<i>From Penrith two roads lead to Pooley Bridge, about six miles distant, which spans the Eamont just at its issue from Ulleswater</i>	
<code>place(penrith)</code>	Penrith is a place.
<code>place(pb)</code>	Pooley Bridge, pb, can be a place (as here) or a bridge. For convenience, here we use the same name, pb, for both the place and the bridge, but in practice it is necessary to have separate names in the formalism, as we discuss below in section 8.
<code>distance(penrith, pb, about(6), miles)</code>	distance in miles between places
<code>road(road1); road(road2)</code>	road1 and road2 belong to the class road.
<code>end(road1, penrith); end(road1, pb)</code>	road1 ends in Penrith and Pooley Bridge.
<code>end(road2, penrith); end(road2, pb)</code>	Also road2 as above.
<code>bridge(pb); spans(pb, eamont)</code>	Pooley Bridge is also a bridge and 'spans' Eamont.
<code>river(eamont); source(eamont, ullswater)</code>	Eamont is a river and issues from Ullswater.
<code>lake(ullswater)</code>	Ullswater is a lake.

Conclusion

- This work expands the discourse on automatic extraction and analysis of spatial elements from text.
- We presented our preliminary work on an extensible framework for understanding the interplay between space and time in narratives.
- It includes a workflow for spatial element definition, corpus annotation, and the design and development of the spatial element '*Extractor*' model
- We also presented a top-level view of the ontology but the spatial relations and individual data instances are yet to be developed and included.
- Overall, this framework will support many downstream tasks in the processing of spatial narratives beyond geo-coding

Streamlit Demo

Allows different input methods

Text area

app

Old Version 0.00

Spatial Narratives Project

How do you want to input your text?

Paste copied text

Use an example file

Upload data file

Select tags to visualize:

Select/Deselect all tags

Place names: PL-NAME

Geo feature nouns: GEO-NOUN

Time: TIME|TIME-sem|DATE

Emotion: EMOTION

Movement: MOVEMENT

Spatial Prepositions: SP-PREP

Locative Adverbs: LOC-ADV

Quantity: QUANTITY

Visualizes multiple spatial tags

Extracting place names and relations

Paste text to tag

We thoroughly enjoyed the wonderful view. From Penrith two roads lead to Pooley Bridge, about six miles distant, which spans the Eamont just at its issue from Ulleswater. Either road may be taken, be we recommend that which follows the Shap road to Eamont Bridge. Carleton Hall is near to it on the left. Cross the bridge, and take the first road to the right. At this point, on the left, are the druidical remains called King Arthur's Round Table, and Mayborough. Immediately after crossing Pooley Bridge, the road runs along the western shore of ULLESWATER.

There is some good fishing here in the lake and stream. Trout, perch, and eels, are numerous, and large lake-trout are sometimes, though seldom, taken. Lowther Castle, the seat of the Earl of Lonsdale, is distant from this bridge about four miles. Ulleswater is nine miles in length, by nearly a mile wide, at the broadest point; but, owing to its irregular form, it is divided into three reaches, the first of which is closed in by Hallen Fell, on the western shore.

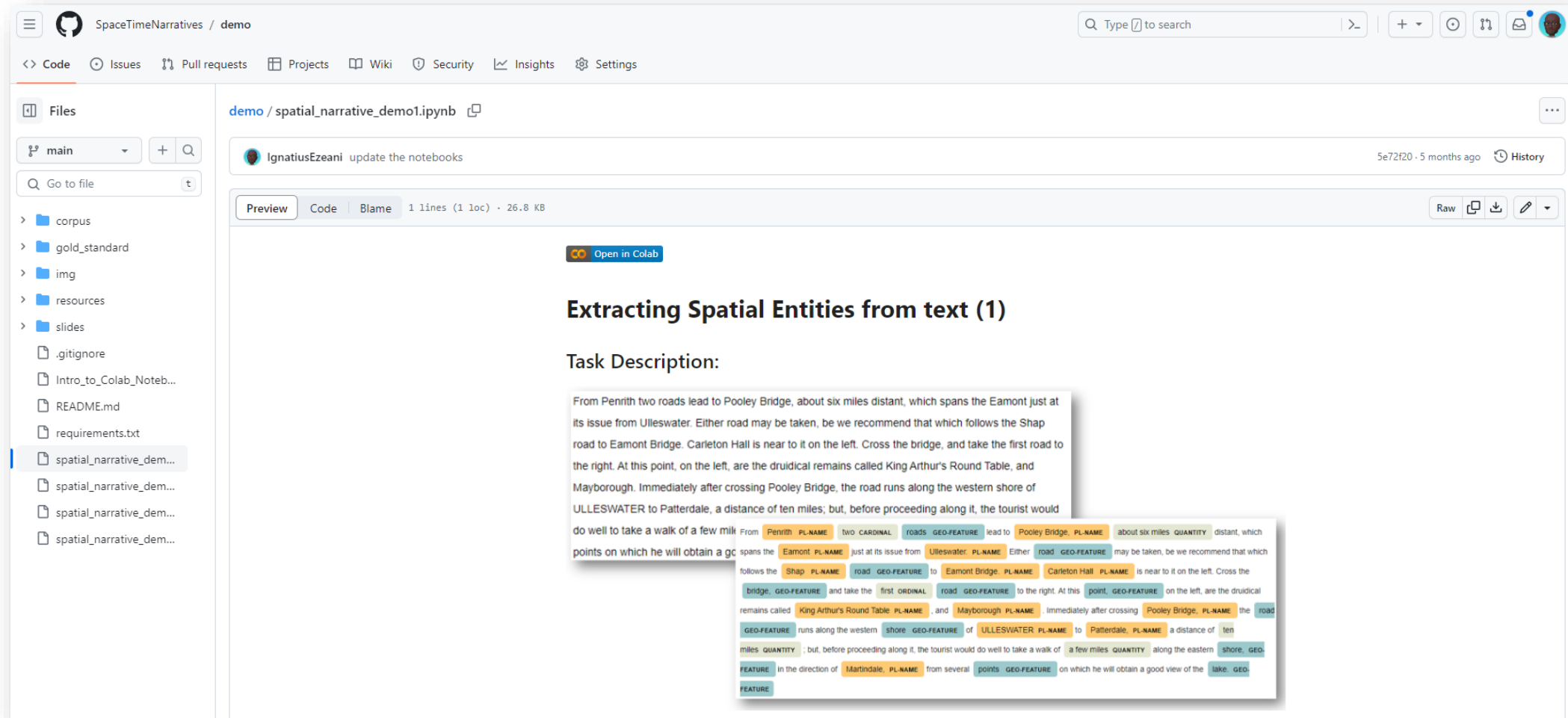
We thoroughly enjoyed the wonderful view . From Penrith PL-NAME two CARDINAL roads GEO-NOUN lead to Pooley Bridge PL-NAME , about six miles QUANTITY distant , which spans the Eamont PL-NAME just at its issue from Ulleswater PL-NAME . Either road GEO-NOUN may be taken , be we recommend that which follows MOVEMENT the Shap PL-NAME road to Eamont PL-NAME . Carleton Hall PL-NAME is near to it on the left LOC-ADV . Cross MOVEMENT the bridge GEO-NOUN , and take the first ORDINAL road GEO-NOUN to the right . At this point TIME-sem , on the left LOC-ADV , are the druidical remains called King Arthur's Round Table PL-NAME , and Mayborough . Immediately after crossing MOVEMENT Pooley Bridge PL-NAME , the road GEO-NOUN runs along the western shore GEO-NOUN of ULLESWATER PL-NAME .

There is some good fishing here LOC-ADV in the lake GEO-NOUN and stream GEO-NOUN . Trout , perch , and eels , are numerous , and large lake GEO-NOUN - trout are sometimes , though seldom , taken . Lowther Castle PL-NAME , the seat GEO-NOUN of the Earl of Lonsdale PL-NAME , is distant from this MOVEMENT bridge GEO-NOUN about four miles QUANTITY . Ulleswater PL-NAME is nine miles QUANTITY in length , by nearly a mile QUANTITY wide , at the broadest point GEO-NOUN ; but , owing to its irregular form , it is divided into three CARDINAL reaches , the first ORDINAL of which is closed in by Hallen Fell PL-NAME , on the western shore GEO-NOUN .



<https://spacemenarratives.streamlit.app/>

Colab Notebooks



SpaceTimeNarratives / demo

Code Issues Pull requests Projects Wiki Security Insights Settings

Files

- main
- corpuz
- gold_standard
- img
- resources
- slides
- .gitignore
- Intro_to_Colab_Noteb...
- README.md
- requirements.txt
- spatial_narrative_dem...
- spatial_narrative_dem...
- spatial_narrative_dem...
- spatial_narrative_dem...

demo / spatial_narrative_demo1.ipynb

IgnatiusEzeani update the notebooks 5e72f20 · 5 months ago History

Preview Code Blame 1 lines (1 loc) · 26.8 KB

Open in Colab

Extracting Spatial Entities from text (1)

Task Description:

From Penrith two roads lead to Pooley Bridge, about six miles distant, which spans the Eamont just at its issue from Ulleswater. Either road may be taken, be we recommend that which follows the Shap road to Eamont Bridge. Carleton Hall is near to it on the left. Cross the bridge, and take the first road to the right. At this point, on the left, are the druidical remains called King Arthur's Round Table, and Mayborough. Immediately after crossing Pooley Bridge, the road runs along the western shore of ULLESWATER to Patterdale, a distance of ten miles; but, before proceeding along it, the tourist would do well to take a walk of a few miles along the eastern shore, in the direction of Martindale, from several points on which he will obtain a good view of the lake.

From Penrith PL-NAME two CARDINAL roads GEO-FEATURE lead to Pooley Bridge PL-NAME about six miles QUANTITY distant, which spans the Eamont PL-NAME just at its issue from Ulleswater PL-NAME. Either road GEO-FEATURE may be taken, be we recommend that which follows the Shap PL-NAME road GEO-FEATURE to Eamont Bridge PL-NAME. Carleton Hall PL-NAME is near to it on the left. Cross the bridge GEO-FEATURE and take the first ORDINAL road GEO-FEATURE to the right. At this point GEO-FEATURE on the left, are the druidical remains called King Arthur's Round Table PL-NAME, and Mayborough PL-NAME. Immediately after crossing Pooley Bridge PL-NAME the road GEO-FEATURE runs along the western shore GEO-FEATURE of ULLESWATER PL-NAME to Patterdale PL-NAME a distance of ten miles QUANTITY; but, before proceeding along it, the tourist would do well to take a walk of a few miles QUANTITY along the eastern shore, GEO-FEATURE in the direction of Martindale PL-NAME from several points GEO-FEATURE on which he will obtain a good view of the lake. GEO-FEATURE

Thanks for your attention