

A Semantically Enabled Geographic Information Retrieval Framework by using Representation Learning: A Simple Case Study of DBpedia

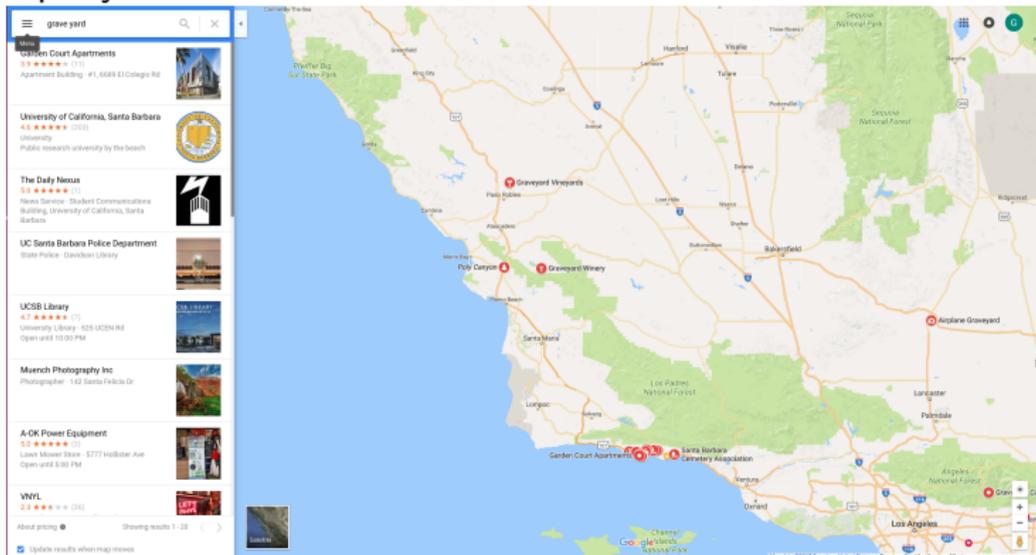
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Traditional Map Search v.s. Semantically Enabled Search

- Traditional map/placename search fails to understand the query



- How to let our GIR system understand the semantic of geographic information and do a more intelligent search: Semantically Enabled GIR system

Data Source and Representation Learning Method

- **Data Source:** All entities typed dbo:HistoricalPlace in DBpedia
- **Method:** Doc2Vec Model (PVDM)
 - Treat each place as a document whose content is its description from DBpedia/Wikipedia
 - Use a Representation Learning method (Doc2Vec) to learn a dense embedding for each place and each word token.
 - Cosine similarity between embeddings encodes their semantic similarity.
 - Apply dimension reduction techniques to these embeddings of places into 2D.
 - Cluster these places into different groups/topics
 - Construct concave hulls for each topic to give a semantic view of these places

Result

Semantically Enabled Search:

The screenshot displays a web application interface for a search tool. At the top, a search bar contains the text "grave yard" and a "Search" button. Below the search bar, the "Search Results" panel lists various cemetery names, including:

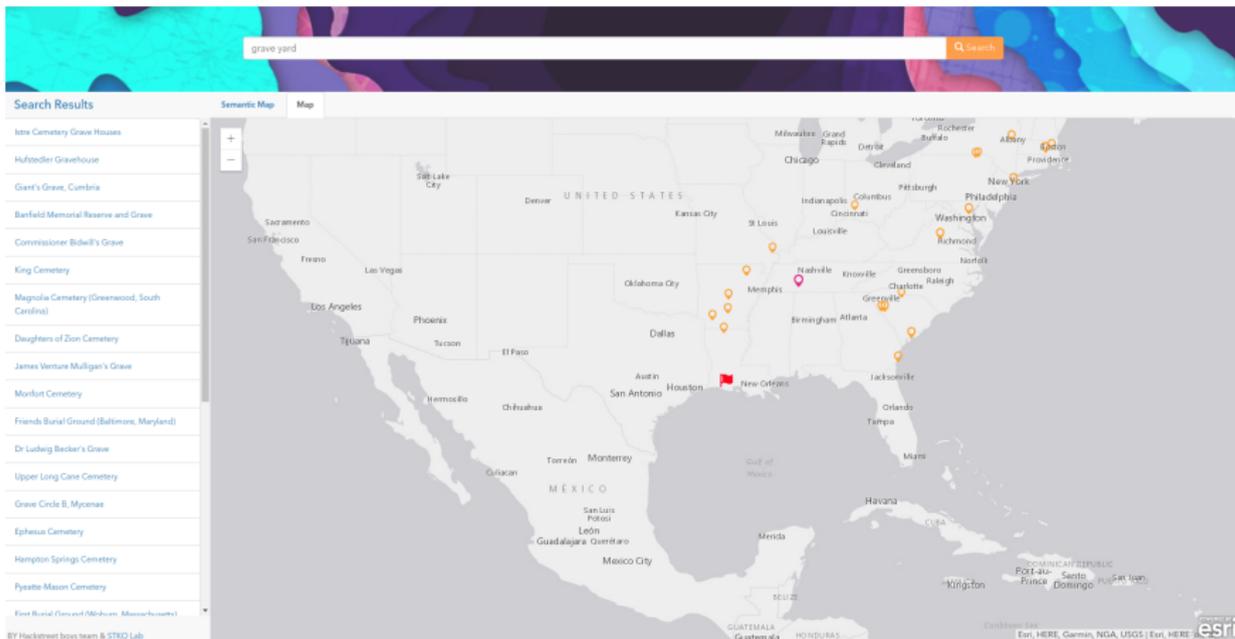
- Isle Cemetery Grave Houses
- Hufstader Gravehouse
- Giant's Grave, Cumbrine
- Banfield Memorial Reserve and Grave
- Commissioner Bidwell's Grave
- King Cemetery
- Magnolia Cemetery (Greenwood, South Carolina)
- Daughters of Zion Cemetery
- James Venture Mulligan's Grave
- Monfort Cemetery
- Friends Burial Ground (Baltimore, Maryland)
- Dr Ludwig Becker's Grave
- Upper Long Cone Cemetery
- Grave Circle B, Mycenae
- Ephesus Cemetery
- Hampton Springs Cemetery
- Pysshe Mason Cemetery
- Five Burial (Five of Mid-Arcum, Missouri)

The main map area shows a yellow-shaded region containing numerous orange location pins. A red pin is highlighted on the right side of the map. The map interface includes a "Semantic Map" and "Map" toggle, a zoom control, and an "esri" logo in the bottom right corner. The text "Parish" is visible on the left side of the map.

BY Hackstreet boys team & STRO Lab

Result

Display search result in geographic space:



Conclusion & Future Work

- Representation learning/Deep Learning methods provide us a nice tool to encode the semantic information of geographic features which facilitate semantically enabled geographic knowledge discovery.
- Future work will focus on how to combine this bottom-up method with the top-down methods to better capture the semantics of geographic information.