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K. N. Toosi University of Technology



**University of
Zurich**^{UZH}

Recommend Places by Spatial and Non-Spatial Features

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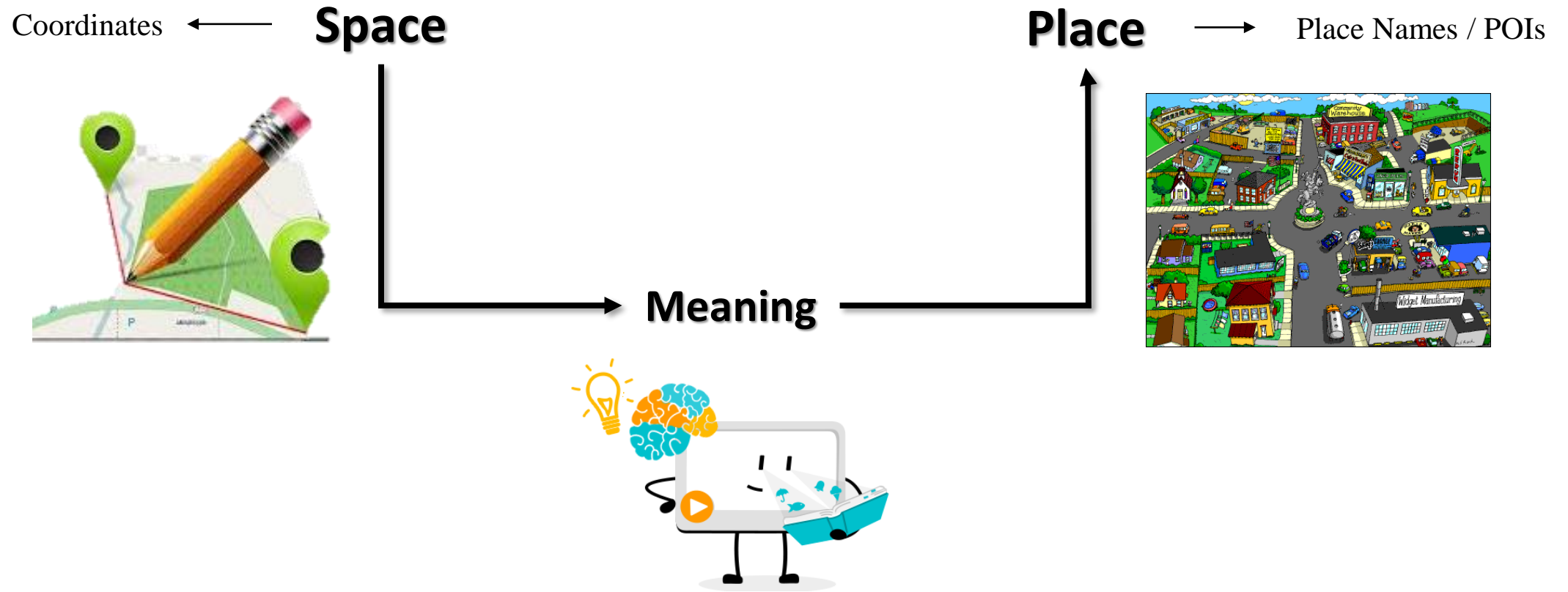
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Introduction





Problem

- ❖ Location-based recommender systems provide relevant suggestions to users by integrating location information.
- ❖ These could include recommendations for hotels, restaurants, parks or other places near the user's location .
- ❖ Place recommendation would not recommend only near places.
- ❖ A recommender system of tourism should focus on attractiveness of places rather than their locations.
- ❖ These systems focus only on the general area of places, not on their exact locations.
- ❖ A place may be very attractive, but it is so far away that users will avoid visiting it.

**A Place recommender system
which consider spatial and non-spatial features**



Objective

Extract meaningful place-based concepts

from UGTCs and s

applicable in rec

Consider semantic spaces consisting of

objects from some

(TripAdvisor

Such semantic spaces often model salient

features (e.g., attrac

The feature directions allow us to rank

objects according t

the correspon

Our method is fully unsupervised, requiring

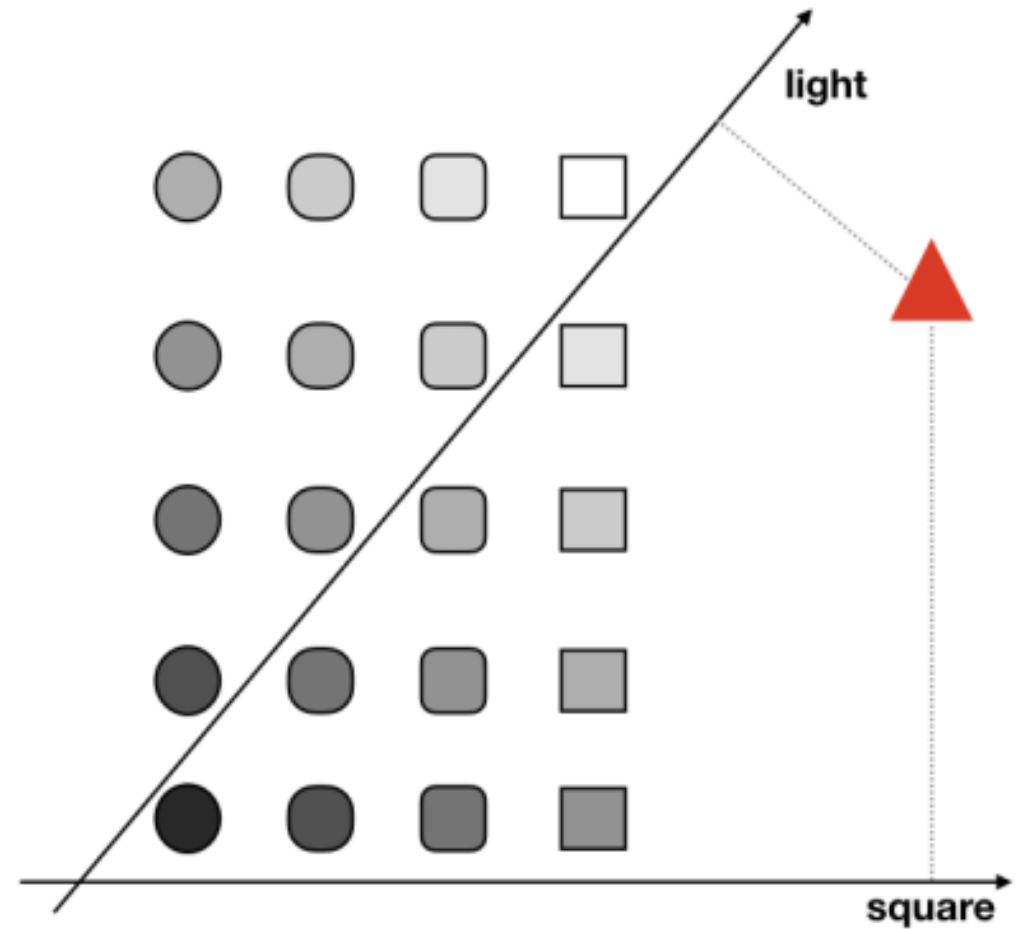
only a bag-of-words representation of the

objects as input

Toy example: A 2-D embedding of geometric shapes

Within this space: Identify directions which encode

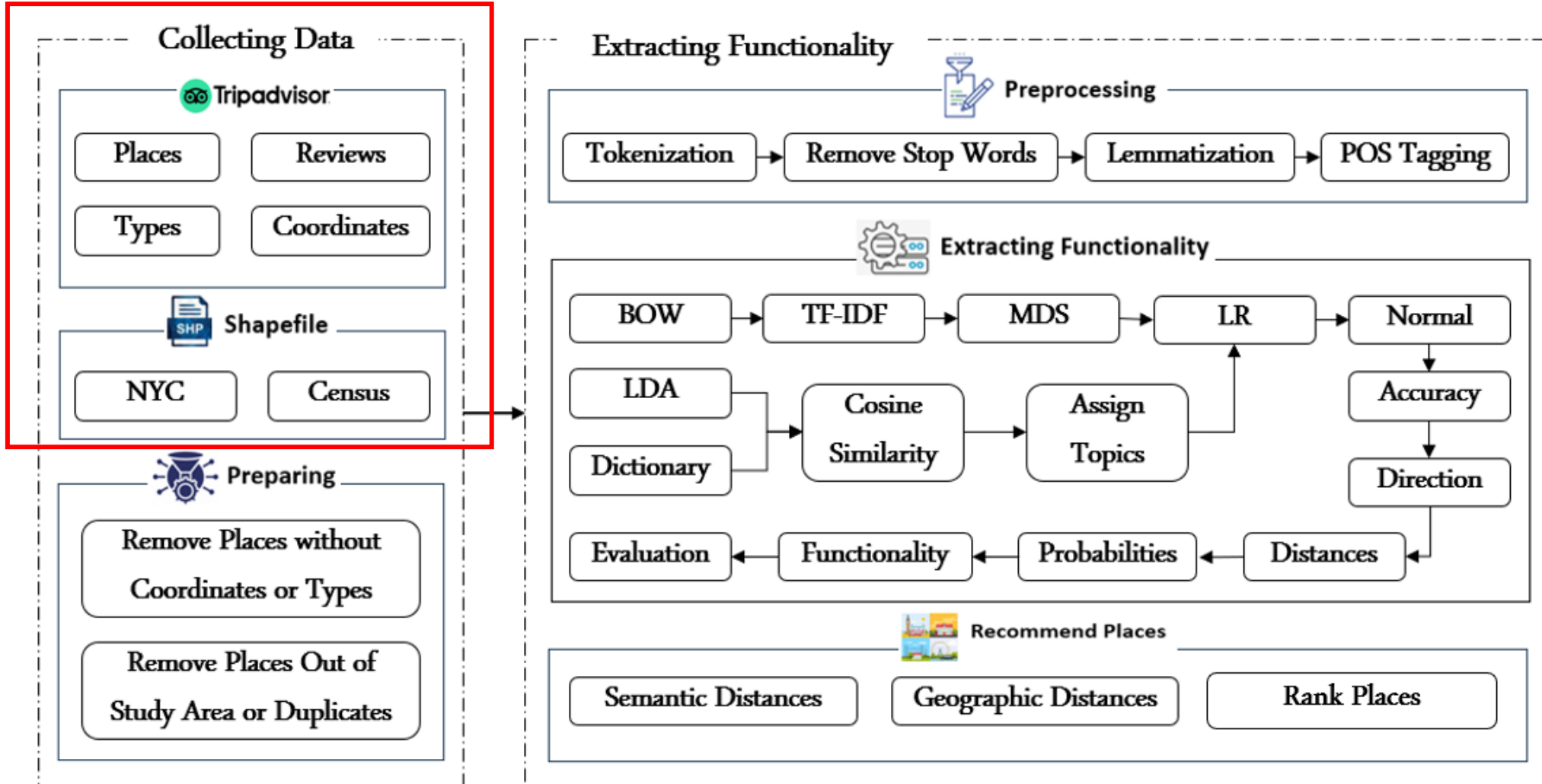
- ❖ how light an object is and
- ❖ how closely its shape resembles a square



Ager, T., Kuzelka, O., & Schockaert, S. (2018). Modelling salient features as directions in fine-tuned semantic spaces.

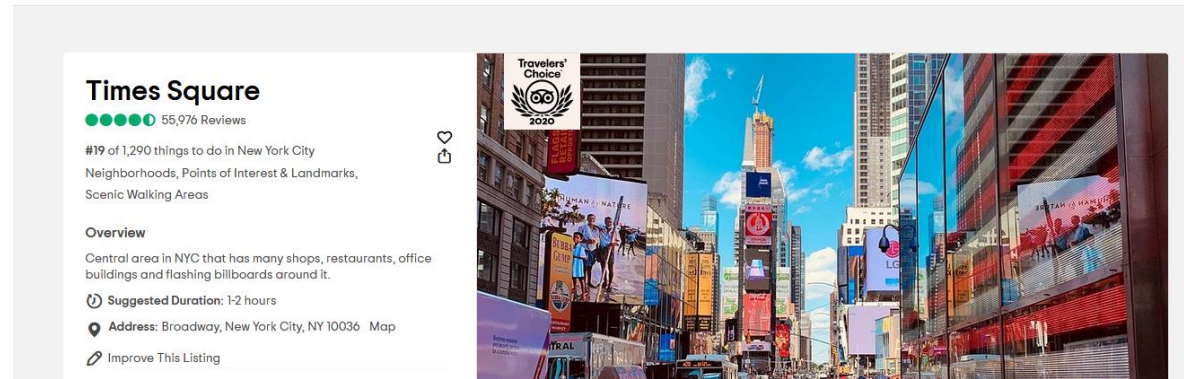
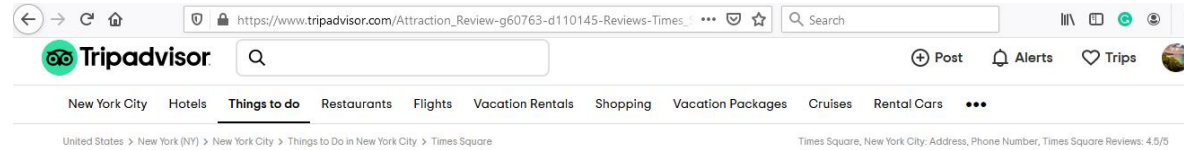


Workflow





Tripadvisor

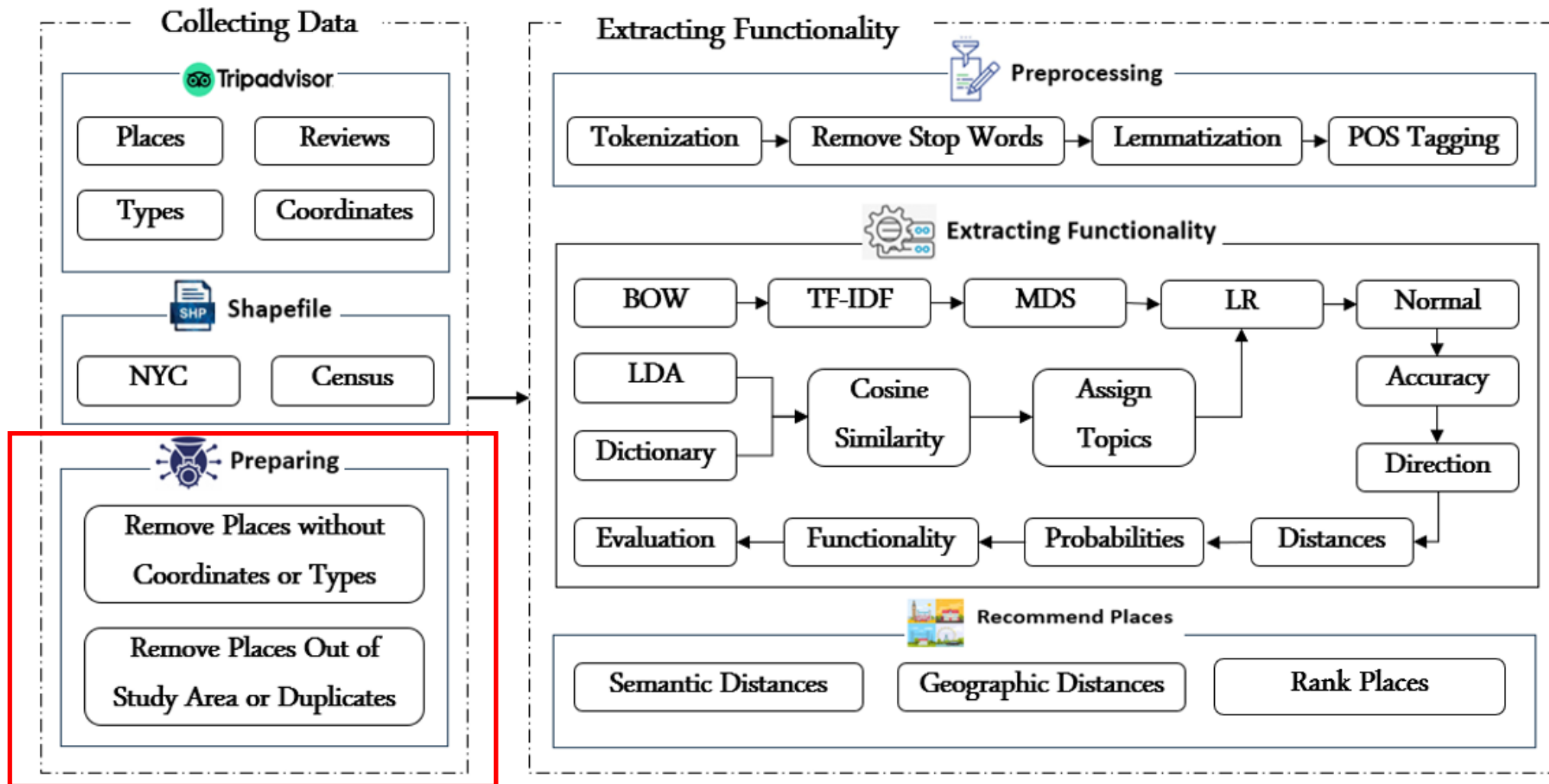


placeld	reviewId	reviewTitle	reviewText	reviewRating
20053947	747586682	WOW	So glad I made it to this exhibit. An "experience" is exactly right - the room was filled with beautiful vibes and people, and we had a wonderful ti	5
20053947	744159299	Tantalizing!	Amazing Experience. I thought I was on another planet. The music was a big part of this event in my opinion.	5
20053947	744006695	Epic art experience!	It was such an amazing experience!!! Such a talented artist !! I highly recommend checking it out! Something you donâ€™t want to miss.	5
20053947	743986384	2120: An Art Experience	Absolutely loved! Itâ€™s hard to find art thatâ€™s fun to play with, so instagrammable and different. Had a great time experiencing the installati	5

FID	id	name	type	url	reviewCount	rating	latitude	longitude	openHours	mentions	reviewCountEN	description	categoryType
0	555455	303	Shoppings	/Attractio	0	0	40.7476082	-74.00547		[]	0	The innovative master works of leading-e Art Galleries	
1	13951437	212 Arts	Shoppings	/Attractio	0	0	40.7286987	-73.980164		[]	0	Founded in 2014 in New York City's East V Art Galleries	
2	20053947	2120: An Art Experien	Shoppings	/Attractio	8	5	40.7867546	-73.977936	1:30 PM - 7:	['installatio	8	Produced by YTG Agency, 2120: An Art Exp	Art Galleries
3	12877518	242 Grand Jewelry	Shoppings	/Attractio	1	5	40.7134285	-73.959114		[]	1	242 Grand Jewelry is part storefront part	Gift & Specialty Shops
4	218682	26th Street Flea Mark	Shoppings	/Attractio	13	3.5	40.7446556	-73.993187	9:00 AM - 6:	['jewelry']	11	Chelsea Flea Market evokes the original A	Flea & Street Markets

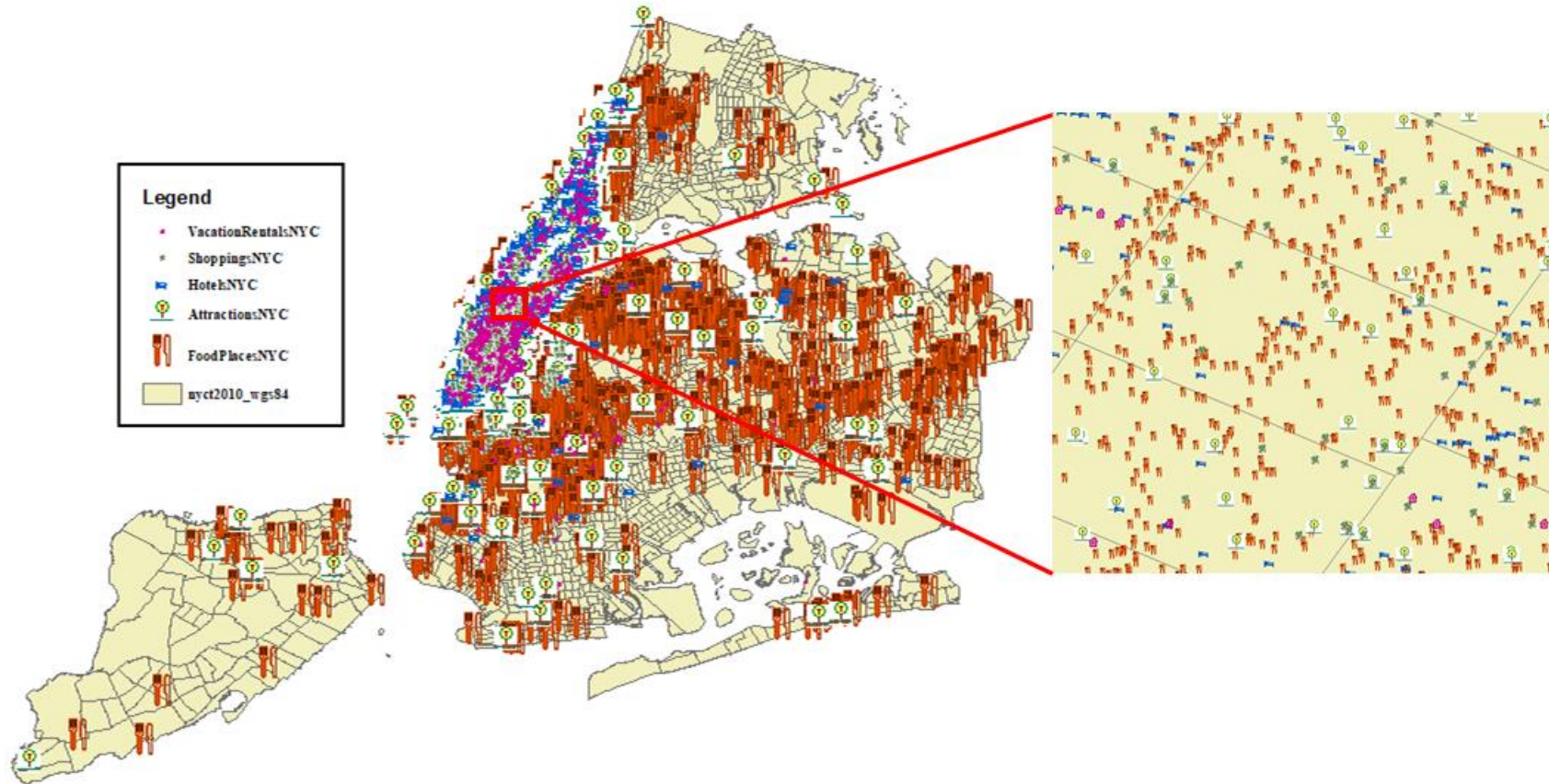


Workflow





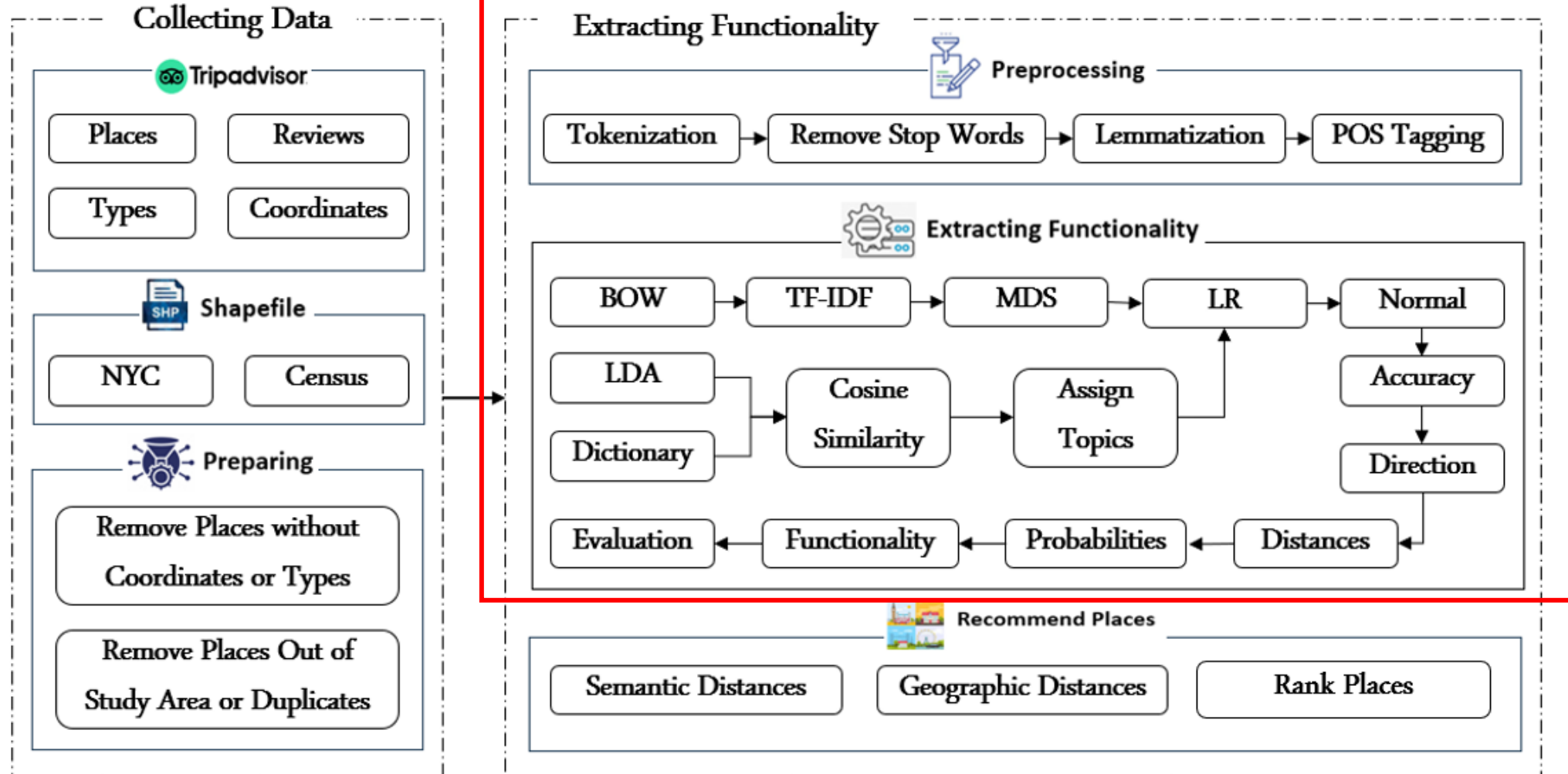
Data and Study Area



Place Functionality	FoodPlace	Hotel	Attraction	Shop	Total
No. of Places	3314	573	482	232	4601
No. of Reviews	325774	160774	95661	17840	600049



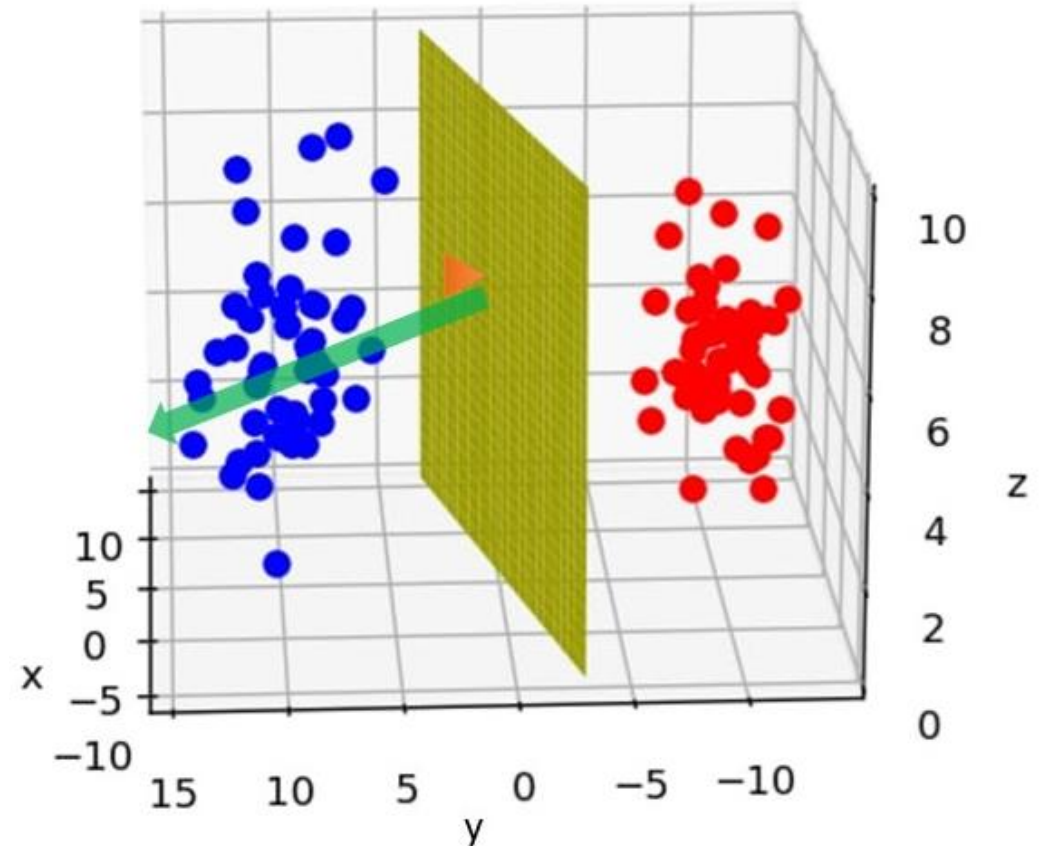
Workflow





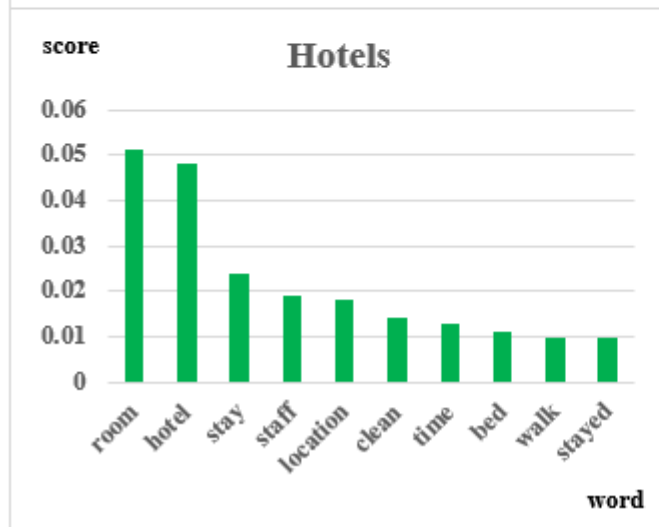
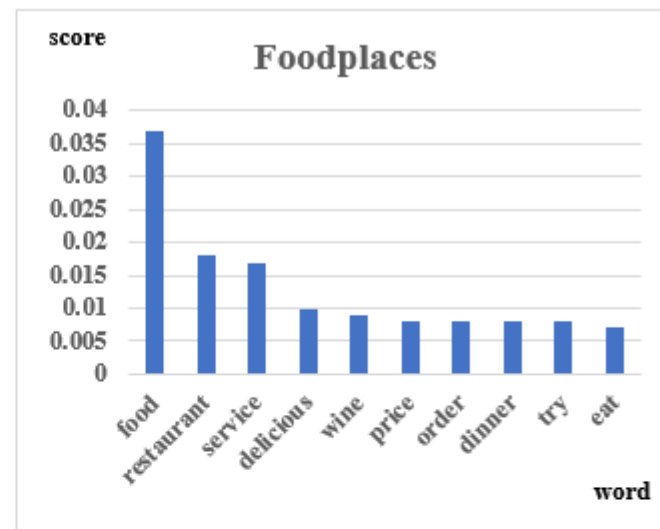
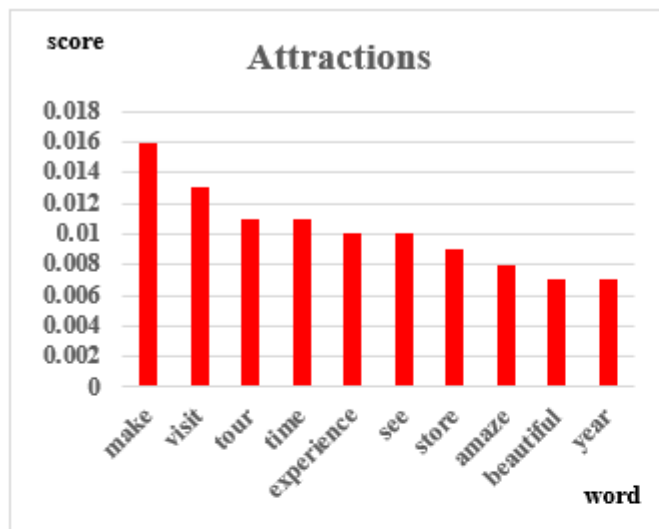
The Thematic View of The Semantic Space

- ❖ A topic for each functionality (4 topics)
- ❖ MDS Dimensions are the constant number of dimensions to convert BoW to lower dimensional similarity space (D=5, 10, 20, 50)
- ❖ A hyperplane for each functionality (4 hyperplanes)





Topic Modeling LDA



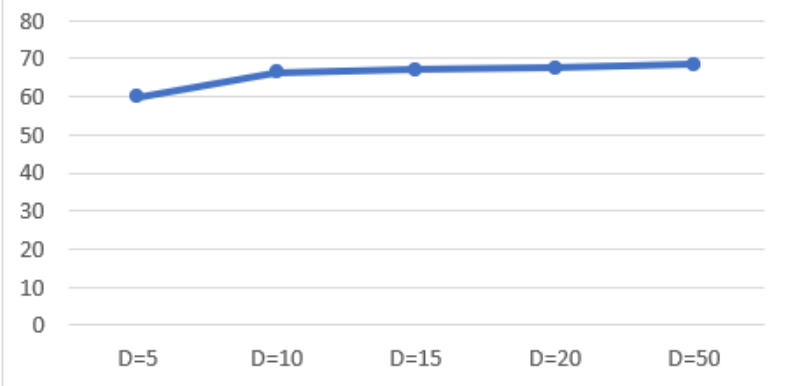


Sample of Predicted Functionalities

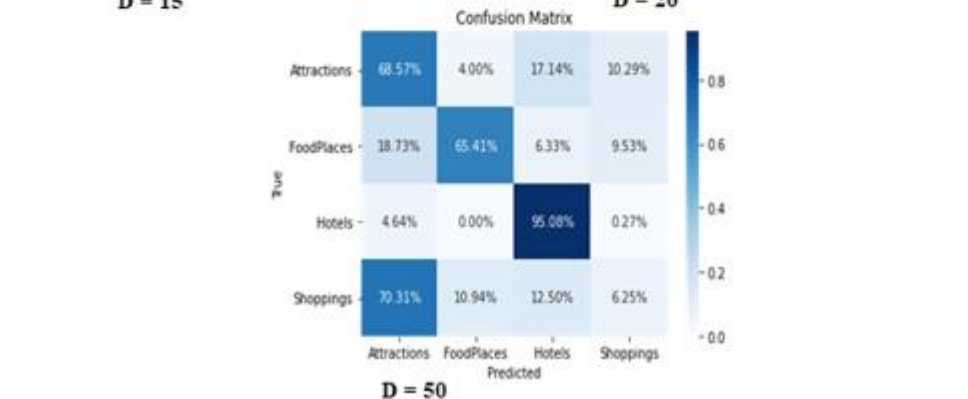
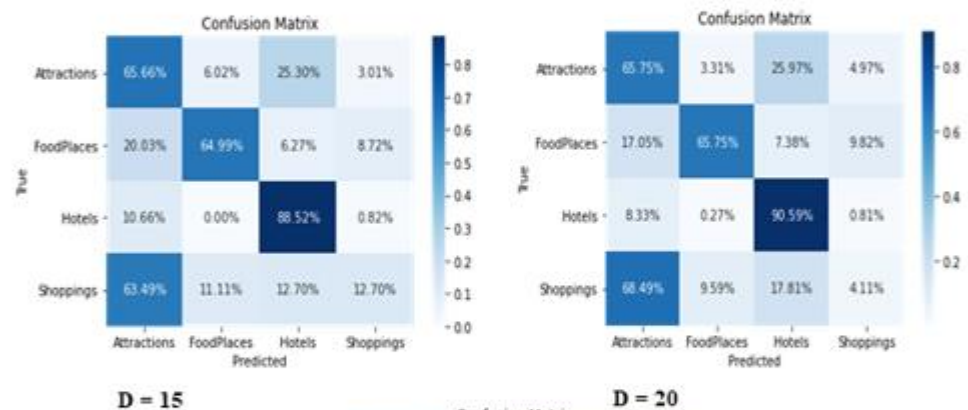
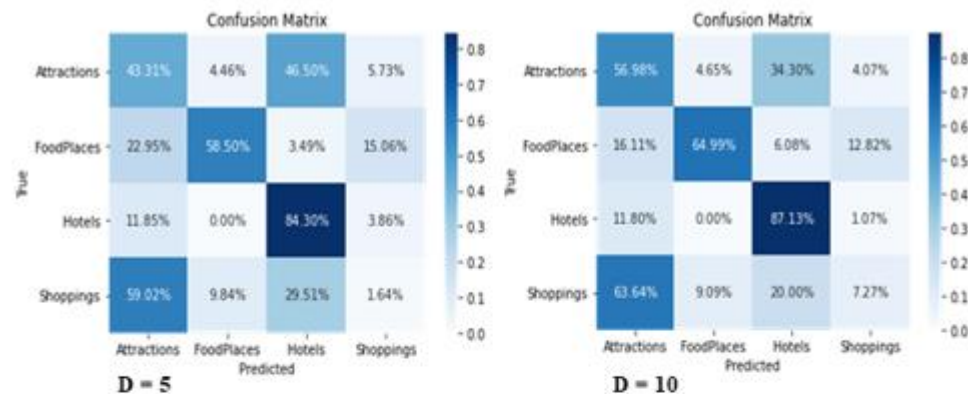
Tripadvisor	Predicted	Distances
Attraction	Attraction	[7.976, -4.076, 7.348, 4.300]
Attraction	FoodPlace	[-18.809, 16.044, -51.044, -8.239]
Attraction	Hotel	[24.275, -68.621, 30.069, 10.392]
Attraction	Shopping	[11.399, -16.329, -4.216, 13.422]
Attraction	Unclassified	[-6.158, -63.251, -37.637, -43.335]
FoodPlace	Attraction	[11.024, 9.74, -43.903, -10.894]
FoodPlace	FoodPlace	[-10.372, 76.230, -56.525, 1.929]
FoodPlace	Hotel	[9.236, 7.277, 17.749, 13.212]
FoodPlace	Shopping	[8.058, -1.743, 7.158, 9.104]
FoodPlace	Unclassified	[-11.687, -46.167, -8.320, -16.781]
Hotel	Attraction	[14.775, -47.845, 13.027, 1.870]
Hotel	FoodPlace	-
Hotel	Hotel	[25.224, -61.947, 89.383, 28.718]
Hotel	Shopping	[66.003, 34.351, 68.137, 74.605]
Hotel	Unclassified	[-11.687, -46.167, -8.320, -16.781]
Shopping	Attraction	[-20.790, 4.170, -30.412, -14.821]
Shopping	FoodPlace	[-15.804, 11.622, 0.685, -1.533]
Shopping	Hotel	[29.702, -34.273, 32.2471, 26.964]
Shopping	Shopping	[21.868, -18.723, 22.697, 27.503]
Shopping	Unclassified	[-11.687, -46.167, -8.320, -16.781]

Evaluation Results

Accuracy of the Proposed Method

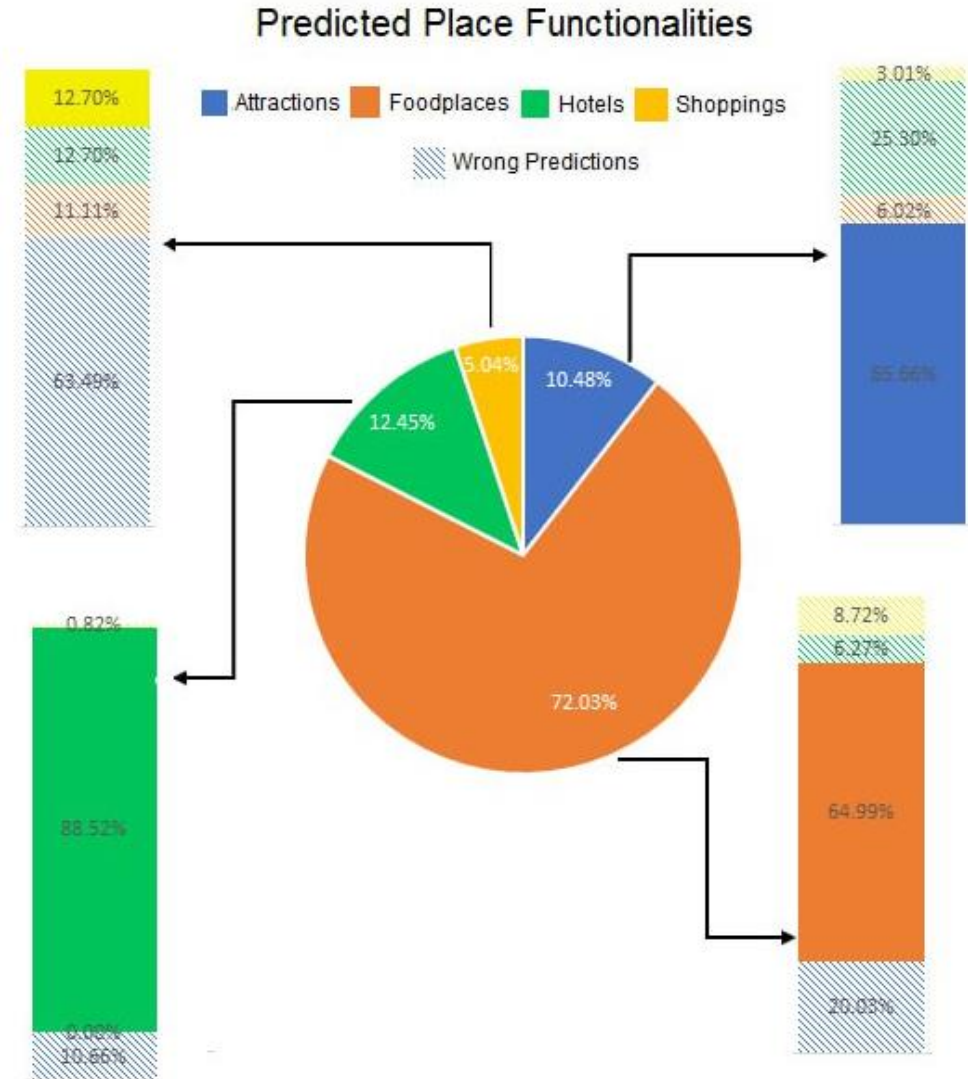
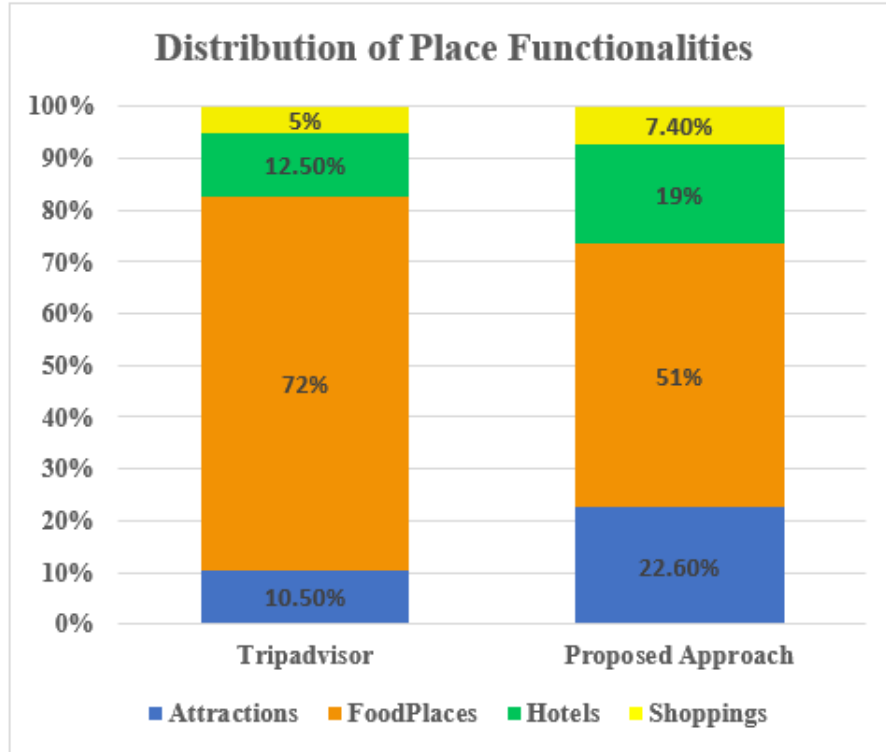


		D=5	D=10	D=15	D=20	D=50
Precision	A	0.11	0.20	0.18	0.22	0.22
	F	0.99	0.99	0.99	0.99	0.99
	H	0.65	0.63	0.65	0.62	0.69
	S	0.00	0.01	0.04	0.01	0.02
Recall	A	0.43	0.57	0.66	0.66	0.69
	F	0.58	0.65	0.65	0.66	0.65
	H	0.84	0.87	0.89	0.91	0.95
	S	0.02	0.07	0.13	0.04	0.06
F1-Score	A	0.17	0.29	0.29	0.33	0.34
	F	0.74	0.78	0.78	0.79	0.79
	H	0.74	0.73	0.75	0.74	0.80
	S	0.01	0.02	0.06	0.02	0.03





Distribution Results



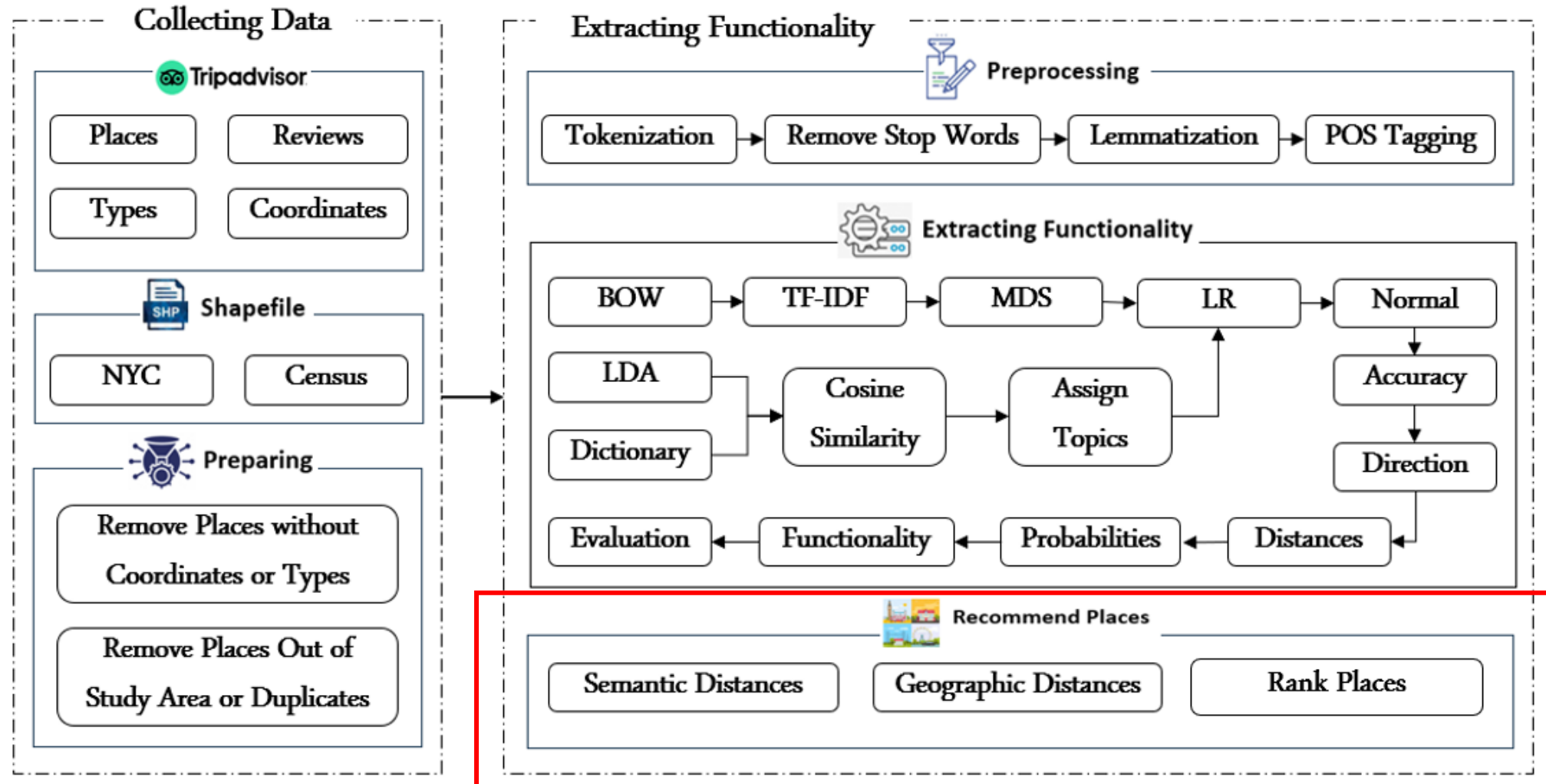


Ranked Places Bases on Semantic Space

id	categoryType	Distance
1	[Sights & Landmarks]	81.44360911
2	[Muesums]	76.17219418
3	[Sights & Landmarks]	52.18535502
4	[Sights & Landmarks]	51.357416
5	[Other]	46.25181251
6	[Concerts & Shows]	45.07901105
7	[Other, Nature & Parks, Sights & Landmarks]	41.15674603
8	[Concerts & Shows]	40.97252379
9	[Fun & Games, Nature & Parks, Sports Camps & Clinics]	36.1009389
10	[Nature & Parks, Sights & Landmarks]	36.04665008



Workflow



Summery

- ❖ The aim was proposing a place recommender system by integrating the geographic space and the semantic space.
- ❖ The general functionalities were extracted from Tripadvisor reviews.
- ❖ The semantic space was constructed by modelling salient features as directions for each functionality.
- ❖ The semantic distances were calculated in this space.
- ❖ The pairwise geographic distances were calculated in the geographic space.

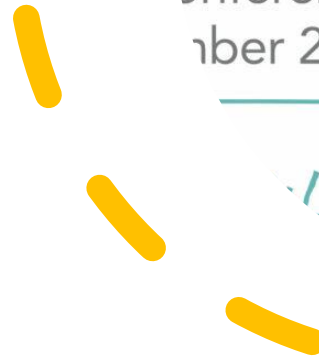
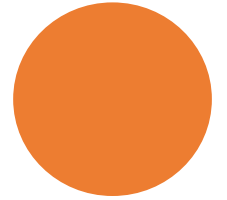
Limitations and Future works

- ❖ Insufficient performance for shopping functionality
- ❖ Looking for an approach to integrate the geographic space and the semantic space
- ❖ Consider user's location in ranking approach for place recommender system

Thank you for your attention

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