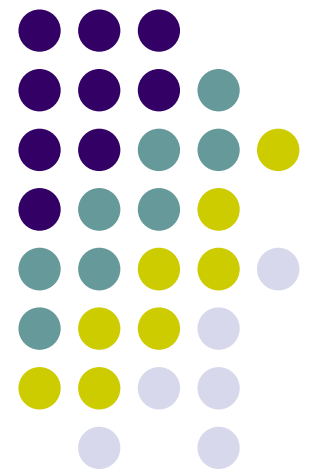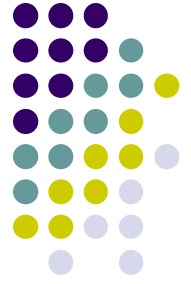# Advanced Computer Graphics
CS 525M: *Identifying the Activities Supported by Locations with Community-Authored Content*

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OUTLINE

- Introduction
- Motivation
- Goals
- Related Works
- Contributions
- Methodology
- Results
- Conclusions
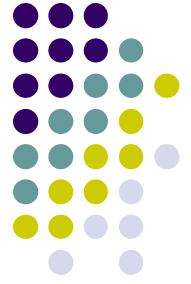- Limitations and Future Works

Introduction

- Context-aware applications require knowledge of a person's location and activity.

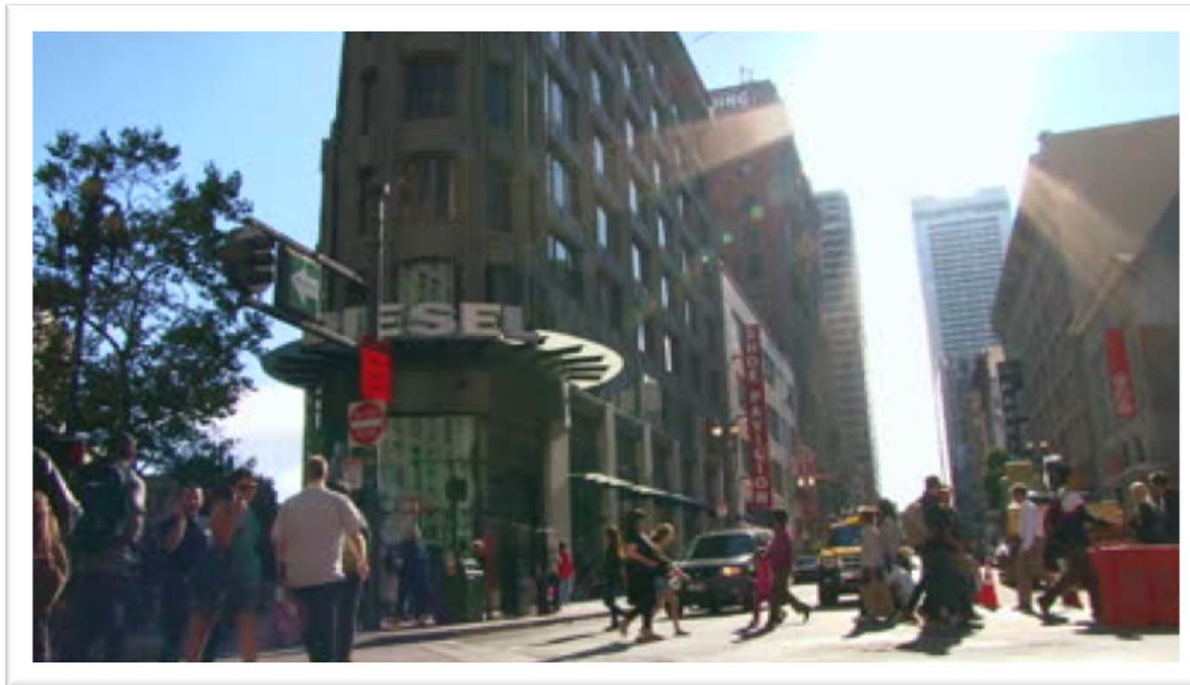- These methods for sensing and inferring context lack *generality.*
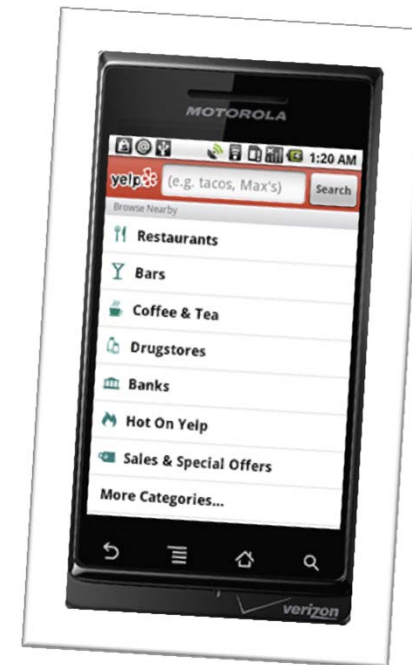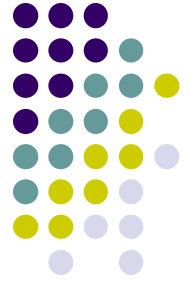
Context-Awareness

Problem

- How to determine types of activities which are available at a given location?
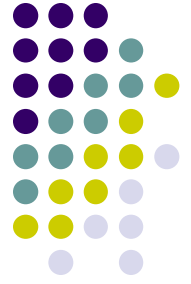
Motivation

- The set of *activities* a person can perform at a *location changes* depending on the situations that arise and the people who experience them.

- Yelp's offers community-authored content by locations.

Goal

- Identify a set of *potential activities* that are supported by a person's location. Not to infer *what* activity a person is *currently* performing

Related Works

- Infer activities by analyzing physical manifestations. [Home, RFID's]

- Detect activities with on-body sensing. [accelerometers, compass] 2005-2007

- Sense activities within the home.

- Detect infrastructure activities

by deploying small number of sensors.

Contribution

- Show that the majority of common results per location are actual activities supported by their respective locations, with a mean precision of up to 79.3%.

Contribution

- Developed and Present two context-aware services that leverage location-based activity information on a city scale that is accessible through a Web service supporting multiple cities in North America.
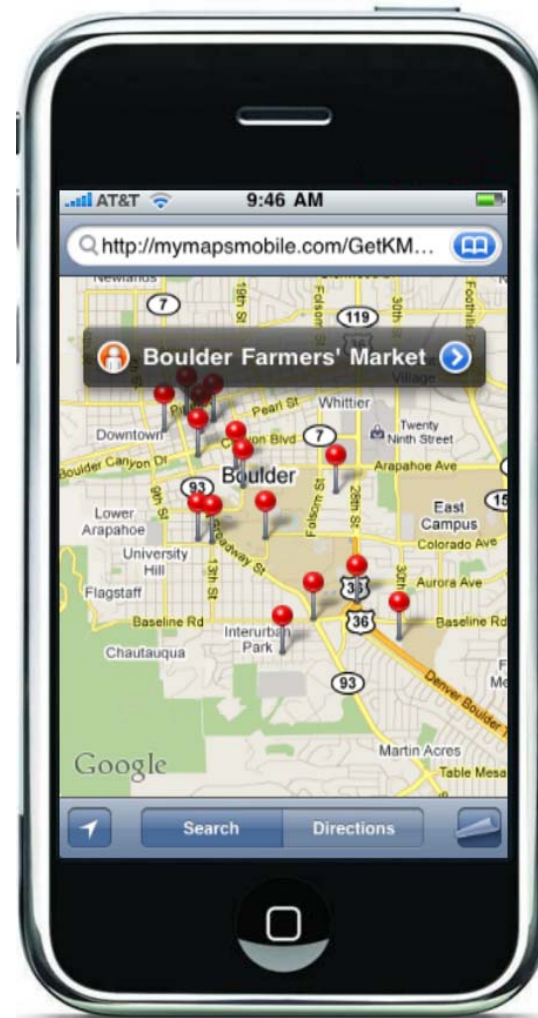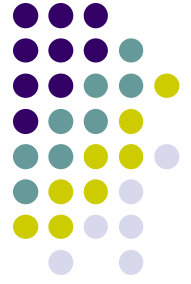
Methodology

- Community-authored content
  = review texts on locations in Yelp.com

- Potential user activities
  = verb-noun pairs
  - E.g. "check zoo", "take rowboat", "play chess" for Central Park
  - "play tennis", "sit hill", "drink beer" for Dolores Park "ride bike", "walk dog", "walk paths" in common
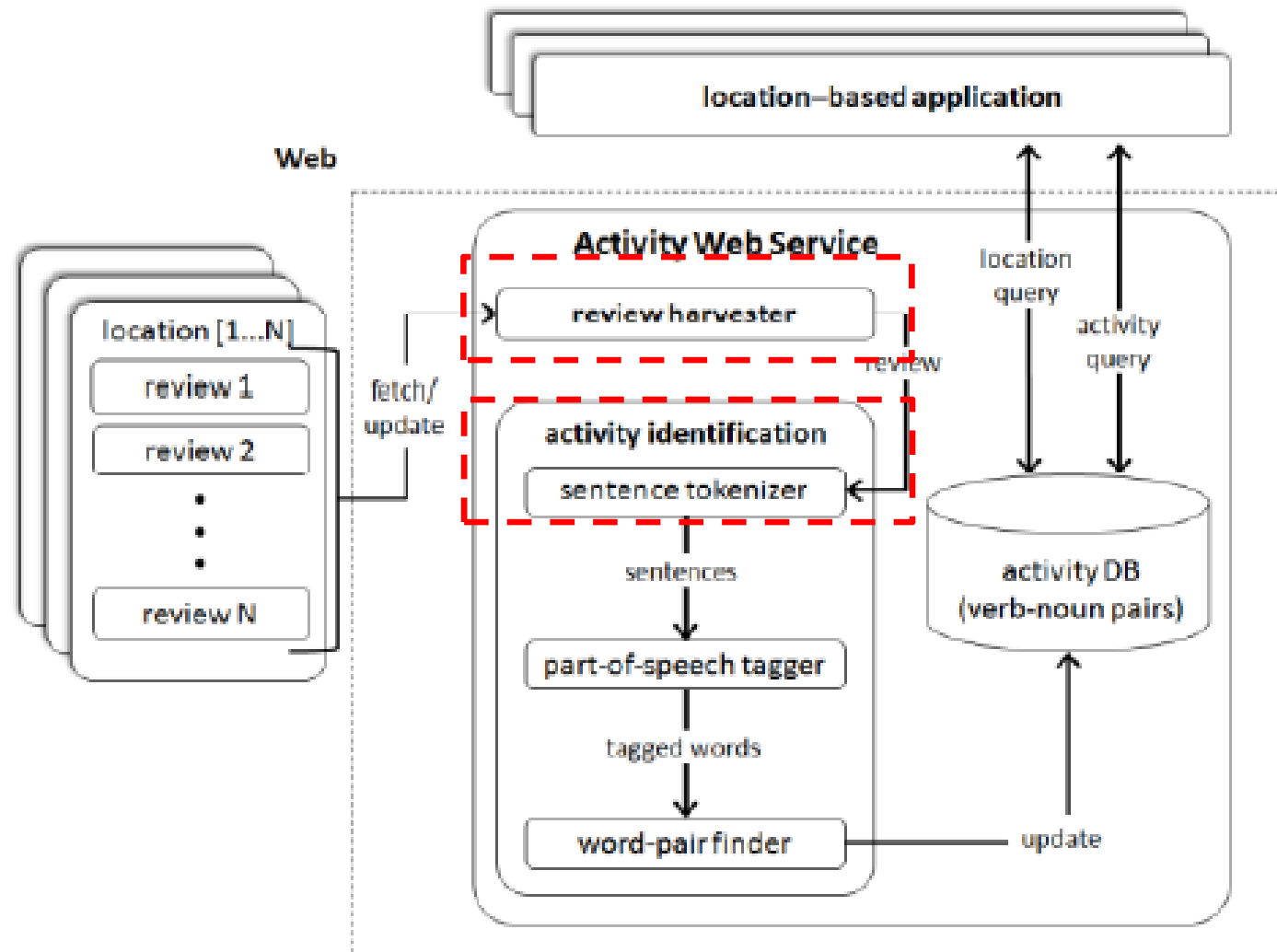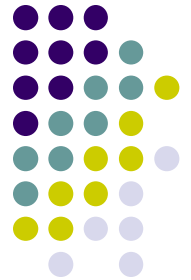
- 14 test locations

Methodology

1) *Harvesting* the review texts and related attributes (e.g., date authored) for each unique location

    ✓ Review texts + name, URL, latitude, longitude, #reviews

2) *Parsing* the review texts to identify each sentence

    ✓ Stanford Part-Of-Speech Tagger → individual sentences
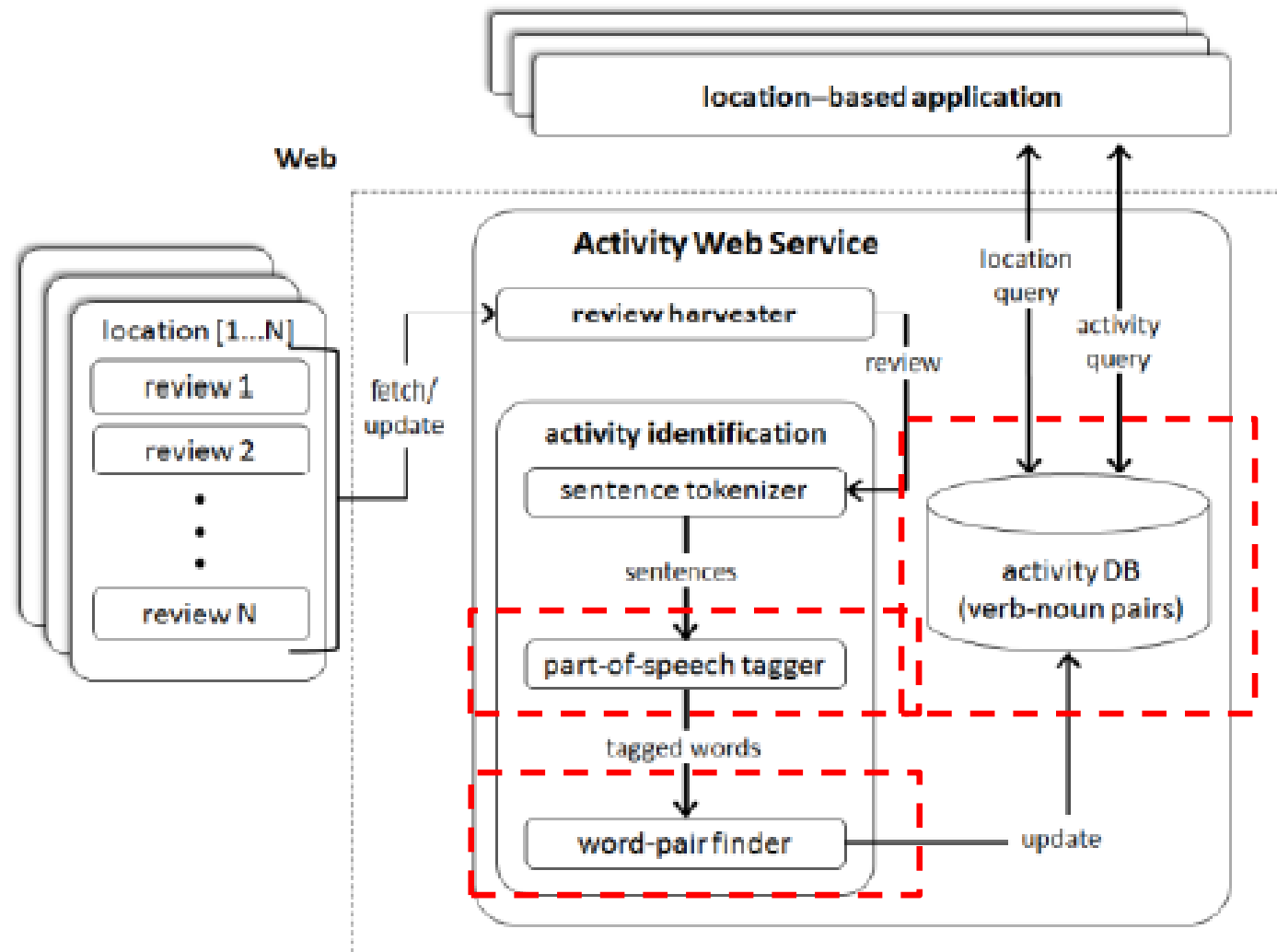
Methodology

Methodology

3) *Tagging* each word of a sentence with its part-of-speech and *extracting* local verb-noun pairs to form activities

- ✓ Stanford Part-Of-Speech Tagger → part-of-speech of each word
- ✓ Pairs of <u>valid verb</u> + nearest <u>local noun</u>

4) *Populating* and *updating* the activity database with the identified verb-noun pairs

- ✓ WordNet → respective base-word of verbs and nouns

Methodology

Methodology: experimental set-up

- Participants
  - provide activities performed/experienced at locations
  - validate 40 most common verb-noun pairs
  - True Positive (TP) – participant validated
  - False Positive (FP) – participant rejected
  - False Negative(FN) – not in most common

Methodology: Measurements tools

- Precision = TP/ FP&TP

- Recall = TP / FN&TP

- Filter applied to noun-verb pairs to reduce number of false positives
  - None, 1st Person, Frequency > 1

- Known activity to identified verb-noun pairs
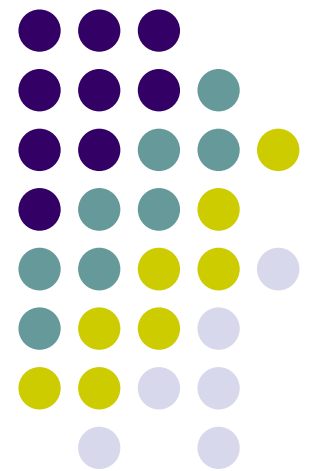 - Exact Terms
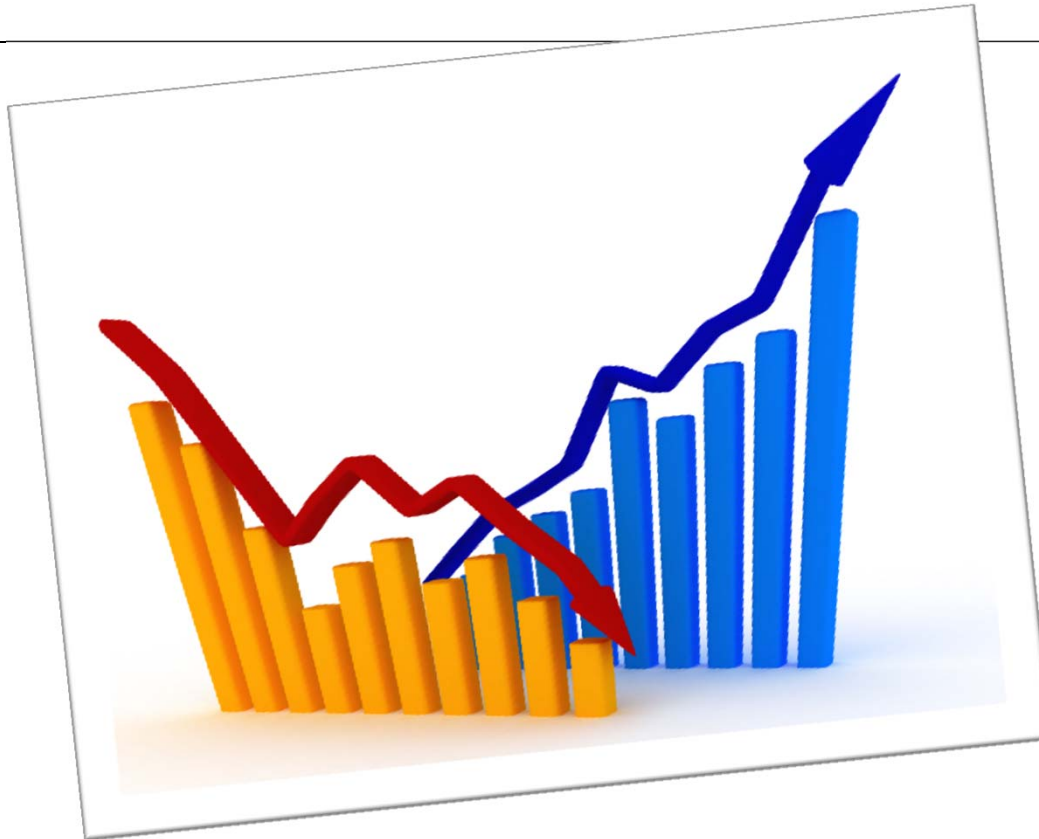 - Similar Terms
  - Synonyms

Methodology: Precision

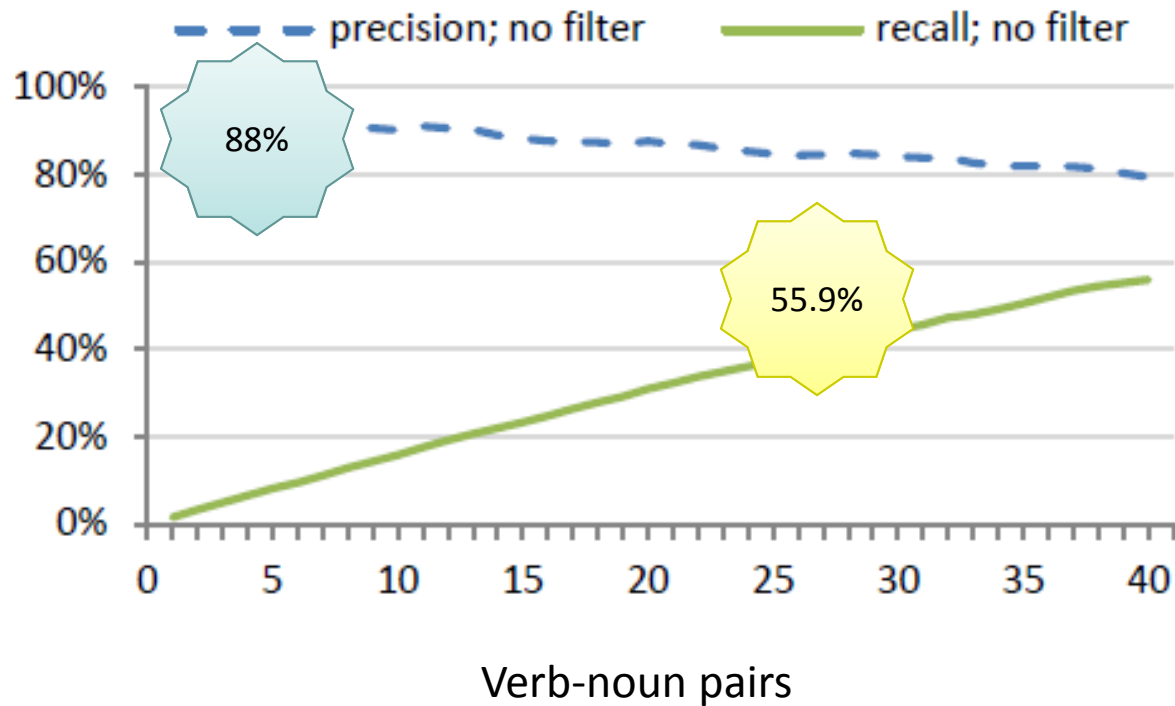|		Precision			Average Precision	
		no filter		1st person		no filter	1st person
		n	%	n	%	%	%
Validated		444	79.3	438	78.2	88.3	88.9
Provided	exact	32	5.7	29	5.2	23.2	24.7
	similar	66	11.8	62	11.1	26.7	26.7
	synonym	73	13.0	73	13.0	34.6	31.6

The precision and average precision; averaged across the 14 locations.

RESULTS

Mean Precision across locations

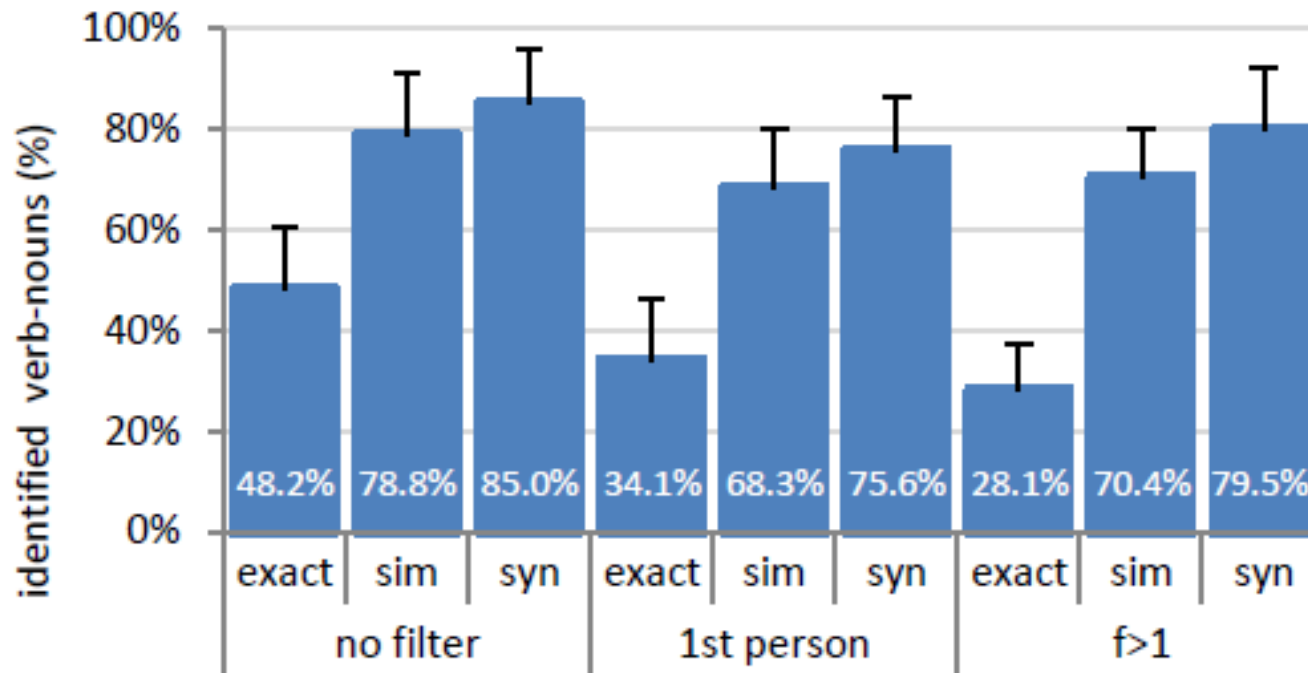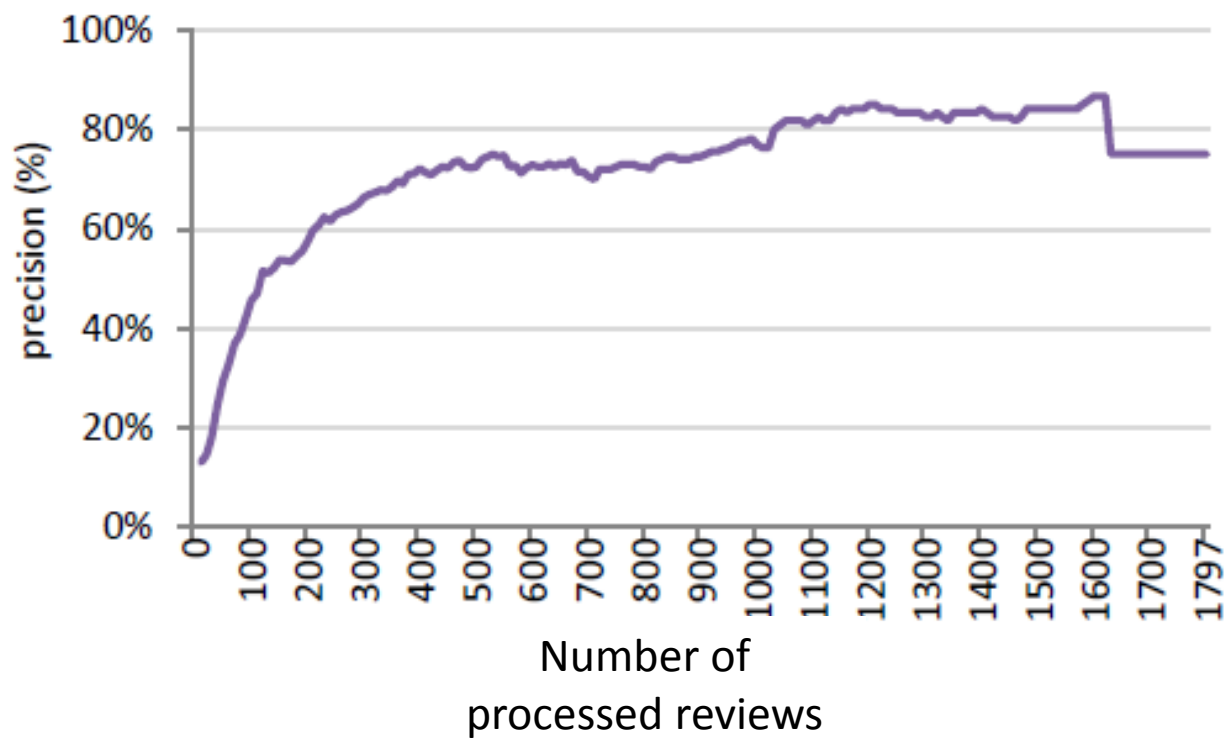# Participants provided activities across locations

Figure 3. The percentage of participant-provided activities that are identified in the set of verb-noun pairs grouped by method of comparison and filter, averaged across the 14 locations. The error bars represent one standard deviation.
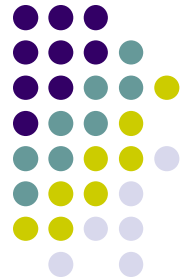
Mean Precision of common verb-nouns

Participant provided activities
No-filter
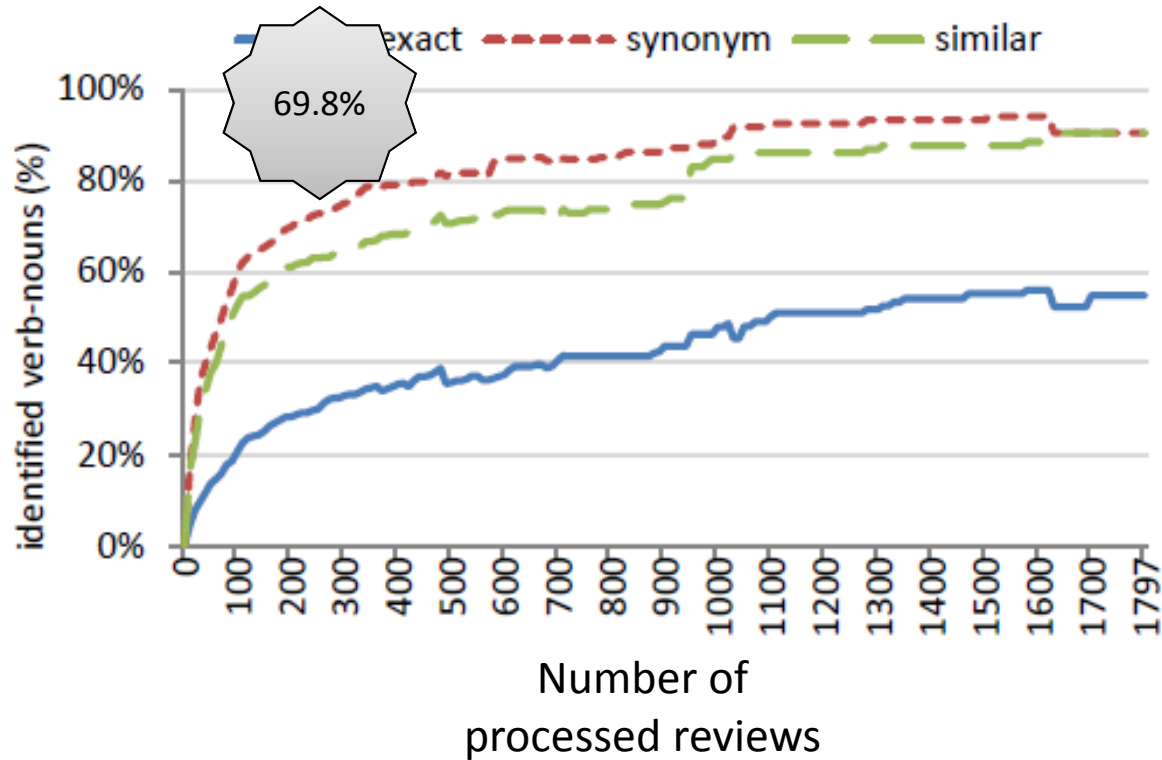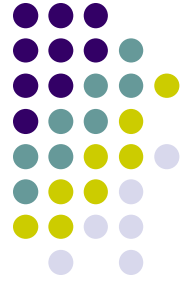
Interesting…

Community-derived activities

ID	Activity Category	Example	n	%
C1	Physical	*buy book*	685	77.6%
C2	Cognitive	*appreciate art*	101	11.4%
C3	Perceptual	*watch people*	81	9.2%
	Unclassified		16	1.8%

Applications
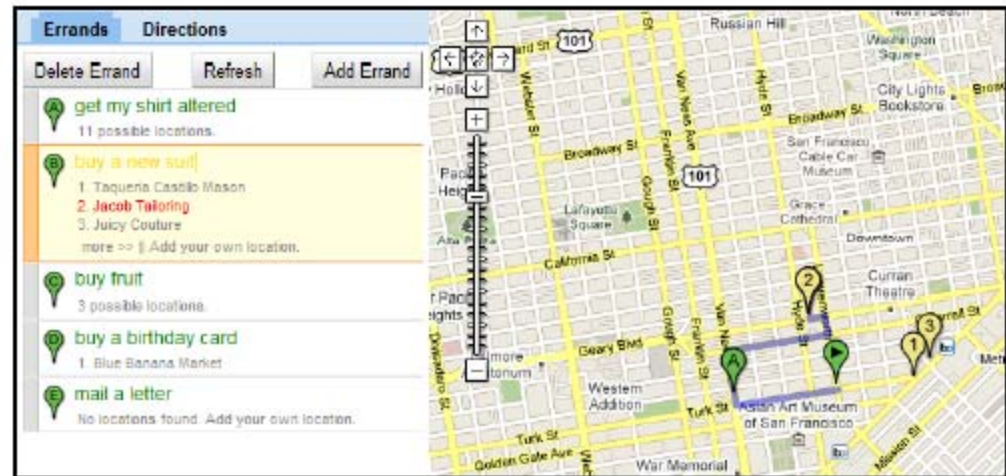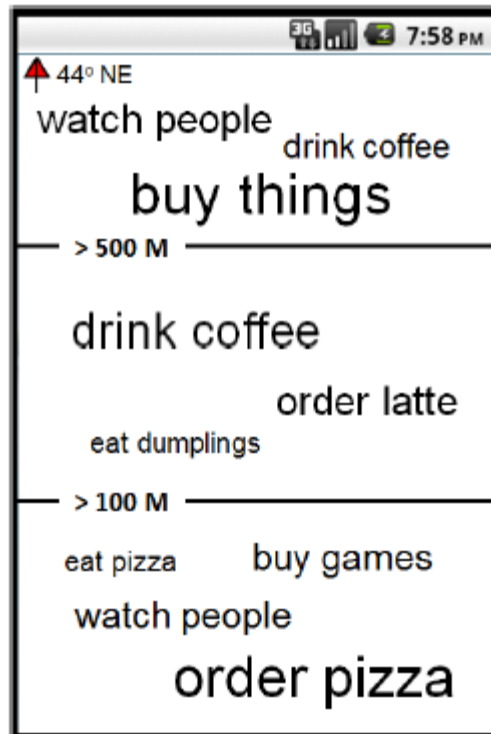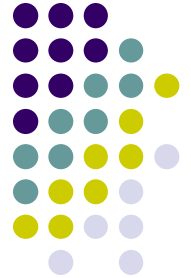
Activity Compass and Better Errands
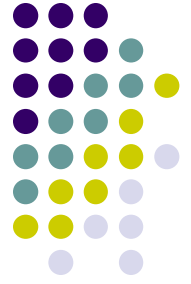
Conclusions

- Validated the use of community-authored content as a source to identify activities supported by location.

- Showed that the community-authored reviews provided a diverse and comprehensive data source.

- 40 most common verb-noun pairs identified from the reviews for a location achieve a mean precision of up to 79.3% and recall of up to 55.9%.

- Presented two context-aware services that leverage location-based activity information on a city scale.

Limitations and Future work

- Do not evaluate alternate location-based review communities.

- In 2011 the authors developed a context-aware place discovery application called Opportunities Exist to assist in the acquisition of spatial knowledge and meaning [2].

- SocialTelescope: A location-based service that leverages user interactions in location-based social networks to learn people's preference for places. [3].

References

[1] Dearman, D. and Truong, K.N. Identifying the activities supported by locations using community-authored content. In Proc. Ubicomp 2010, ACM Press (2010), 23-32.

[2] Dearman, D., Sohn, T., and Truong, K.N. Opportunities Exist: Continuous Discovery of Places to Perform Activities. In Proceedings of CHI '11, pp. 2429-2438.

[3] Shankar, P.; Yun-Wu Huang; Castro, P.; Nath, B.; Iftode, L.; , "Crowds replace experts: Building better location-based services using mobile social network interactions," Pervasive Computing and Communications (PerCom), 2012 IEEE International Conference on , vol., no., pp.20-29, 19-23 March 2012

[4] http://www.realestaterelativity.com/2012/06/29/location-based-services-yield-more-accurate-rankings-than-algorithms-used-by-top-review-ranking-sites/

Thanks!

Questions?