

Improved Recommendation of Photo-Taking Locations using Virtual Ratings

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Overview

- Problem Definition
- Related Work
- Proposed Solution
- Recommenders
- Experiments
- Discussion & Conclusion

Problem Definition

- Task: Recommend **geolocations** to users
- Discover new places to enjoy good views or nice settings, suitable for photo-taking





Related Work

- Points of Interest recommendation
- Photo composition recommendation, e.g ClickSmart [5]
- Photo-taking location recommendation, Phan et al. [1]
 - $(\text{latitude}, \text{longitude}) \rightarrow$ rectangular bins
 - $[0,1]$ ratings

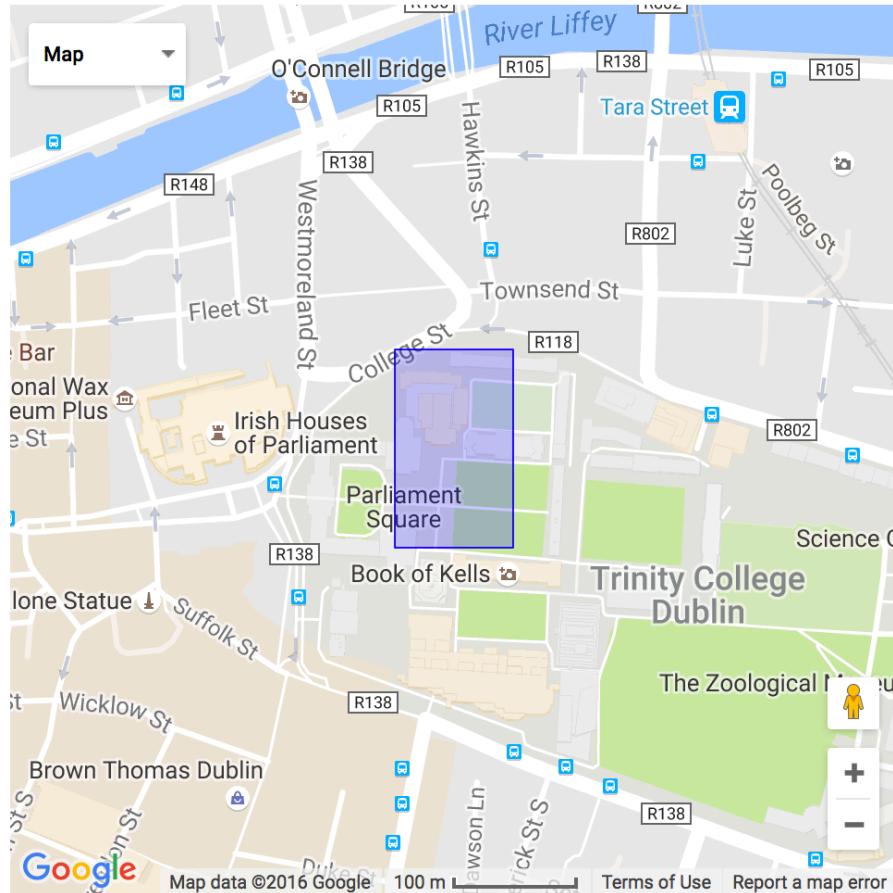
Proposed Solution

Geohashing

Create Virtual Ratings

Rating Normalization

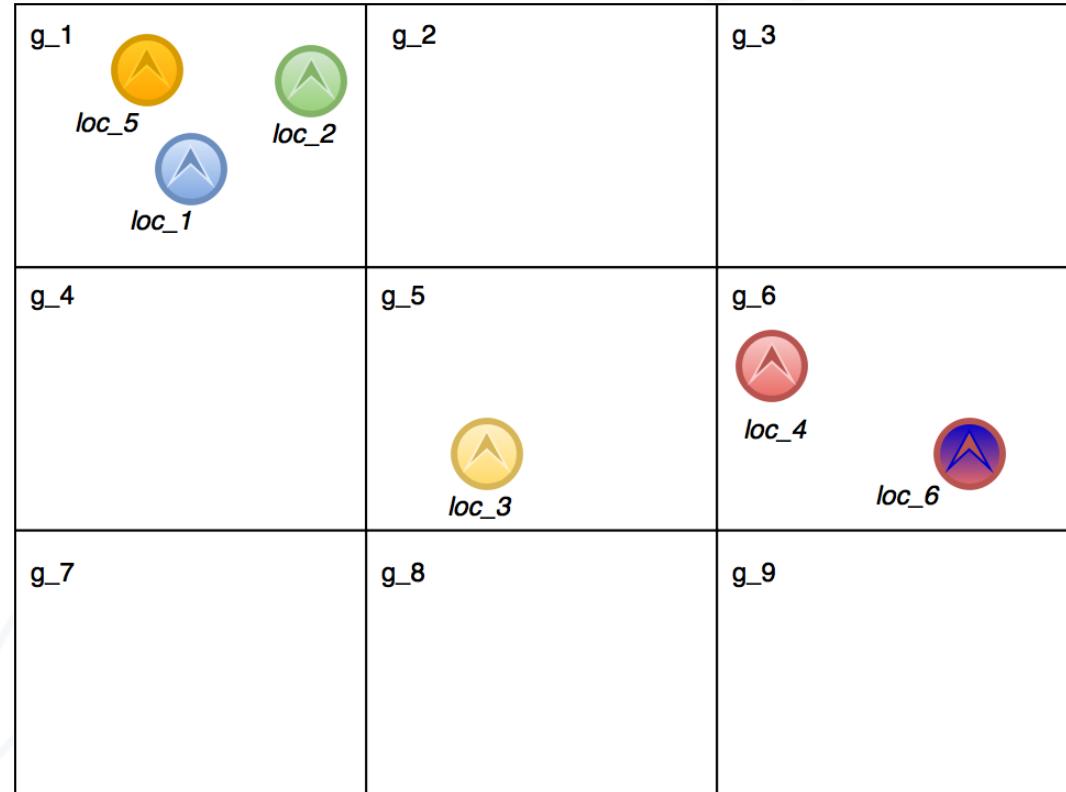
Geohashing



GeoHash length	Area width x height
1	5,009.4km x 4,992.6km
2	1,252.3km x 624.1km
3	156.5km x 156km
4	39.1km x 19.5km
5	4.9km x 4.9km
6	1.2km x 609.4m
7	152.9m x 152.4m
8	38.2m x 19m
9	4.8m x 4.8m
10	1.2m x 59.5cm
11	14.9cm x 14.9cm
12	3.7cm x 1.9cm

Geohashing

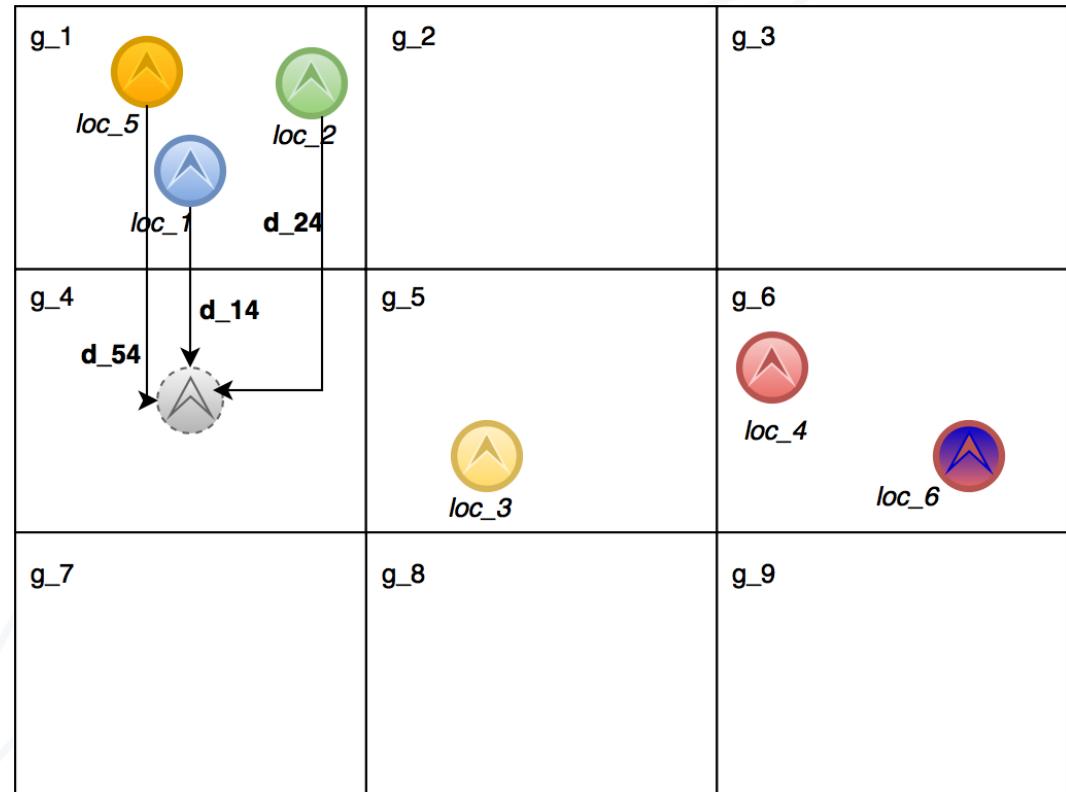
$\langle u, g1, 3 \rangle$
 $\langle u, g6, 2 \rangle$
 $\langle u, g5, 1 \rangle$



Creating Virtual Ratings

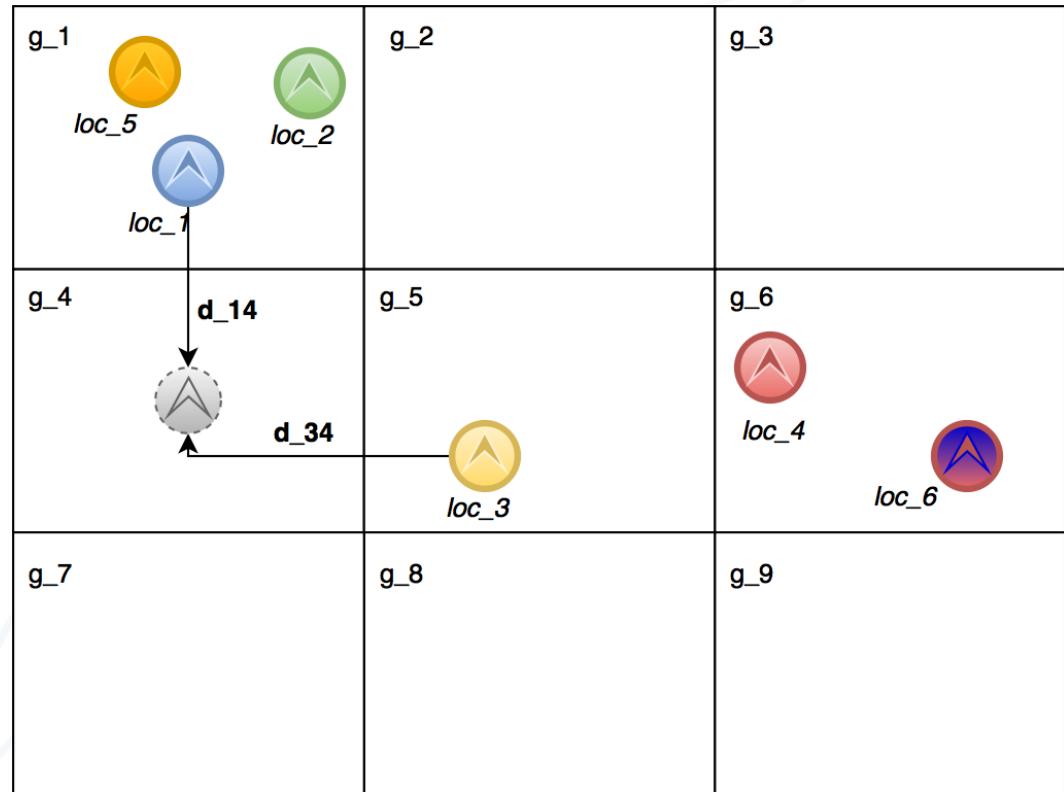
- **Problem:** discretized coordinate space
- **Solution:** virtual ratings
- **Distance:** Geodesic

$\langle u, g_4, f_4 \rangle$

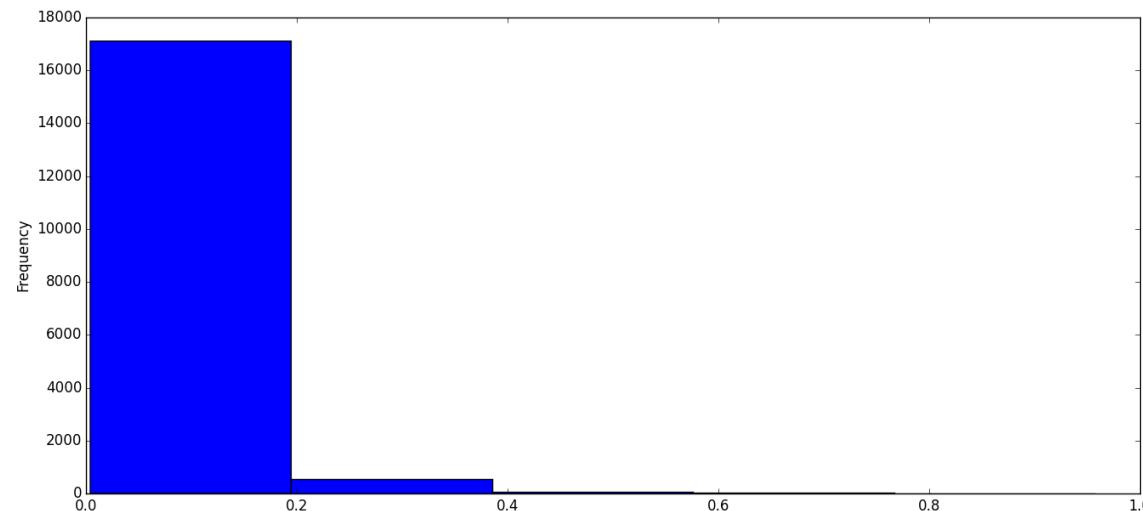


Creating Virtual Ratings

- **Problem:** multiple ratings that 'arrive' in a bucket
- **Solution:** the *maximum* of the ratings



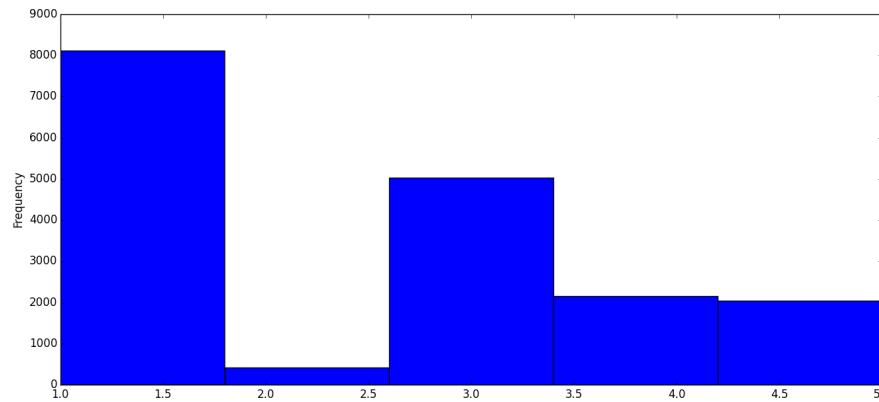
Rating Normalization



Phan et al [1]

Rating Normalization

- Normalize to 1-5 scale by Celma's method [2]
- Complementary Cumulative Distribution
 - top 80 – 100% → 5
 - top 60 – 80% → 4



Recommenders in the Experiments

- Koren's SVD Matrix Factorization [3] on four different versions of the ratings matrix

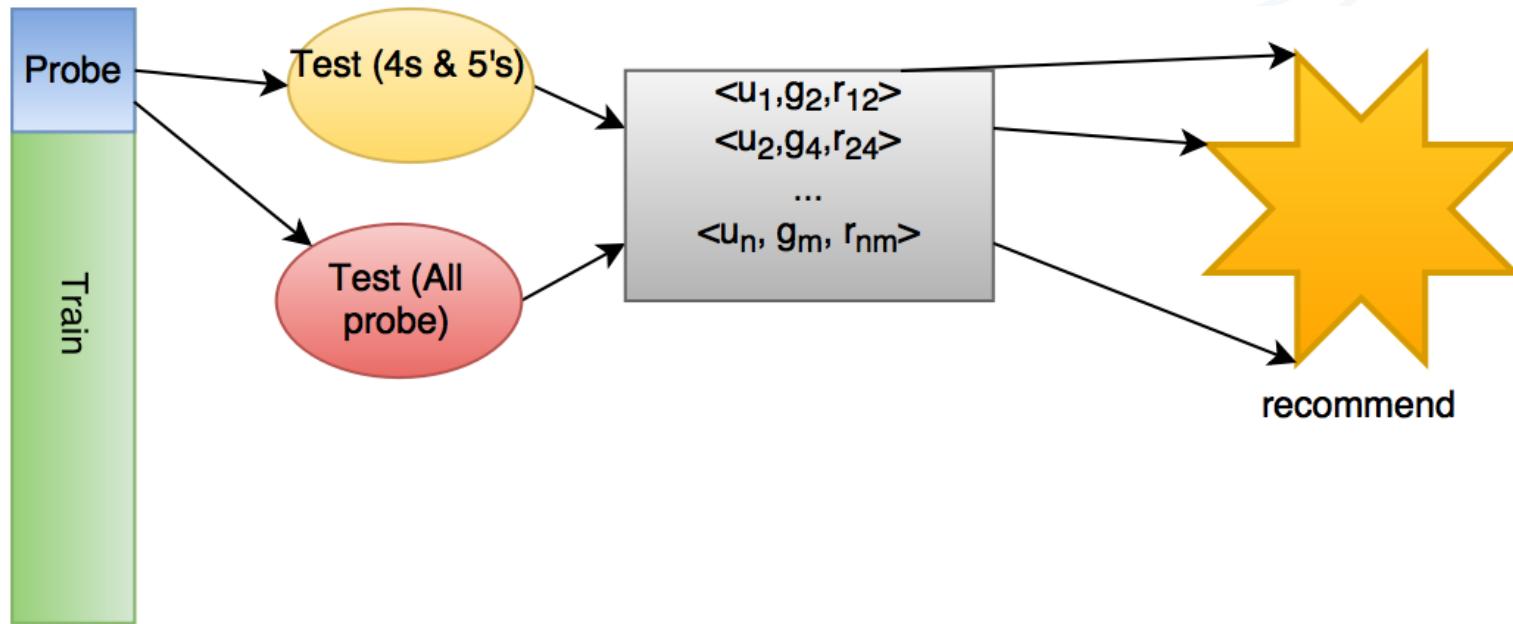
	(0,1] ratings	1-5 ratings
No virtual ratings	“1”	“5”
Virtual ratings	“1-VR”	“5-VR”

- Popularity baselines:
 - POP_H: Computed from 4's & 5's
 - POP_ALL: Computed from all.
- Home location baseline [4]

Datasets (flickr.com)

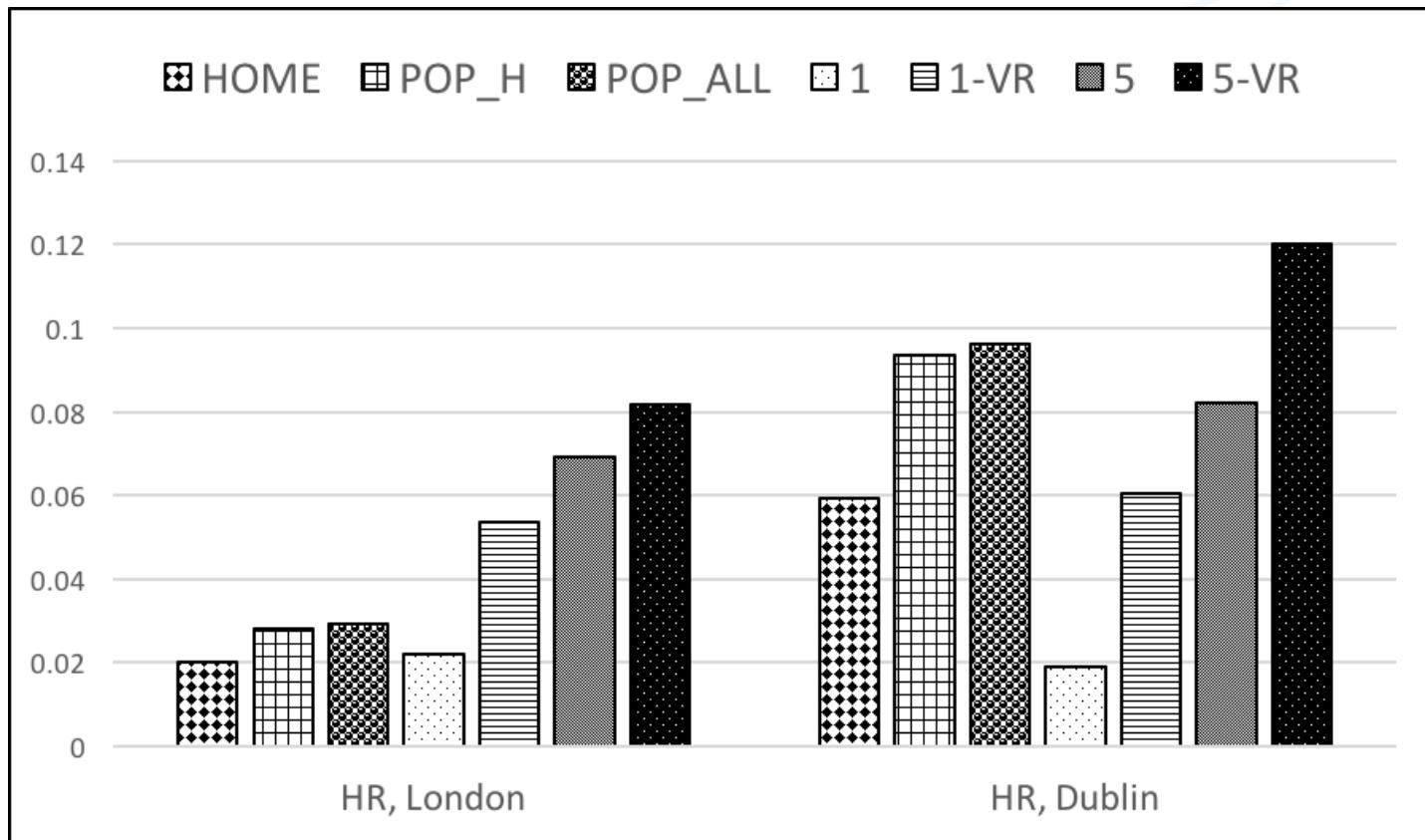
	Users	Photos	Average
London	978	112671	115
Dublin	1567	54082	34

Experimental Setup



- Hit rate
- Average reciprocal hit rank
- Average discounted gain

Results



Conclusion

- Virtual Ratings
- Rating Normalization

Future Work

- Other datasets & Algorithms
- User Trial
- Personalize precision (size of buckets) and make it location specific.
- Use time information
- Integration with system like ClickSmart[5]

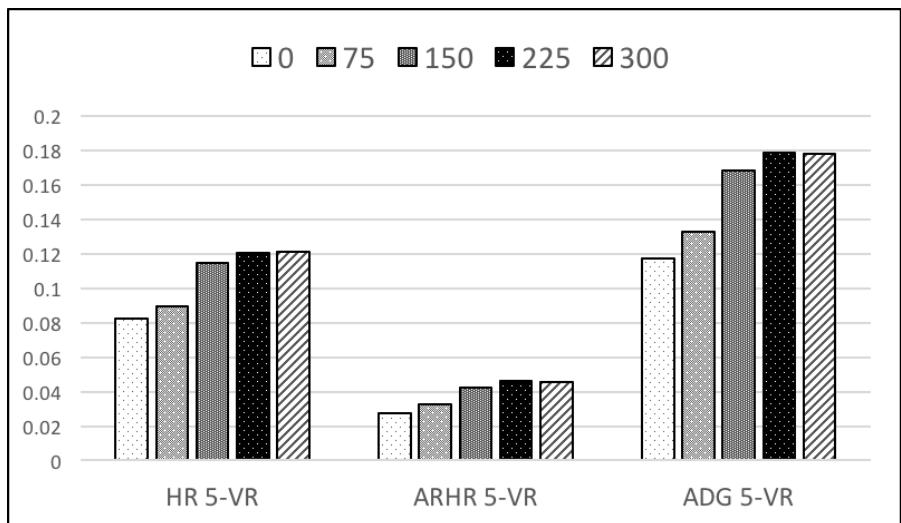
References

- [1] Phan, Thomas, et al. "Collaborative recommendation of photo-taking geolocations." *Proceedings of the 3rd ACM Multimedia Workshop on Geotagging and Its Applications in Multimedia*. ACM, 2014.
- [2] Oscar Celma. *Music Recommendation and Discovery: The Long Tail, Long Fail, and Long Play in the Digital Music Space*. Springer, 2010.
- [3] Koren, Yehuda, Robert Bell, and Chris Volinsky. "Matrix factorization techniques for recommender systems." *Computer* 42.8 (2009): 30-37.
- [4] Van Laere, Olivier, Steven Schockaert, and Bart Dhoedt. "Georeferencing Flickr resources based on textual meta-data." *Information Sciences* 238 (2013): 52-74.
- [5] Rawat, Yogesh Singh. "Real-Time Assistance in Multimedia Capture Using Social Media." *Proceedings of the 23rd ACM international conference on Multimedia*. ACM, 2015.

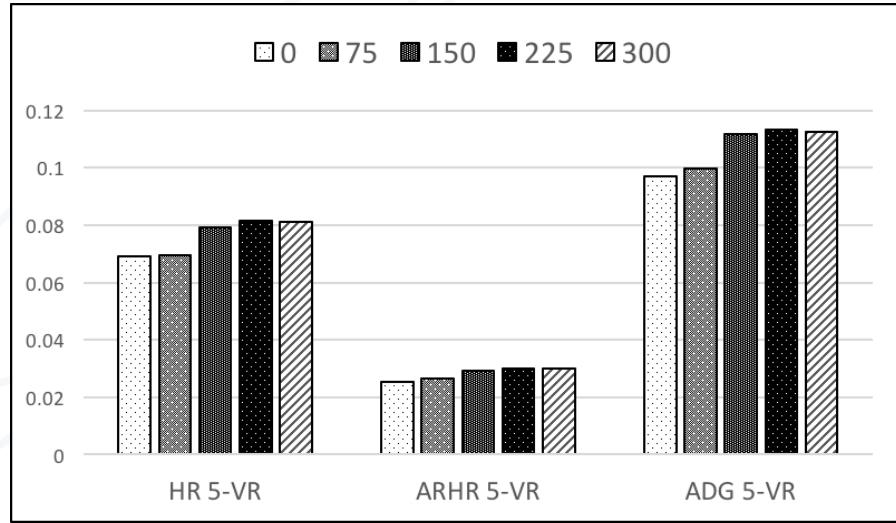
Thanks!



Δ Experiments



Dublin varying delta experiments



London varying delta experiments