DCLab at MediaEval2015 Retrieving Diverse Social Images Task

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ABSTRACT

In this paper we recommend a social image re-ranking method from the Retrieving Diverse Social Images Task at MediaEval 2015 in order to increase the accuracy of a search result on Flickr based on relevance and diversity. Our approach is based on re-ranking the original result, using a precalculated distance matrix with spectral clustering. We use color related visual features, text and credibility descriptors to define similarity between images.

1. INTRODUCTION

When a potential tourist makes an image search for a place, she expects to get a diverse and relevant visual result as a summary of the different views of the location.

In the official challenge (Retrieving Diverse Social Images at MediaEval 2015: Challenge, Dataset and Evaluation) [2] a ranked list of location photos retrieved from Flickr is given, and the task is to refine the result by providing a set of images that are both relevant and provide a diversified summary. An extended explanation for each metric referred in this paper can be found in the task description paper [2]. The diversity means that images can illustrate different views of the location at different times of the day/year and under different weather conditions, creative views, etc. The utility score of the refinement process can be measured using the precision and diversity metric [8].

Our team participated in previous challenges [7, 6], each year we experimented with a different approach. In 2013 we used diversification of initial results using clustering, but our solution was focused on diversification only. In 2014 we tried to focus on relevance and diversity with the same importance as a new idea.

In the past we treated our feature vectors (calculated values from metrics) as an N dimensional continuous space with euclidean coordinates. In this paper we will define a hand crafted distance matrices with non-eucledian coordinates, which can be used during the clustering.

2. RUNS

2.1 Run1: Visual based re-ranking

In the first subtask participants could use only visual based metrics or own metrics calculated using only the images.

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Our main approach was using color based distances [1, 5] and filtering photos with faces on them [7, 6]. We experimented with HOG feature distances but did not achieve any additional improvement.

First we calculated a new metric for each image: the $FACE$ metric is the ratio of the calculated area occupied by the possible face regions on an image and whole image area [7]. Then we used the CN metric to filter out black color based images, since mostly dark images tend to have less colors and those are mainly shifted into the gray region rather then having bright colors.

In the reordering step we started from the original result. We did our initial filtering by putting images to the end of the result list where $FACE > 0$ or $CN[0] > 0.8$, the first value in CN corresponds to the color black.

After the preprocessing step we built the distance matrix F, between each A and B images the distance was calculated using the following equation:

$$F_{A,B} = \sum_{i=0}^{10} |CN_A[i] - CN_B[i]| + \sum_{i=0}^{10} |s_i * (CM_A[i] - CM_B[i])|$$

$$s_i = \begin{cases} 5, \text{ where } 0 \leqslant i < 3 \\ 1.5, \text{ where } 3 \leqslant i < 5 \\ 0.5, \text{ where } 5 \leqslant i < 9 \end{cases}$$

After the distance matrix was created we used spectral clustering [3, 4] to create clusters from the first 150 images, the target cluster count was 10.

The final result was generated by picking the lowest ranking item from each cluster, appending those to the result list, then repeating this until all the items are used. The same clustering and sorting method was used during run2 and run3.

2.2 Run2: Text based re-ranking

The second subtask was the text based re-ranking which is accomplished using the title, tags and description fields of each image.

As a preprocessing step we executed a stop word filtering. We also removed some special characters (namely .,-:;0123456789()_@) and HTML specific character sets (&, " and everything between $<$ and $>$), then we used the remaining text as the input for a simple TF-IDF calculation [9].

We calculated the distance between images (e.g. description fields) A and B in the following manner. We initalize distance $G_{A,B}$ to zero and compared A and B at the term level. All occurring t terms in document A compared with all terms in the document B and so on. If term t is contained by both document, then $G_{A,B}$ will be increased by 0. If t contained by only one document, we take into consideration the document frequency (DF_t): if $DF_t < 5$, then it is a rare term and $G_{A,B}$ should be increased by 2; if $DF_t > DN/4$, then it is a common term and $G_{A,B}$ should be increased by 0.1 (where DN is the total number of documents). If the term is not common nor rare, then we added the DF_t/DN to the distance.

Using the three text descriptors we created a weighted sum for the field distences, where the weights are as follows: title=1, tags=2, description=0.5 From these $G_{A,B}$ values we created the G distance matrix.

2.3 Run3: Text + Visual

In the third subtask both visual and textual descriptors could be used to create the results.

We used our visual distance matrix F and text distance matrix G and created a new aggregate matrix H. This matrix is simply the sum of the corresponding values from both F and G matrix. We tried different kind of weighting methods, but the pure matrices supplied the best results on the devset.

2.4 Run4: Credibility based re-ranking

In the fourth run participants were provided with credibility descriptors detailed in [2].

Using the original result we filtered the images by users who had $faceProportion$ more than 1.3 to create the same effect as we did with the $FACE$ metric. With the purpose of increase the diversity we used the $locationSimilarity$ metric, if this value exceeds the threshold of 3.0 we exluded the image. Despite our simple approach we had great results on the devset.

3. RESULTS AND CONCLUSION

run name	P@20	CR@20	F1@20
Run1 single	.7022	.3702	.4751
Run1 multi	.7164	.3857	.4813
Run2 single	.64[illegible]5	.3494	.4379
Run2 multi	.7021	.3813	.4748
Run3 single	.6732	.3563	.4554
Run3 multi	.6993	.3683	.4651
Run4 single	.7014	.3589	.4651
Run4 multi	.7150	.3498	.4479

Table 1: Average results of each run

Our results can be seen in Table 3. and the F1 metrics can be seen in Figure 1, we listed the single and multi-concept based results separately.

As one can see the visual information based results are the best among all the runs. In the devset we experienced that the textual information for many images are missing or do not describe the content very well. It is not uncommon that an author gives the same textual information to all of the images in a topic.

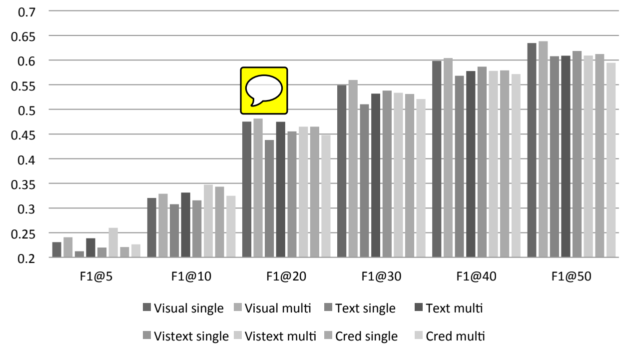

Figure 1: F1@N results

4. REFERENCES

[1] R. Datta, D. Joshi, J. Li, and J. Z. Wang. Image retrieval: Ideas, influences, and trends of the new age. *ACM Comput. Surv.*, 40(2):5:1–5:60, May 2008.

[2] B. Ionescu, A. Popescu, A. Lupu, A. Ginsca, and H. Müller. Retrieving diverse social images at mediaeval 2015: Challenge, dataset and evaluation. In *Proceedings of the MediaEval 2015 Multimedia Benchmark Workshop*, 2015.

[3] X. Ma, W. Wan, and L. Jiao. Spectral clustering ensemble for image segmentation. In *Proceedings of the First ACM/SIGEVO Summit on Genetic and Evolutionary Computation*, GEC '09, pages 415–420, New York, NY, USA, 2009. ACM.

[4] A. Y. Ng, M. I. Jordan, and Y. Weiss. On spectral clustering: Analysis and an algorithm. In *ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS*, pages 849–856. MIT Press, 2001.

[5] M. L. Paramita, M. Sanderson, and P. Clough. Diversity in photo retrieval: Overview of the imageclefphoto task 2009. In *Proceedings of the 10th International Conference on Cross-language Evaluation Forum: Multimedia Experiments*, CLEF'09, pages 45–59, Berlin, Heidelberg, 2010. Springer-Verlag.

[6] Z. Paróczi, B. Fodor, and G. Szucs. Dclab at mediaeval2014 search and hyperlinking task. In *Working Notes Proceedings of the MediaEval 2014 Workshop, Barcelona, Spain, October 16-17, CEUR-WS. org, ISSN 1613-0073*, 2014.

[7] G. Szűcs, Z. Paróczi, and D. Vincz. Bmemtm at mediaeval 2013 retrieving diverse social images task: Analysis of text and visual information. In *Working Notes Proceedings of the MediaEval 2013 Workshop, Barcelona, Spain, October 18-19, CEUR-WS. org, ISSN 1613-0073*, 2013.

[8] B. Taneva, M. Kacimi, and G. Weikum. Gathering and ranking photos of named entities with high precision, high recall, and diversity. In *Proceedings of the Third ACM International Conference on Web Search and Data Mining*, WSDM '10, pages 431–440, New York, NY, USA, 2010. ACM.

[9] J.-B. Yeh and C.-H. Wu. Video news retrieval incorporating relevant terms based on distribution of document frequency. In *Proceedings of the 9th Pacific Rim Conference on Multimedia: Advances in Multimedia Information Processing*, PCM '08, pages 583–592, Berlin, Heidelberg, 2008. Springer-Verlag.