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CluChunk: Clustering Larger Scale User-generated Content Incorporating Chunklet Information

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Introduction

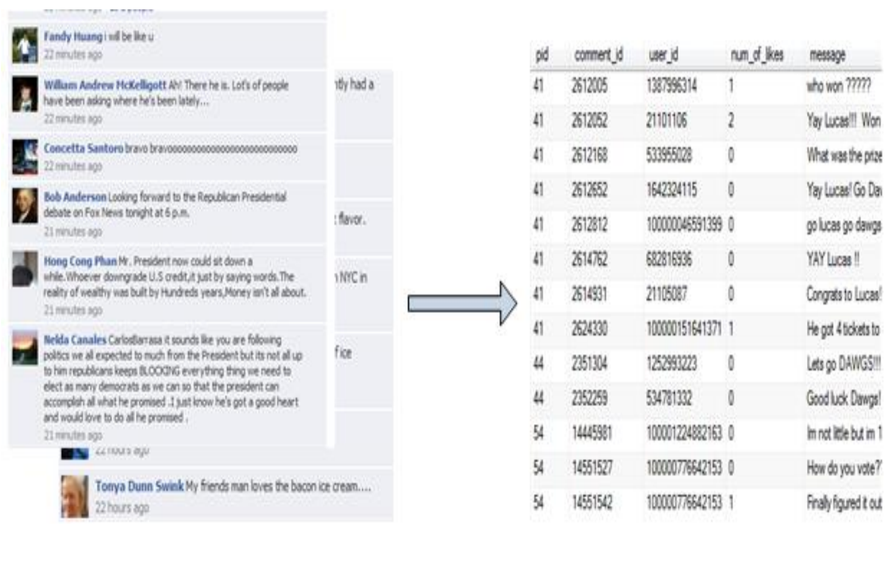
Bigdata from web: a large amount of web content being generated by users in the form of forums, blogs, microblogs, customer reviews and so on.

Necessity: the huge amount of information invariably makes its manual comprehension infeasible for a person and urges the development of automated methods geared to help the user better understand this information. Eg. clustering/classification

Challenge from clustering/classification: 1) web text is short and sparse; 2) labeling such data is expensive.

Motivation

Chunklet Data: for several kinds of web user generated content, it is much easier to obtain the input in subsets, where the data in each subset comes from the same but unknown class. This kind of data is called **Chunklet** data.



pid	comment_id	user_id	num_of_likes	message
41	2612005	1387996314	1	who won ?????
41	2612052	21101106	2	Yay Lucas!!! Won
41	2612168	533955028	0	What was the prize
41	2612652	1642324115	0	Yay Lucas! Go Dav
41	2612812	100000046591399	0	go lucas go dawgs
41	2614762	682816936	0	YAY Lucas !!
41	2614931	21105087	0	Congrats to Lucas!
41	2624330	100000151641371	1	He got 4 tickets to
44	2351304	1252993223	0	Lets go DAWGS!!!
44	2352259	534781332	0	Good luck Dawgs!
54	14445981	100001224882163	0	Im not little but im 1
54	14551527	100000776642153	0	How do you vote?
54	14551542	100000776642153	1	Finally figured it out

Fig 1. An illustration of a post and its comments from Facebook.com

Methodology

Feature Extraction Using Chunklet: the feature representation is augmented with related chunklet text. The motivation is the data in one chunklet belong to the same class and we can enrich the feature representation with the other data in the same chunklet. The workflow consists of three consecutive steps, including feature extraction, feature generation and feature combination, as shown in Figure 2.

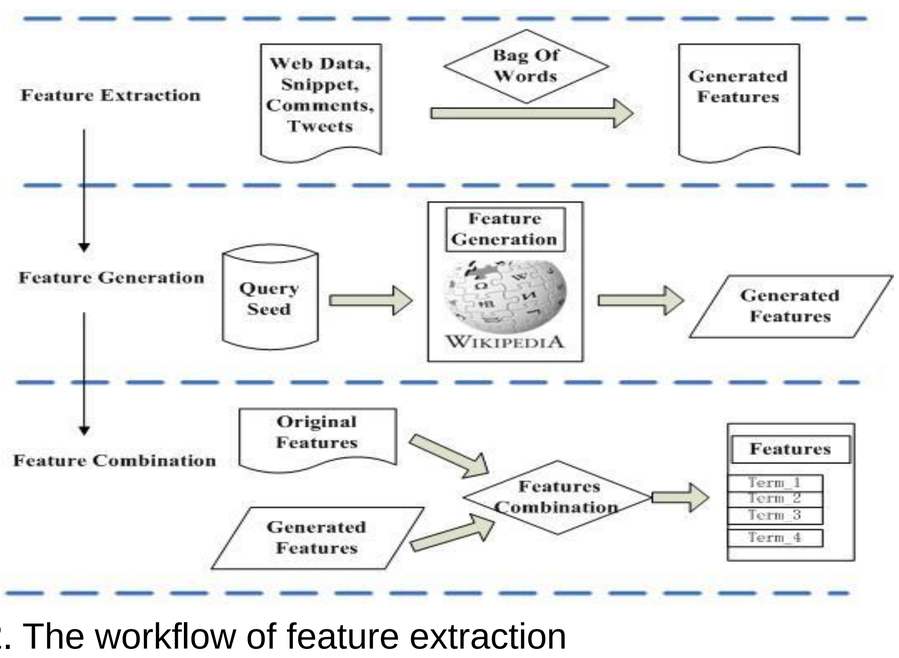


Fig 2. The workflow of feature extraction

Clustering Using Chunklet Information: we propose an algorithm: **ChunkLT** for data pre-pocessing, which aims to discriminatively learn a linear transformation matrix using the inherent chunklet information, such that the Euclidean distance in the new feature space is so discriminative for clustering.

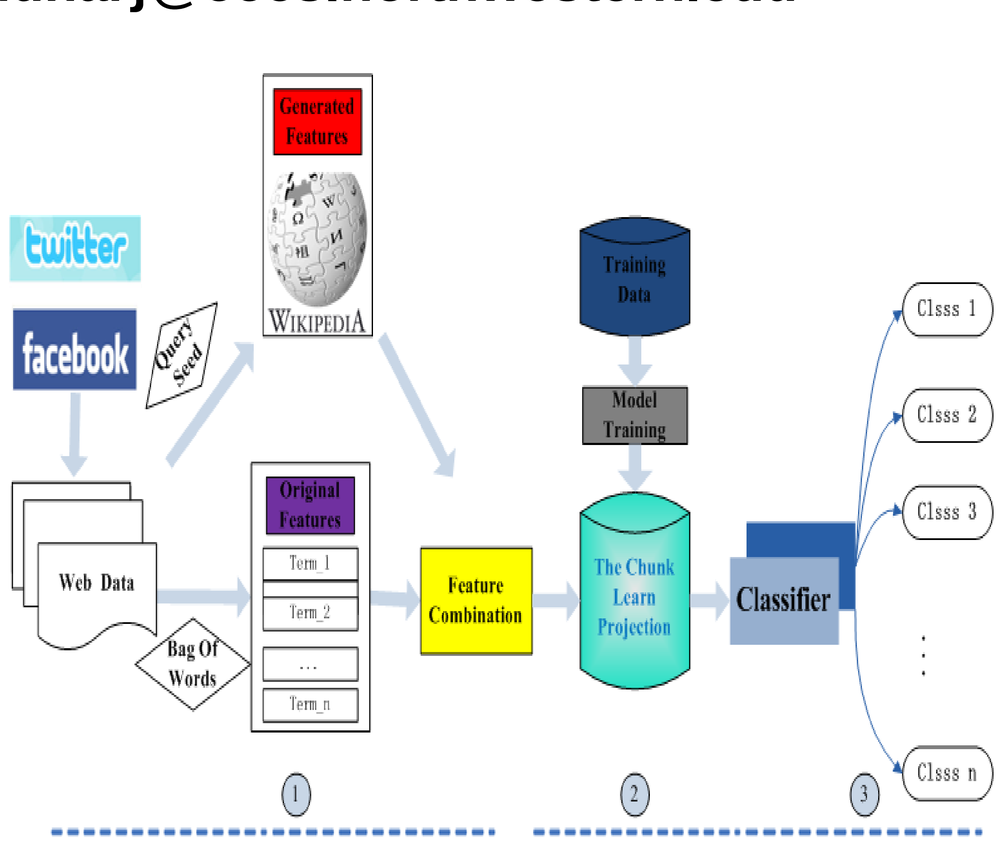


Fig 2. The overall framework of the ClChunk system

Transformation Matrix: W, learned from the chunklet data

$$\min_{w} \ |W^T S_g W|$$

$$s.t. \ \ |W^T S_{\bar{g}} W| > 0, \ and$$

$$\| \omega_i \|^2 = 1 \ \ for \ \ i = 1, 2, ..., m$$

$$S_g = \sum_{n=1}^{N} \sum_{x \in H_n} (x - u_{H_n})(x - u_{H_n})^T$$

$$S_{\bar{g}} = \sum_{n=1}^{N} N_{H_n} (\mu - \mu_{H_n})(\mu - \mu_{H_n})^T$$

Table 3: Results of different algorithms applied to fbs-5000 with four class sizes

RCA	Km		Km+*Chunk*		ChunkLT		ChunkLT+*Chunk*	
M	F-Score	Purity	F-Score	Purity	F-Score	Purity	F-Score	Purity
4	0.537	0.622	0.598	0.652	0.644	0.667	0.713	0.744
6	0.487	0.508	0.522	0.543	0.569	0.614	0.622	0.653
8	0.437	0.450	0.462	0.489	0.512	0.535	0.564	0.581
10	0.389	0.411	0.487	0.518	0.482	0.504	0.532	0.545

Table 4: Results of different algorithms applied to fly-3000 with four class sizes

RCA	Km		Km+*Chunk*		ChunkLT		ChunkLT+*Chunk*	
M	F-Score	Purity	F-Score	Purity	F-Score	Purity	F-Score	Purity
4	0.600	0.575	0.622	0.684	0.635	0.703	0.752	0.805
6	0.521	0.533	0.573	0.626	0.595	0.638	0.655	0.677
8	0.485	0.488	0.536	0.579	0.555	0.601	0.608	0.625
10	0.404	0.457	0.482	0.504	0.567	0.592	0.561	0.595

Fig 3. Results of different algorithms on two datasets

Experiments

Data Sets: (1)fbs-5000 Facebook data; (2) fly-3000: forum data.

Comparison Algorithms: (1)Km+bow; (2)Km+*Chunk*; (3)ChunkLT+bow; (4)ChunkLT+*Chunk*.

Results: the *Chunk* method for the feature generation is very powerful. Our proposed system with ChunkLT+*Chunk* can get great improvement than the baseline methods.

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