

A Novel Calibrated Label Ranking Based Method for Multiple Emotions Detection in Chinese Microblogs

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- Introduction
- Related work
- Our approach
- Evaluation
- Conclusions and Future work

Introduction

- explicit or implicit sentiments in microblogs



- sentiment classification granularity

- polarity classification



- fine-grained sentiment classification



- sentiment classification methods

- based on lexicon
- based on machine learning

Introduction

● Evaluation Task (NLPCC2014)

- emotion analysis in Chinese Weibo texts
- extract the top 2 emotion labels of a sentence and a microblog. (multi-label sentiment classification)
- {*happiness, sadness, like, anger, disgust, fear, surprise*}

● Our Approach

- propose a novel calibrated label ranking (CLR) based framework
- detecting the multiple fine-grained emotions in the Chinese microblogs

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● Sentiment Classification

- Active and important
- Product reviews , microblogs
- polarity classification , fine-grained sentiment analysis

● Multi-label Learning

- polysemy problem of text categorization
- information retrieval
- personalized recommendation
- Web mining

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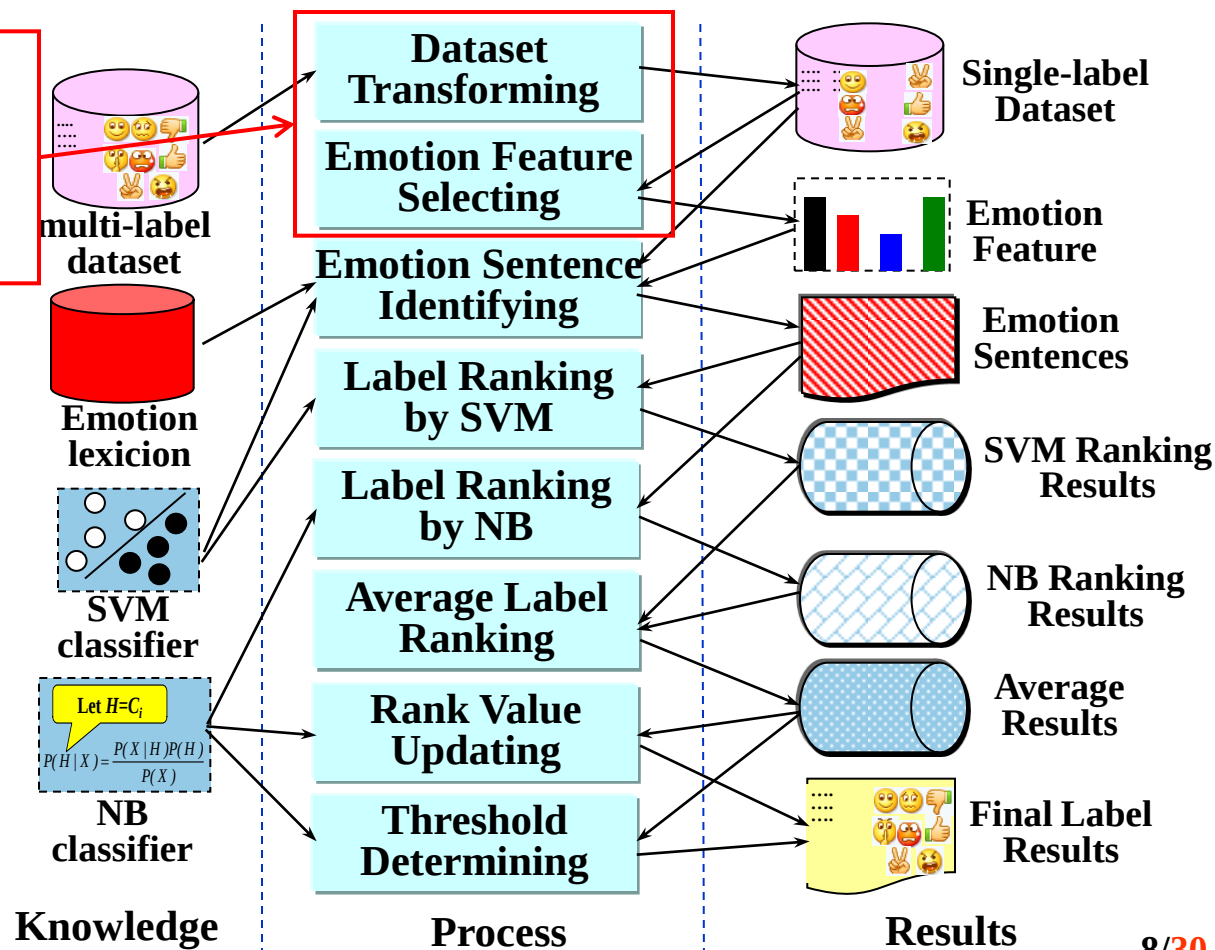
Our approach

● The overall framework for calibrated label ranking based emotion classification

➤ Training Dataset Transformation and Feature Selection

➤ Multi-Label Emotion Analysis of Weibo Sentence

➤ Multi-label Emotion Analysis of Weibo Text



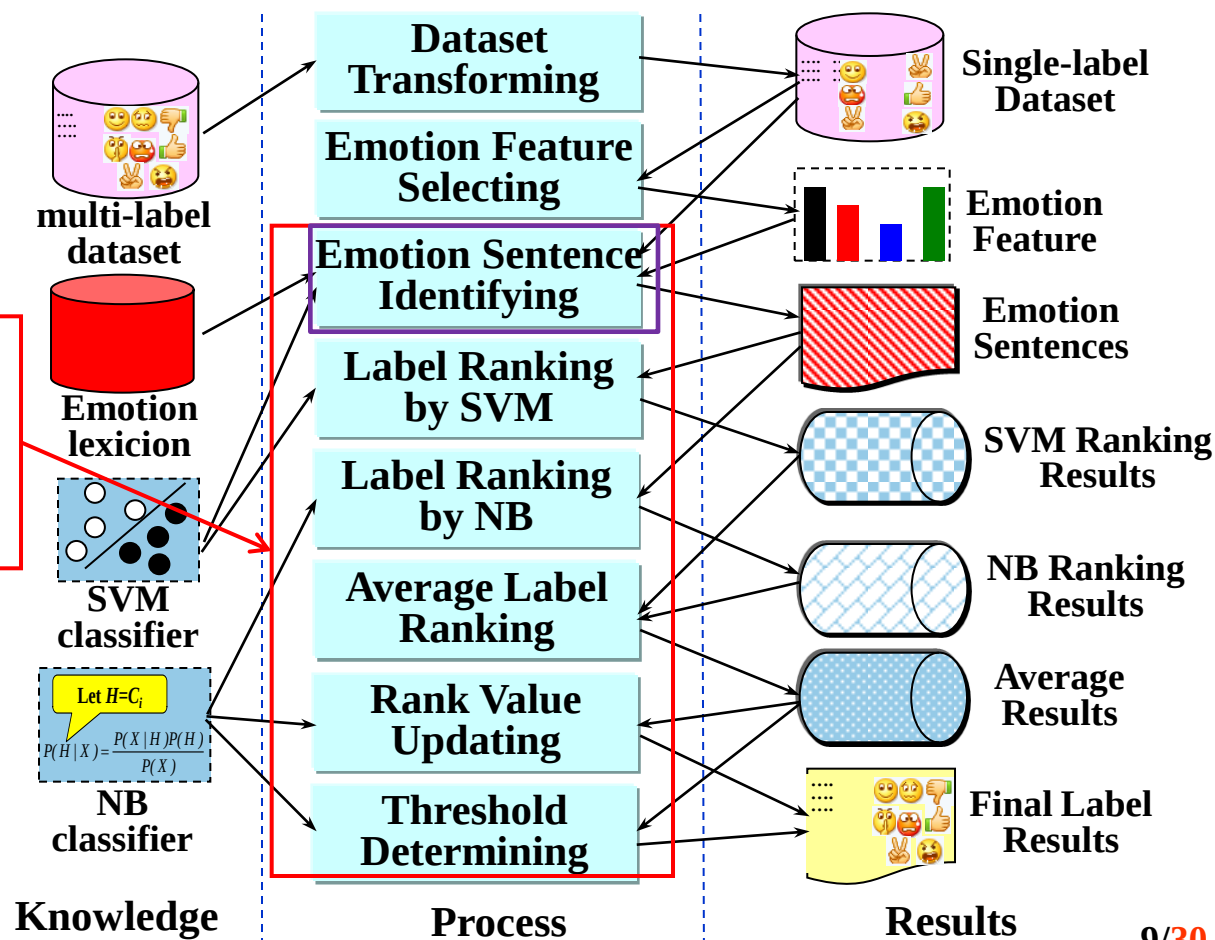
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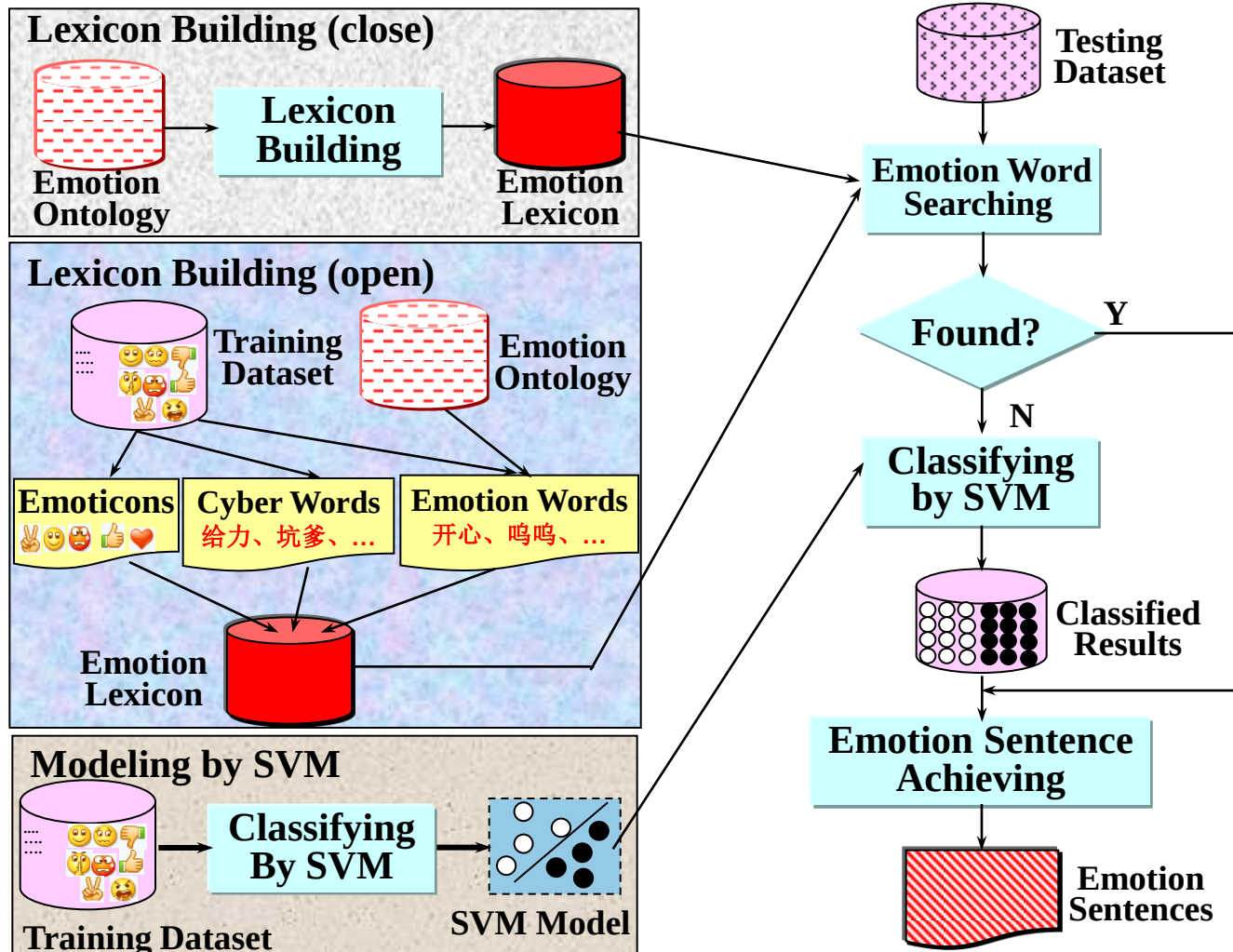
➤ **Multi-Label Emotion Analysis of Weibo Sentence**

➤ Multi-label Emotion Analysis of Weibo Text



Our approach

● Two-stage Method for Emotional Sentence Identification



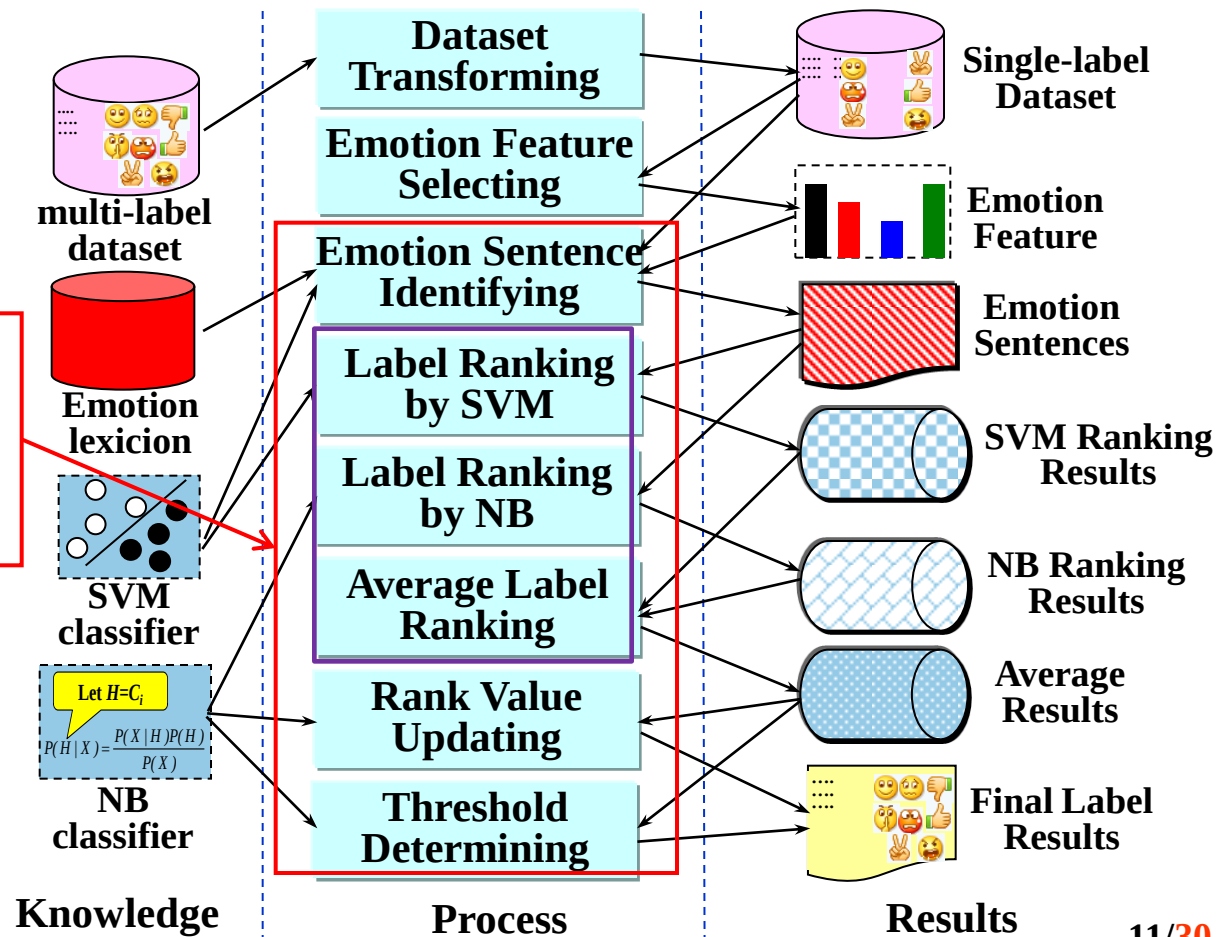
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Our approach

● Label ranking

- we utilize the SVM and NB respectively to realize the label ranking.

$$\text{rank}_f(x_i, y_j) = \sum_{k=1, j \neq k}^7 \mathbb{I}[f(x_i, y_j) > f(x_i, y_k)]$$

where $f(x_i, y_j)$ represents the confidence that sentence x_i has the emotion label y_j

- In our experiment we adopt the average rank value $\text{rank}_f^{\text{avg}}(x_i, y_j)$ of NB and SVM.

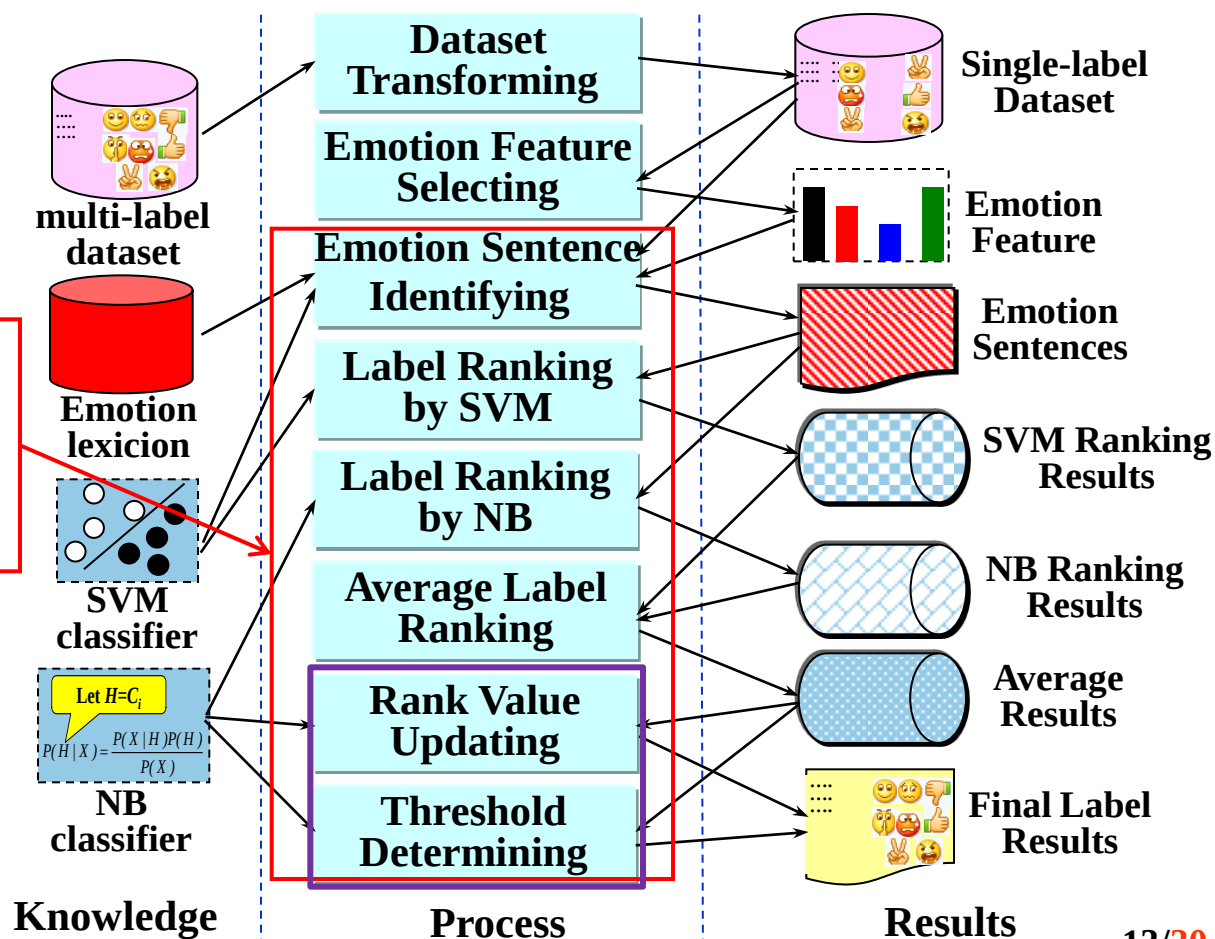
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Our approach

● Threshold Calibration

- We construct k (7) binary classifiers respectively corresponding with the k emotion labels
- For every binary classifier $g_j(x_i)(y_j, \text{non-}y_j)$, if x_i is corresponding with y_j , then $g_j(x_i)=+1$,

$$\text{rank}_f^*(x_i, y_j) = \text{rank}_f^{\text{avg}}(x_i, y_j) + \begin{cases} 1 & \text{if } g_j(x_i) > 0 \\ 0 & \text{otherwise} \end{cases}$$

otherwise $g_j(x_i)=-1$

$$\text{rank}_f^*(x_i, y_V) = \sum_{j=1}^7 \begin{cases} 1 & \text{if } g_j(x_i) < 0 \\ 0 & \text{otherwise} \end{cases}$$

Our approach

● Updating Ranking Value by Emotion Lexicon

- An emotion lexicon that has k ($=7$) categories separately associated with a label in $\{happiness, sadness, like, anger, disgust, fear, surprise\}$.

$$rank_f^*(x_i, y_j) = rank_f^*(x_i, y_j) + 1$$

Our approach

- The multi-label emotion classifier $h(x_i)$:

$$h(x_i) = \{y_j \mid \text{rank}_f^*(x_i, y_j) > \text{rank}_f^*(x_i, y_V), y_j \in Y\}$$

➤ The size of $h(x_i) > 2$: top 2

➤ The size of $h(x_i) = 0$: top 1

Our approach

● **Example** x_i : I am tired , but I am very **happy**

label	happiness	sadness	disgust	like	surprise	angry	fear
confidence	P_1	P_2	P_3	P_4	P_5	P_6	P_7

$$P_1 > P_2 > P_3 > P_4 > P_5 > P_6 > P_7$$

label	happiness	sadness	disgust	like	surprise	angry	fear
Rank value	7	6	5	4	3	2	1

➤ **Threshold determination**

$G(x_i) : (\text{happiness}, \text{non-happiness})$

label	happiness	sadness	disgust	like	surprise	angry	fear	thres hold
Rank value	8	6	5	4	3	2	1	0

Our approach

● **Example** x_i : I am tired , but I am very **happy**

$G(x_i)$: (sadness, **non-sadness**)

label	happiness	sadness	disgust	like	surprise	angry	threshold	fear
Rank value	8	6	5	4	3	2	1	1

$G(x_i)$: (disgust, **non-disgust**)

label	happiness	sadness	disgust	like	surprise	threshold	anger	fear
Rank value	8	6	5	4	3	2	2	1

● ● ●

Our approach

● Example

label	happiness	threshold	sadness	disgust	like	surprise	anger	fear
Rank value	8	6	6	5	4	3	2	1

➤ Update by emotion lexicon

x_i : I am tired , but I am very **happy**

label	happiness	threshold	sadness	disgust	like	surprise	anger	fear
Rank value	8+1	6	6	5	4	3	2	1

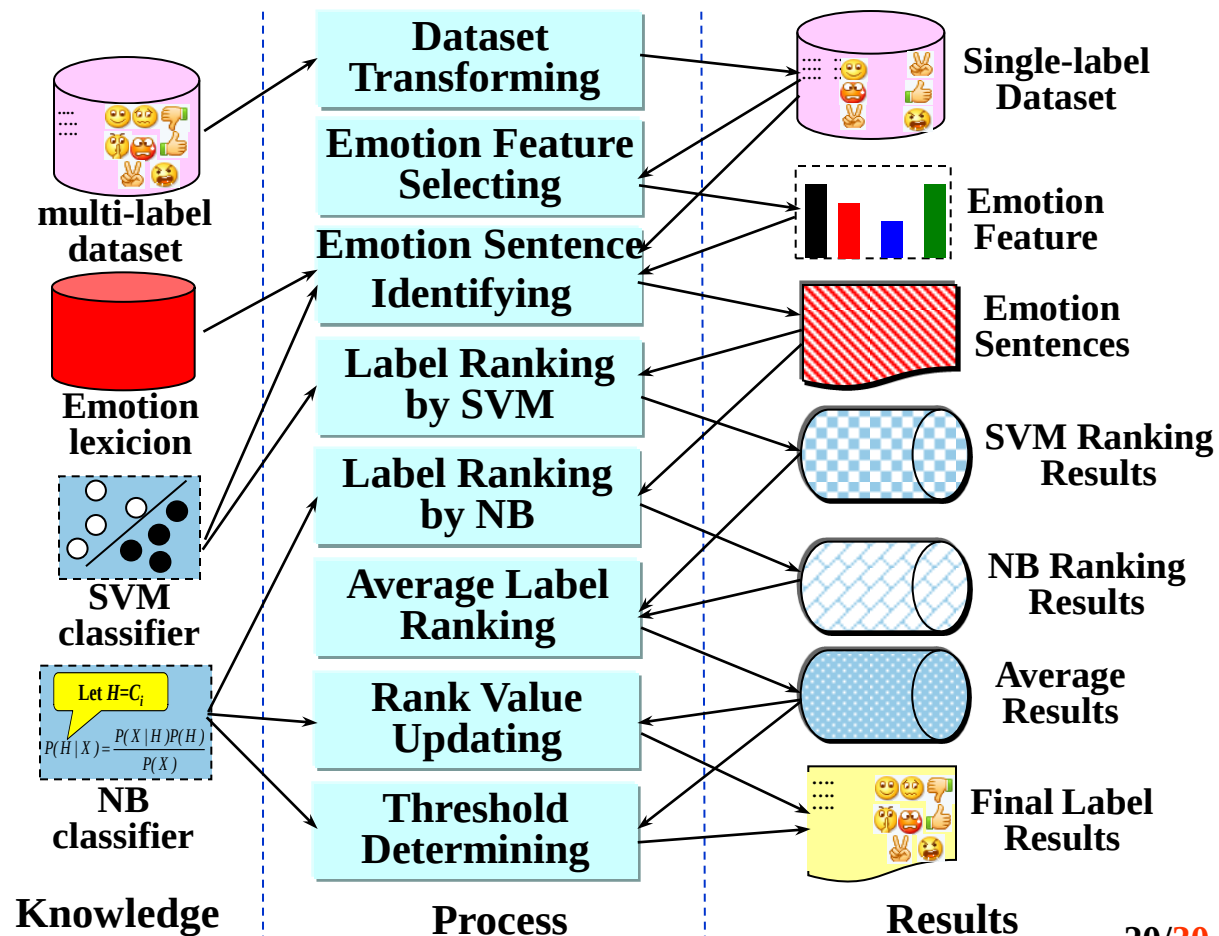
Relevant label set : **happiness**

Our approach

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➤ **Multi-label Emotion Analysis of Weibo Text**



Our approach

● Multi-label Emotion Analysis of Weibo Text

- Use the sentence level multi-label classification result above to achieve the emotion labels at Weibo text level

$$rank_m(m, y_j) = \sum_{i=1}^n rank_m^{emo}(x_i, y_j) \quad rank_m^{emo}(x_i, y_j) = \begin{cases} 0, y_j \text{ is the irrelevant label} \\ 1, y_j \text{ is the secondary label} \\ 2, y_j \text{ is the dominant label} \end{cases}$$

$$rank_m(m, y_V) = \sum_{i=1}^n rank_m^{none}(x_i, y_V) \quad rank_m^{none}(x_i, y_V) = \begin{cases} 0, x_i \text{ has two emotions} \\ 1, x_i \text{ has only one emotions} \\ 3, x_i \text{ is not an emotional sentence} \end{cases}$$

- Just consider the Weibo Text as a long sentence

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● Data sets

- The real-world dataset that provided by NLPCC 2014 , Emotion Analysis in Chinese Weibo Texts (EACWT) task
- Training dataset contains 14,000 Weibo and 45,421 sentences
- Testing dataset contains 6,000 Weibo and 15,693 sentences

- The comparisons for emotion sentence identification

	Precision	Recall	F-Measure
SVM	49.24	57.73	53.15
Lexicon	40.49	77.14	53.11
Lexicon+SVM	38.41	87.21	53.40

Evaluation

- The comparisons for **sentence level** emotion classification (Average Precision, Strict)

	Result ID	NB	SVM	NB+ SVM	NB+ Lexicon	SVM+ Lexicon	CLR
Close	NEUDM-1	0.4479	0.4660	0.4778	0.4704	0.4883	0.5042
	NEUDM-2	0.4421	0.4580	0.4700	0.4578	0.4786	0.4911
Open	NEUDM-1	0.4772	0.4850	0.5044	0.4963	0.5128	0.5330
	NEUDM-2	0.4773	0.4850	0.5044	0.4953	0.5133	0.5317

Evaluation

- The comparison with other participators for **sentence level** emotion classification

Result ID	Close		Open	
	AP(loose)	AP(strict)	AP(loose)	AP(strict)
NEUDM-1	0.5502	0.5042	0.5799	0.5330
NEUDM-2	0.5381	0.4911	0.5785	0.5317
AVG	0.3981	0.3666	0.5158	0.4791
Sec-Best	0.3032	0.2831	0.5489	0.5175
MAX	0.5502	0.5042	0.5799	0.5330

Evaluation

- The comparison with other participators for **Weibo level** classification

Result ID	Close		Open	
	AP(loose)	AP(strict)	AP(loose)	AP(strict)
NEUDM-1	0.6033	0.5115	0.5851	0.4960
AVG	0.4306	0.3678	0.5145	0.4406
Sec-Best	0.5736	0.4756	0.5309	0.4668
MAX	0.6033	0.5115	0.5851	0.4960

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Conclusions and future work

● Discussions

- our proposed method significantly outperformed the methods of other participators and other single classifiers or other combined approaches
- further improving the emotional sentence identification task
- find more effective emotion features and integrate more classifiers
- new multi-label learning methods for the multiple emotions detection task

Thank You

