

# QUANTIFICATION OF RESTAURANT REVIEWS

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## Abstract

Sentiment analysis has attracted increasing attention in e-commerce. The sentiment polarities underlying user reviews are of great value for business intelligence. Aspect category sentiment analysis and review rating prediction are essential tasks to detect the fine-to-coarse sentiment polarities. While most methods do these two tasks on the English dataset, we propose a novel learning-based framework for them on the Chinese dataset.

## Background

Nowadays, customers often write reviews after having a meal in a restaurant on online platforms. These reviews and rating scores describe customers' experiences in multiple aspects and maybe a reference when other customers make their selections. For example, if a customer gives a 5-star rating score to the coffee shop and praises the sanitation, other potential customers may be attracted. The sentiment polarities underlying user reviews are of great value for business intelligence. The task to generate sentiment polarities from the reviews is called aspect category sentiment analysis (ACSA) and the task to predict rating scores from the reviews is called rating prediction (RP). Both are essential tasks to detect the fine-to-coarse sentiment polarities and are highly correlated and usually employed jointly in real-world e-commerce scenarios.

## Problem statement

We formulate two tasks on sentiment analysis on dataset **ASAP** with Chinese restaurant reviews and two annotations: the customers' attitude from 18 aspects and the rating scores.

- Propose a method to predict aspect category sentiment scores from the Chinese restaurant comment.
- Propose a method to predict rating prediction scores from the Chinese restaurant comment.



Fig. 1: An example of a review with the rating score from the Dianping app

## Data statement

- A large-scale Chinese restaurant review dataset ASAP, including 46,730 genuine reviews from Dianping App.
- Dataset is divided into a training set (36,850 samples), a validation set (4,940 samples), and a test set (4,940 samples).
- The rating score is ranging from 1-Star to 5-Star, the larger the better.
- The sentiment polarity over 18 aspects category is labeled as 1(Positive),0(Neutral),-1(Negative),-2(Not-Mentioned).

Review	Rating	Aspect Category	Label	Aspect Category	Label
With convenient traffic, the restaurant holds a high-end decoration, but quite noisy because a wedding ceremony was being held in the main hall. Impressed by its delicate decoration and grand appearance though, we had to wait for a while at the weekend time. However, considering its high price level, the taste is unexpected. We ordered the Kung Pao Prawn, the taste was acceptable and the serving size is enough, but the shrimp is not fresh. In terms of service, you could not expect too much due to the massive customers there. By the way, the free-served fruit cup was nice. Generally speaking, it was a typical wedding banquet restaurant rather than a comfortable place to date with friends.  交通还挺方便的，环境看起来很高大上的样子，但是因为主厅在举办婚礼非常混乱，特别吵感觉，但是装修的还不错，感觉很精致的装修，门面很气派，周末去的时候还需要等位。味道的话我觉得还可以但是跟价格比起来就很一般了，性价比挺低的，为了去吃宫保虾球的，但是我觉得也就那样吧不是特别新鲜，不过虾球很大，味道还行。服务的话由于人很多所以也顾不上上菜的速度不快，但是有送水果杯还挺好吃的。总之就是典型的婚宴餐厅不是适合普通朋友吃饭的地方了。	3-Star	Location#Transportation (交通方便)	1	Price#Discount (折扣力度)	-
		Location#Downtown (位于商圈附近)	-	Ambience#Decoration (装修)	1
		Location#Easy_to_find (是否容易寻找)	-	Ambience#Noise (嘈杂情况)	-1
		Service#Queue (排队时间)	-	Ambience#Space (就餐空间)	1
		Service#Hospitality (服务人员态度)	-	Ambience#Sanitary (卫生情况)	-
		Service#Parking (停车方便)	-	Food#Portion (分量)	1
		Service#Timely (点菜/上菜速度)	-1	Food#Taste (口味)	1
		Price#Level (价格水平)	0	Food#Appearance (外观)	-
		Price#Cost_effective (性价比)	-1	Food#Recommend (推荐程度)	-

Fig. 2: A review sample in ASAP

## Methods

- The Chinese comment is encoded into an embedding by a BERT module.
- Then, the aspect category sentiment scores (ACS.) and the rating prediction scores (RPS.) are predicted from the embedding by CNN.

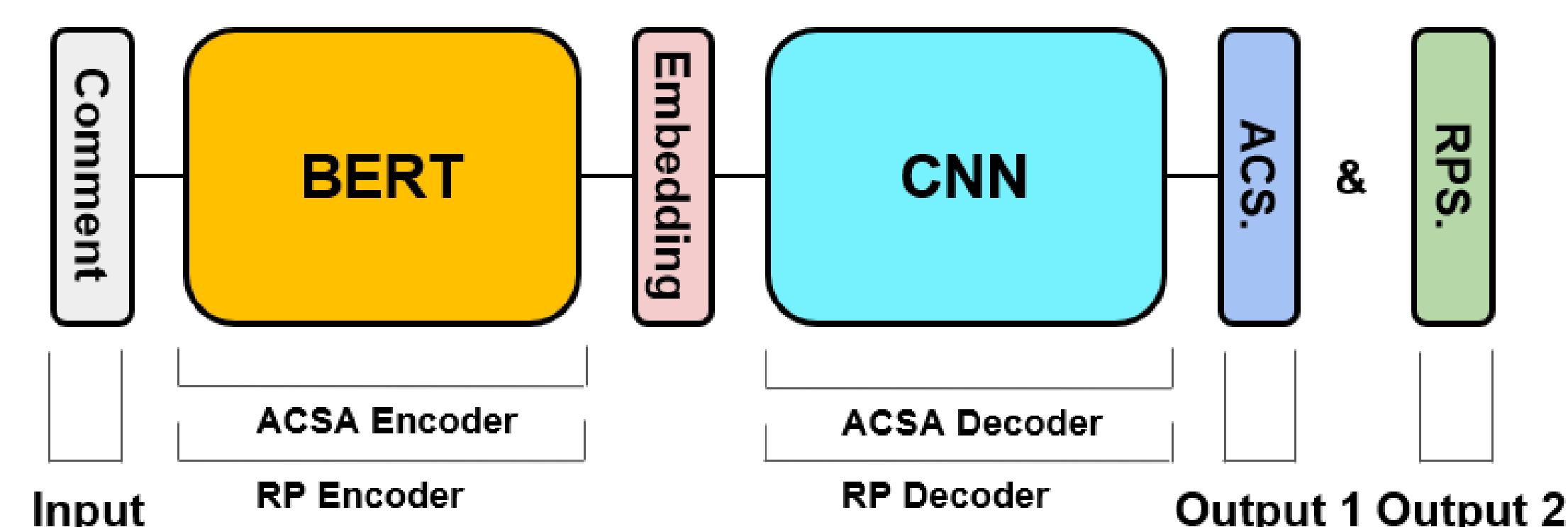


Fig. 3: The Framework of our method

## Results

- The MSE result of the 5-star rating score classification task.

Class	MSE
1 star	0.03
2 star	0.03
3 star	0.13
4 star	0.26
5 star	0.33

Fig. 4: The MSE value of 5 classes

- The MSE result of the Sentiment polarity over 18 aspects category classification task.

18 Aspect Category	MSE
Location:Transportation	0.95
Location:Downtown	0.97
Location:Easy_to_find	0.88
Service:Queue	0.65
Service:Hospitality	0.79
Service:Parking	0.79
Service:Timely	0.87
Price:Level	0.55
Price:Cost_effective	0.87
Price:Discount	0.51
Ambience:Decoration	0.81
Ambience:Noise	0.83
Ambience:Space	0.76
Ambience:Sanitary	0.87
Food:Portion	0.82
Food:Taste	0.59
Food:Appearance	0.85
Food:Recommend	0.91

Fig. 5: The MSE value of 18 classes