Abstract

In sentiment analysis (SA) of product reviews, both user and product information are proven to be useful. Current tasks handle user profile and product information in a unified model which may not be able to learn salient features of users and products effectively. In this work, we propose a dual user and product memory network (DUPMN) model to learn user profiles and product reviews using separate memory networks. Then, the two representations are used jointly for sentiment prediction. The use of separate models aims to capture user profiles and product information more effectively. Compared to state-of-the-art unified prediction models, the evaluations on three benchmark datasets, IMDB, Yelp13, and Yelp14, show that our dual learning model gives performance gain of 0.6%, 1.2%, and 0.9%, respectively. The improvements are also deemed very significant measured by p-values.

Introduction

A user profile is defined by the collection of reviews a user writes. Product information defined for a product is the collection of reviews for this product. We can consider user profile and product information in sentiment analysis, while they are fundamentally different. We should not consider them as single united representation.

Model Design

DUPMN: Dual User and Product Memory Network

Part I: Hierarchical LSTM network with Attention

Joint Mechanism

Sentiment Prediction

UMN

PMN

Hierarchical LSTM with Attention

Config ①: Number of Hops

Config ②: Importance of User vs Product Memory Network

Config ③: Memory Size

Evaluation

Benchmark review datasets:
IMDB, Yelp13 and Yelp14

DUPMN vs Comparison Models

DUPMN with Different Configurations

Config ①: Number of Hops
- Smaller hop works better

Config ②: Importance of User vs Product Memory Network
- User profile influences sentiments of movie reviews more
- Product information influences sentiments of restaurants reviews more

DUPMN with Different Configurations Outperforms the state-of-the-art model

Key References

Munhoz, Chen, Meixiao Sun, Chunchen Tu, Yen-hui Lin, and Zhiyuan Liu. 2016. Neural sentence classification with user and product attention. EMNLP.


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Related Works

Linear or kernel methods on lexical features

Traditional Way

Neural-network-based Approaches

Focus more on important text and add more associated data like eye-tracking data

Utilizing User Profile and Product Information as single representation

Code, dataset and more are available at: derek.ma/proj/dupmn