# Introductory Research Report for Graduate School

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| Title | Rating Prediction by Considering Relations among Documents and Sentences and among Categories | | |

Sentiment classification of product reviews is important for marketing in companies. Nowadays, for sentiment classification problems, several methods using neural network are proposed and work better than previous methods. Neural network is capable to extract and utilize complex relations among factors in input features for sentiment classification. However, these methods are mostly proposed for binary or multi-class classification on one category. As a method to learn semantic representations of several levels of language expressions, such as documents, paragraphs, and sentences, the Distributed Memory model of Paragraph Vectors (PV-DM) is proposed and shows good performance on sentiment classification while it ignores order of sentences in the classification step.

This research proposes a method of sentiment classification on multiples categories. The method considers relations among its text, its sentences and categories and improves classification accuracy over the existing methods. The proposed method classifies reviews in 2 steps. First, it generates distributed representations of reviews and their sentences using PV-DM. Second, it classifies reviews into degrees of ratings on multiple categories using a fully-connected neural network, which takes as input an weighted average of sentence vectors in each review. At the second step, the relations of texts and sentences in a review and categories are considered to classify the review. In the experiments, the proposed method showed a better accuracy than comparative methods and the existing method specialized for sentiment classification on multiple categories. This result shows that the order of sentences in a review is important for sentiment classification and PV-DM captures some sort of different characteristics of them when combining a whole document and sentences in a review.