World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

# Evaluation of Modern Natural Language Processing Techniques via Measuring a Company's Public Perception

**Authors :** Burak Oksuzoglu, Savas Yildirim, Ferhat Kutlu

**Abstract :** Opinion mining (OM) is one of the natural language processing (NLP) problems to determine the polarity of opinions, mostly represented on a positive-neutral-negative axis. The data for OM is usually collected from various social media platforms. In an era where social media has considerable control over companies' futures, it's worth understanding social media and taking actions accordingly. OM comes to the fore here as the scale of the discussion about companies increases, and it becomes unfeasible to gauge opinion on individual levels. Thus, the companies opt to automize this process by applying machine learning (ML) approaches to their data. For the last two decades, OM or sentiment analysis (SA) has been mainly performed by applying ML classification algorithms such as support vector machines (SVM) and Naïve Bayes to a bag of n-gram representations of textual data. With the advent of deep learning and its apparent success in NLP, traditional methods have become obsolete. Transfer learning paradigm that has been commonly used in computer vision (CV) problems started to shape NLP approaches and language models (LM) lately. This gave a sudden rise to the usage of the pretrained language model (PTM), which contains language representations that are obtained by training it on the large datasets using self-supervised learning objectives. The PTMs are further fine-tuned by a specialized downstream task dataset to produce efficient models for various NLP tasks such as OM, NER (Named-Entity Recognition), Question Answering (QA), and so forth. In this study, the traditional and modern NLP approaches have been evaluated for OM by using a sizable corpus belonging to a large private company containing about 76,000 comments in Turkish: SVM with a bag of n-grams, and two chosen pre-trained models, multilingual universal sentence encoder (MUSE) and bidirectional encoder representations from transformers (BERT). The MUSE model is a multilingual model that supports 16 languages, including Turkish, and it is based on convolutional neural networks. The BERT is a monolingual model in our case and transformers-based neural networks. It uses a masked language model and next sentence prediction tasks that allow the bidirectional training of the transformers. During the training phase of the architecture, pre-processing operations such as morphological parsing, stemming, and spelling correction was not used since the experiments showed that their contribution to the model performance was found insignificant even though Turkish is a highly agglutinative and inflective language. The results show that usage of deep learning methods with pre-trained models and fine-tuning achieve about 11% improvement over SVM for OM. The BERT model achieved around 94% prediction accuracy while the MUSE model achieved around 88% and SVM did around 83%. The MUSE multilingual model shows better results than SVM, but it still performs worse than the monolingual BERT model.

**Keywords :** BERT, MUSE, opinion mining, pretrained language model, SVM, Turkish
**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development
**Conference Location :** Chicago, United States
**Conference Dates :** December 12-13, 2020