Advanced Transfer Learning Approach for Improving Sentiment Analysis on Different Dialects of Spanish

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Abstract

In the last years, innovative techniques like Transfer Learning have impacted strongly in Natural Language Processing, increasing massively the state-of-the-art in several challenging tasks. In particular, the Universal Language Model Fine-Tuning (ULMFiT) and the Bidirectional Encoder Representations from Transformers (BERT) algorithms have proven to have an impressive performance on several English text classification tasks. In this paper, we aim at developing an algorithm for Spanish Sentiment Analysis of short texts that is comparable to the state-of-the-art. In order to do so, we have adapted the ULMFiT and BERT algorithms to this setting. Experimental results on benchmark datasets (InterTASS 2017 and InterTASS 2018) show how this simple transfer learning approach performs well when compared to fancy deep learning techniques.

1 Introduction

Spanish is the third language most used on the Internet[1]. However, the development of Natural Language Processing (NLP) techniques for this language did not follow the same trend. In particular, this research gap can be observed in Spanish *sentiment analysis*. In this context, the main issue that we aim to address is how to build a polarity detection system that can be interchangeably used across several dialects of Spanish. It is challenging to have the same performance when classifying texts written in Spanish from different dialects such as Peru, Argentina and so on. While there are a lot of similarities among dialects, there are also several ways to express positive or negative sentiments.

2 Related Work

Since 2015, there have been several Deep Learning architectures used for Spanish Twitter Sentiment Analysis, ranging from Multilayer Perceptron [4], Recurrent Neural Networks [2] and Convolutional Neural Networks [9] and several combinations of them. We refer to [7] in order to get an in-depth review of several deep Learning approaches for the Spanish language before 2018. Our proposal is also based on deep learning but, unlike previous approaches, it plans to use a general language model to improve the polarity detection task on different dialects of Spanish. This setup is novel for the Spanish language.

[1]http://www.internetworldstats.com/stats7.htm

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3 Methodology

Our proposal is inspired by the success of transfer learning approaches in several text classification tasks for the English language. In particular, we resort to ULMFit [3] and BERT [1] language models. In this sense, it has been obtained interesting preliminary results using a modified ULMFit setup for the Spanish language in [8] as described as follows:

(a) The language model (LM) is trained on a general domain corpus to capture general features of the language in different layers. To do so, we have learned a LM for the Spanish language using Wikipedia data.

(b) The full LM is fine-tuned on target task data using discriminative fine-tuning (Discr) and slanted triangular learning rates (STLR) to learn task-specific features. In our case, the target task is Spanish sentiment analysis from Tweets thus, fine-tuning of the LM is performed using unlabeled Spanish Tweets.

(c) The classifier is fine-tuned on the target task using gradual unfreezing, Discr, and STLR to preserve low-level representations and adapt high-level ones (shaded: unfreezing stages; black: frozen). In our context, the sentiment analysis classifier is fine-tuned using labeled Spanish tweets.

Currently, we are working for including attention mechanism, introduced in BERT, for improving the pipeline presented above.

4 Experiments

A complete description about the hardware and software requirements for reproducing this paper are described in the public repository of the project. In addition, we show some preliminary results.

4.1 Benchmark Datasets

In order to train our algorithms we are using benchmark datasets provided by the TASS competition at SEPLN workshops [5, 6]. Those datasets comprise several collections of Spanish Tweets including different dialects. In addition, those datasets will allow us to compare our approach against recent Deep Learning approaches for Spanish sentiment analysis.

4.2 Preliminary Results

The results for InterTASS (Task1) Competition 2017 [6] were better than expected as shown in Table 1a, achieving the second best result, according to M-F1 metric (the ELiRF-UPV team reached a M-F1 score of 0.493).

Furthermore, results on InterTASS-PE (Task1 / Sub-task 2) Competition 2018 [5] are shown in Table 1b. While they weren't the best, they are within the best eight results of the competition.

Table 1: Results over InterTASS Test datasets.

(a) InterTASS 2017.

Team	M-F1	Acc.
ELiRF-UPV-run1	0.493	0.607
Our proposal	**0.481**	**0.567**
RETUYT-svm_cnn	0.471	0.596
ELiRF-UPV-run3	0.466	0.597
ITAINNOVA-model4	0.461	0.476
jacerong-run-2	0.460	0.602
jacerong-run-1	0.459	0.608
INGEOTEC-evodag001	0.457	0.507
RETUYT-svm	0.457	0.583
tecnolengua-sentonly	0.456	0.582

(b) InterTASS-PE 2018.

Team	M-F1	Acc.
retuyt-cnn-pe-1	0.472	0.494
atalaya-pe-lr-50-2	0.462	0.451
retuyt-lstm-pe-2	0.443	0.488
retuyt-svm-pe-2	0.441	0.471
ingeotec-run1	0.439	0.447
elirf-intertass-pe-run-2	0.438	0.461
atalaya-mlp-sentiment	0.437	0.520
retuyt-svm-pe-1	0.437	0.474
Our proposal	**0.436**	**0.463**
elirf-intertass-pe-run-1	0.435	0.440

References

[1] Jacob Devlin, Ming-Wei Chang, Kenton Lee, and Kristina Toutanova. BERT: pre-training of deep bidirectional transformers for language understanding. *CoRR*, abs/1810.04805, 2018.

[2] M. Garcia-Vega, A. Montejo-Raez, M. C. Diaz-Galiano, and S. M. Jimenez-Zafra. Sinai in tass 2017: Tweet polarity classification integrating user information. In *Proceedings of TASS 2017: Workshop on Sentiment Analysis at SEPLN*, pages 91–96, 2017.

[3] Jeremy Howard and Sebastian Ruder. Universal language model fine-tuning for text classification. In *Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 328–339, Melbourne, Australia, July 2018. Association for Computational Linguistics.

[4] Lluis-F Hurtado, Ferran Pla, and Jose-Angel Gonzalez. Elirf-upv at tass 2017: Sentiment analysis in twitter based on deep learning. In *Proceedings of TASS 2017: Workshop on Sentiment Analysis at SEPLN*, pages 29–34, 2017.

[5] Eugenio Martinez-Camara, Yudivián Almeida-Cruz, Manuel Diaz-Galiano, Suilan Estévez-Velarde, M. Angel Garcia-Cumbreras, Manuel Garcia Vega, Yoan Gutiérrez, Arturo Montejo-Ráez, Andres Montoyo, Rafael Munoz, Alejandro Piad-Morffis, and Julio Villena-Roman. Overview of tass 2018: Opinions, health and emotions. In *Proceedings of TASS 2018: Workshop on Sentiment Analysis at SEPLN*, pages 13–27, 2018.

[6] Eugenio Martinez-Camara, Manuel Diaz-Galiano, M. Angel Garcia-Cumbreras, Manuel Garcia-Vega, and Julio Villena-Roman. Overview of tass 2017. In *Proceedings of TASS 2017: Workshop on Sentiment Analysis at SEPLN*, pages 13–21, 2017.

[7] José Ochoa-Luna and Disraeli Ari. Deep neural network approaches for spanish sentiment analysis of short texts. In Guillermo R. Simari, Eduardo Fermé, Flabio Gutiérrez Segura, and José Antonio Rodríguez Melquiades, editors, *Advances in Artificial Intelligence - IBERAMIA 2018*, pages 430–441, Cham, 2018. Springer International Publishing.

[8] Daniel Palomino and José Ochoa-Luna. Advanced transfer learning approach for improving spanish sentiment analysis. In *To appear: 18TH MEXICAN INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE (MICAI 2019)*, 2019.

[9] Isabel Segura-Bedmar, Antonio Quiros, and Paloma Martínez. Exploring convolutional neural networks for sentiment analysis of spanish tweets. In *Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 1, Long Papers*, pages 1014–1022. Association for Computational Linguistics, 2017.