

Tech Review

The paper "Text Classification Using Label Names Only: A Language Model Self-Training Approach" proposes a weakly-supervised text classification model that can classify text with as little as one label word. The technique discussed in the paper is named Label-Name-Only Text Classification, or LOTClass for short. The paper discusses related models, how LOTClass works, and how LOTClass compares to other models using benchmark datasets.

The LOTClass model discussed in the paper builds upon the pre-trained BERT language model. While BERT is used in this case, LOTClass can be adapted to use any other pre-trained neural language models such as ELMo, GPT, XLNet, or any BERT variant. Using pre-trained neural language models that use large text corpora serve as a knowledge base that introduces generic linguistic features.

The core of LOTClass centers around three ideas. The first is generating semantically related words with the label names. The second is finding category-indicative words and train LOTClass to predict implied categories. The last is to generalize the model with self-training. Combining these three core ideas produces a robust method that is able to achieve high accuracy without using labeled documents and learning from 1-3 words per class as the label name.

Category understanding using label name replacement uses a pre-trained BERT masked language model (MLM) to predict words that are similar to the label name. The context of the word is preserved based on each document. The top 50 predicted words are used to establish the category vocabulary. This method is effective at producing replacement words that have a similar context to the label name.

In order to find category-indicative words, LOTClass uses masked category prediction (MCP). This step uses the pre-trained language model to create contextualized word-level category supervision to train itself to predict the implied category of a word with the word masked. By masking out the category-indicative word during the training forces the model to infer categories based on the context of the words.

The final step is to self-train the model on the unlabeled corpus. This refines the model for better generalization and allows the model to predict words without the mask. The paper also introduces the concept of soft-labeling during the self-training step. Soft labeling promotes high-confidence prediction and demotes low confidence ones. This step was shown to give better and more stable predictions compared to hard-labeling.

LOTClass is compared against other language models with four benchmark datasets: news topics from AG News, Wikipedia topics from DBPedia, movie review sentiment from IMDB, and product review sentiment from Amazon.

Comparing the results of the classification accuracy shows that LOTClass outperforms other weakly supervised models including LOTClass without self-training. With self-training, LOTClass is approaching the results of semi-supervised and supervised models.

The LOTClass model introduced in this paper is capable of performing text classification using the label name of each class. By associating semantically related words to the label using label replacement, finding category-indicative words using masked predictions, and self-training, the model is able to outperform similar weakly-supervised models and approach more robust semi-supervised and supervised models. While LOTClass may struggle with label names that are generic and difficult to categorize, it is capable of classifying text documents where pre-labeled

documents are not available. Building upon this method may prove useful for many applications and can be used where supervised methods are not feasible.

References

Meng, Yu, et al. “Text Classification Using Label Names Only: A Language Model Self-Training Approach.” Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP), Association for Computational Linguistics, 2020, pp. 9006–17. DOI.org (Crossref), <https://doi.org/10.18653/v1/2020.emnlp-main.724>.