

# Unsupervised Domain adaptation for Sentence Classification

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## **Abstract**

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## **Keywords**

Domain Adaptation, TSDAE, GPL, SBERT, Sentence Classification

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# Introduction

Uvodni zapis - slabosti SBERT-a in podobnih metod, zakaj se uporablja TSDAE in GPL (v povezavi s prilagoditvijo domene). Osredotočili se bomo na "domain adaptation" za slovenski jezik, pri čemer bomo metode testirali nad problemom "sentimental analysis" (nekako povežemo besedilo na problem klasifikacija pri čustvih). Cilj projekta je bila implementacija metod TSDAE, GPL, s katerimi finetunamo SBERT (BERT+pooling), in testiranje metod ter primerjava rezultatov nad problemom klasifikacije stavkov v eno izmed "pos", "neg", "neutral". Opazovali smo tudi izbrane parametre tekom učenja posameznega pristopa.

In the Introduction section you should write about the relevance of your work (what is the purpose of the project, what will we solve) and about related work (what solutions for the problem already exist). Where appropriate, reference scientific work conducted by other researchers.

## **Methods**

Use the Methods section to describe what you did an how you did it – in what way did you prepare the data, what algorithms did you use, how did you test various solutions ... Provide all the required details for a reproduction of your work.

Tu nekoliko opišemo SBERT - predvsem glede sentence embeddingov, ki jih potrebujemo za naprej.

#### **TSDAE**

TSDAE - opis metode, pri čemer se predvsem osredotočimo na domain adaptation. Povemo kateri model finetunamo. Dodamo skico arhitekture.

Transformer-based Sequential Denoising Auto-Encoder (TSDAE) is a state-of-the-art unsupervised method used for domain adaptation with an encoder-decoder architecture. A shortcoming of previous sentence embedding techniques like SBERT is the lack of domain knowledge. Fine-tuning a model like this with TSDAE can adapt our model to a specific domain without any labeled data, as this is hard and expensive to acquire [1].

Before training the model, TSDAE corrupts the input sentences, for example by deleting or swapping words, and encodes them to a fixed vector. The goal of the decoder is to reconstruct the vectors to the original input by prediciting what was changed. It is important to note that the decoder has no context as it doesn't have access to other sentence embeddings and thus creates a bottleneck [1]. This architecture can be seen on image 1.

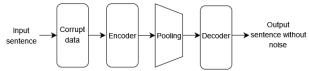


Figure 1. Architecture of TSDAE model

For the purpose of classifying Slovenian sentences based on their sentiment we fine-tune the SBERT model with TS-

DAE. We choose bert-base-uncased (TODO) for our base model to fine-tune. For the loss function we use the DenoisingAutoEncoderLoss as our loss function when training. We train the method and compare our results with the corpus.

TSDAE has been shown by Wang, Reimers and Gurevych [1] to outperform other unsupervised approaches and other supervised models, trained with a lot of labeled data. Many previous works were evaluated on Semantic Textual Similarity (STS) which might return good performance but it is unclear how it performs on specific domains.

## **GPL**

GPL - opis metode, pri čemer se predvsem osredotočimo na domain adaptation. Povemo kateri model finetunamo. Dodamo skico arhitekture.

#### Data

Kakšne podatke uporabljamo, kako izgledajo, in what way did you prepare the data, delitev na množice (poudarimo, da se vse metode treniranjo z enako učno množico). Pokažemo morda par primerov povedi v tabeli.

## **Testing approach**

Naslov morda še ni ustrezen in se bo prilagodil. Katero metriko uporabimo za primerjavo rezultatov, kako iz sentence embedding pridemo do klasifikacije povedi.

## Results

TO DO: Use the results section to present the final results of your work. Present the results in a objective and scien-

tific fashion. Use visualisations to convey your results in a clear and efficient manner. When comparing results between various techniques use appropriate statistical methodology.

## **Discussion**

TO DO: Use the Discussion section to objectively evaluate your work, do not just put praise on everything you did, be critical and exposes flaws and weaknesses of your solution. You can also explain what you would do differently if you would be able to start again and what upgrades could be done on the project in the future.

## **Acknowledgments**

Here you can thank other persons (advisors, colleagues ...) that contributed to the successful completion of your project.

## References

[1] Kexin Wang, Nils Reimers, and Iryna Gurevych. TS-DAE: Using transformer-based sequential denoising autoencoderfor unsupervised sentence embedding learning. In Marie-Francine Moens, Xuanjing Huang, Lucia Specia, and Scott Wen-tau Yih, editors, Findings of the Association for Computational Linguistics: EMNLP 2021, pages 671–688, Punta Cana, Dominican Republic, November 2021. Association for Computational Linguistics.