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# Reproducibility of SciBert

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Modul : Data Mining

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# Introduction

Als pretrained model hängt bert stark von dem korpus ab

Genauso ist das vocabular sehr wichtig

Andere arbeiten zeigten den einfluss eines erweiterten trainings/besser passenden korpus? referenz suchen

=> Roberta zum Beispiel zeigte, dass allein weiteres training die ergebnisse verbessern kann Wissenschaftliche texte unterscheiden sich allgemein sehr stark von "normalen"

=> Somit ist ein auf ähnliche weise trainiertes modell als bessere grundlagen für NLP aufgaben im wissenschaftlichen bereich sinnvoll

Gab es in dieser form noch nicht

besitzt daher potential.

insbesondere als grundbaustein für unterschiedlichste aufgaben im !!! wiss. bereich

Allgemein stellt sich das Problem von Datensätzen insbesondere da diese annotiert werden müssen (im wiss. bereich teuer da hochqualifizierte experten notwendig sind)

# State of the art

## 2.1 BERT

- BERT as revolution
- pretrained-models
- usefull even without finetuning
- $\Rightarrow$  unexpected precision
- nowadays used for many different NLP tasks
- Architecture of BERT
  - explain corpora
  - explain vocabulary
  - explain tokenizer
- extensions of BERT like roBERTa

## 2.2 BioBERT

BioBERT is one of the extensions of BERT which were created because BERT by itself did not yield the desired results in the biomedical landscape. This observation was oftentimes explained with the differences in word distributions between a general domain such as Wikipedia on which BERT was trained and the highly specialized words which are oftentimes only or with this meaning only used in the corresponding domain. This difference in the underlying corpora not only produces differences in the architecture of the model itself but implies a possible need for adjustments to the used vocabulary and the tokenizer. [3]

BioBERT itself is a further trained version of BERT. This means the original BERT model was used as basis and further trained on either PubMed abstracts, PubMed central full-text articles or on both. Therefore the authors chose to keep the original BERT vocabulary to be able to use the pretrained version of BERT as basis. This had the advantage that the original model only needed to be further trained on the new corpus and the needed training time could be reduced.

## 2.3 Datasets

- zum Beispiel NCBI-Disease (versuch einen gold-standard für corpora zu erstellen)
- sehr günstig um darauf entsprechende modelle zu trainieren [2]
- SciERC /sciie im repo [4]

Due to the availability of the Datasets used by the original Authors. We will use their prepared Datasets, which are already prepared so that it is easier to use for training of neural nets and still only vary slightly from the original Datasets. The Datasets which we will use are directly retrieved from the SciBERT GitHub page and made available through the DataDeps package which provides an easy way to retrieve data that may or may not be locally available. If it is not already stored locally it will be cached in the local Julia path and inside Julia, DataDeps provides the corresponding paths to the Data and retrieves it from the defined Source if needed. Furthermore, a hash can be defined as well to ensure that

the provided data is identical to the expected one.[6] In the following paragraph, we will take a closer look at the original data and the individual changes that have been made to use those Datasets for the training process.

### **2.3.1 Chemprot**

Chemprot is in a JSON lines file format provided. More precisely every line consists of a text and the corresponding label. A field for metadata exists as well but is most of the time not used. In its original format, the Chemprot corpus consists of a develop, test, and train Set of which the develop, test, and train folder correspond to the identically named files inside the chemprot folder provided on the GitHub site of sciBERT. The difference arises from a database-like structure in which the chemprot corpus is originally provided, in contrast to those subdivided information sets where for example the text itself is in another file than the positions and annotations. Those divided pieces of information were combined and are provided in a single file in the already mentioned format. [1, 5]

# SciBert

## 3.1 Corpus

Comparison

## 3.2 Vocabulary

BaseVocab vs. SCIVocab  
!  $\approx 42\%$  overlap

### 3.2.1 SentencePiece

# Experiments

kurze einföhrung in die test fälle mit einer  
erklärung, was f1 scores sind  
Alles NLP Aufgaben bei denen Bert "überraschend"  
gut abschneided  
Jetzt mit der erweiterung zu scibert erneut betra-  
chtet  
Einföuss des vocabulars und des corpus genau  
gegenübergestellt

all got dropout of 0.1 loss cross entropy optemizer  
adam finetuning for 2 to 5 epochs

## 4.1 NER

Pretrained model -, linear classification layer with  
softmax output

## 4.2 PICO

## 4.3 CLS

## 4.4 REL

## 4.5 DEP

dependency tag and arc embedding of size 100 and  
biaffine matrix attention

## 4.6 Finetuning

## 4.7 Frozen embeddings

## 4.8 Influences of different plat- forms

This section will take a short look at the usability of  
different hardware platforms for the creation of trans-  
former models and in the training or testing of those.  
More precisely we will compare the google-colab en-  
vironment with an Nvidia GPU and an AMD GPU.  
Due to the randomness of the allocation of hardware  
on the google-colab site, I cannot further define the  
GPU that was used on this platform. The Nvidia  
GPU that was used is a GeForce 940MX with ap-  
proximate 2GB VRAM, the AMD GPU on the other  
side was an RX580 with approximate 8GB of VRAM.  
At this point, I will shortly describe how far the  
ROCM stack of AMD is usable because surprisingly  
I was able to define the model and make predic-  
tions with it in a randomized instance. Sadly due  
to the instability in the ROCM stack, the Linux ker-  
nel wasn't capable of using the GPU anymore after an  
update which probably broke the intern dependencies  
on which the kernel and the ROCM driver relay and  
therefore the Video output of the computer was not  
usable anymore. Even though this shows that in fact,  
an AMD GPU is capable of running the Transformer  
package and at least load a defined model. This fact  
in itself is surprising since AMD itself describes the  
support status of the RX580 as it "may or may not  
work" and Julia describes the support of AMD GPUs

as level 3 which corresponds to the lowest level of support. (verweis zu der aussage)[belege und verweis zu ROCM]

Still, I would discourage anyone from installing the ROCM stack on any productive system since it is still way too unstable and would recommend experimenting only in some form of a virtualized environment. Due to the failure with the ROCM stack, the following part will only consider the MX940 and the google-colab environment.



# Discussion

## Further development

# Bibliography

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