PETGUI - A GRAPHICAL USER INTERFACE FOR PATTERN-EXPLOITING TRAINING

R. Sari[1], M. He[1], P. Richter-Pechanski[1,2], P. Wiesenbach[1,2], D. Schwab[2], C. Kiriakou[2], C. Dieterich[1,2]

[1]Section of Bioinformatics and Systems Cardiology, Klaus Tschira Institute for Integrative Computational Cardiology, Heidelberg, Germany,
[2]Department of Internal Medicine III, University Hospital Heidelberg, Germany

1. Introduction

- Integration of deep learning methods for reliably analyzing unstructured clinical texts in data-scarce domains remains limited, **endorsing active involvement of physicians in model development.**
- Recent advancements in few-shot learning, such as Pattern-Exploiting Training (PET) (Fig. 1), a state- of-the-art semi-supervised prompting method for text classification tasks[1], **showed promising results in German clinical section classification tasks[2]**.
- To grant physicians access to such methods, we present **PETGUI, an intuitive and user-friendly graphical user interface for PET**.

2. Methods

- Developed using open-source Python web framework, **FastAPI**.
- Compatible with state-of-the-art Slurm computing infrastructure with **GPU support**.
- Tested by physicians as an early-stage prototype using **self-developed questionnaires** (Fig. 2).
- Easily installable with Docker using a step-wise installation guide, publicly **available on GitHub**:

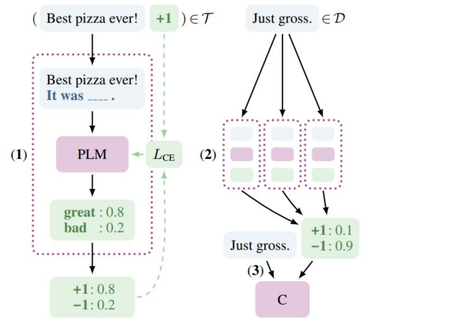
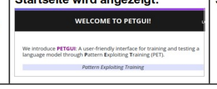


Fig. 1 Illustration of Pattern-Exploiting Training[1]

Schritt 1: Applikationsstart:

Aktion(en)	Erwartete Darstellung	Hat es funktioniert?	Falls nicht: Bitte Darstellung beschreiben
Bitte öffnen Sie diesen Link in einem Browser auf einem klinischen PC	**Startseite wird angezeigt:** 	Ja [X] Nein []	

Schritt 9: Bitte bewerten Sie Ihre Nutzer-Erfahrung mit der App "PETGUI"

1. **Nachvollziehbarkeit**: Waren die **Funktionen** der App-Komponenten in Form von Buttons, Texten und Beschreibungen nachvollziehbar für Sie ?

   Gar nicht 1○ 2○ 3○ 4○ 5○ Sehr

   Kommentar(e):

   _____

Fig. 2 Snapshot of PETGUI questionnaire

Training Setup Page

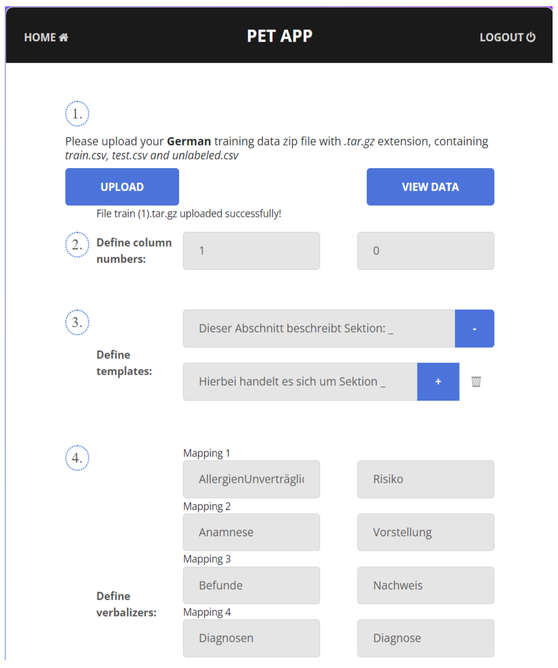


Fig. 3 Training parameters are defined on the Setup Page

Training Page

Fig. 4 Training results are displayed as model performance per label

3. Results

- We received positive feedback from testers, who **successfully conducted PET experiments using PETGUI.**
- The user-friendly interface enabled physicians to **actively influence the entire life-cycle of model development**, including preparatory, training and evaluation steps (Fig. 3 & 4).
- **Testers highlighted the intuitive installation procedure** and suggested improvements with regard to error handling and training speed.

Main Takeaways

Our approach underscores the need to involve physicians in the development of medical state-of-the-art machine learning methods.

PETGUI is a step towards bridging the gap between complex machine learning systems and their practical clinical application.

From here, we plan to leverage powerful large language models for tackling data scarcity in the German medical domain.

4. Discussion & Conclusion

- Recent few-shot learning methods, such as PET[1], have become crucial for the data-scarce medical domain.
- To **meet actual needs of clinical routine**, we involved physicians in the development and evaluation of PETGUI, a user-friendly interface for running PET experiments.
- PETGUI demonstrates that **physicians are highly motivated to be involved in model development** from the onset.
- Overall positive reception highlight the potential of our app in the clinical domain and the need for further improvements.

References

[1] Schick T, Schütze H. Exploiting Cloze Questions for Few Shot Text Classification and Natural Language Inference. 2020 [cited 2023 Jun 15]; Available from: https://arxiv.org/abs/2001.07676.

[2] Richter-Pechanski P, Wiesenbach P, Schwab DM, Kiriakou C, He M, Geis NA, et al. Few-Shot and Prompt Training for Text Classification in German Doctor's Letters. In: Hägglund M, Blusi M, Bonacina S, Nilsson L, Cort Madsen I, Pelayo S, et al., editors. Studies in Health Technology and Informatics [Internet]. IOS Press; 2023 [cited 2024 Mar 12]. Available from: https://ebooks.iospress.nl/doi/10.3233/SHTI230275.