MedTem2.0: Prompt-based Temporal Classification of Treatment Events from Discharge Summaries

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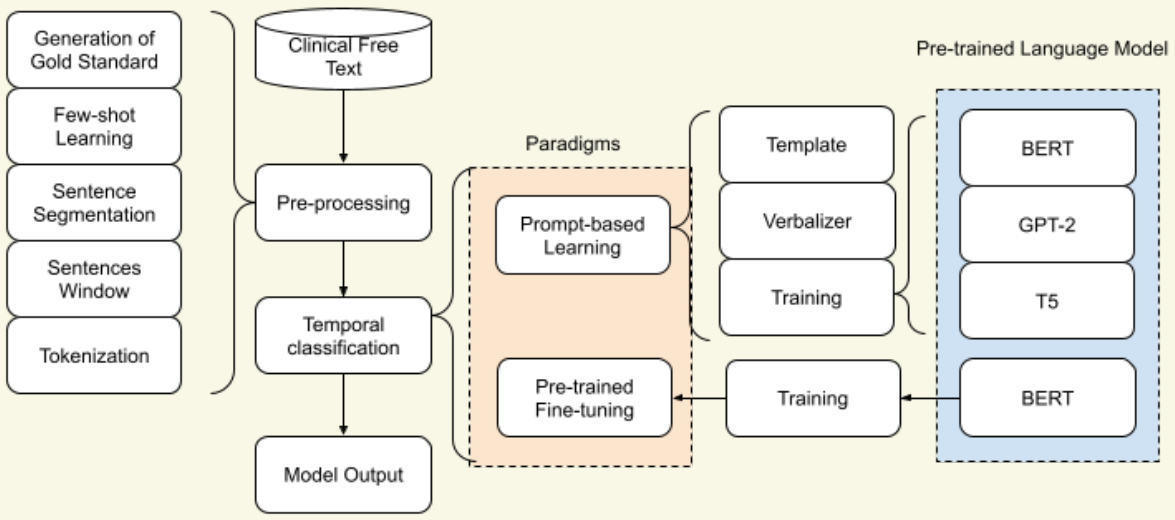
Motivations

- Clinical texts contain important temporal information, e.g. medication start and end dates, appointment and diagnosis dates.
- Developing effective natural language processing techniques for extracting temporal information from clinical texts is crucial for improving healthcare.
- For example, if the discharge note records that “The patient took ibuprofen during the hospitalization”. Ibuprofen is marked as "ON" when it is considered a treatment and "OFF" when it is not.

Pipeline



Methodology

- Different Paradigms: Prompt-based Learning (PBL), Pre-trained Fine-tuning
- Different PLMs: BERT, GPT-2, T5

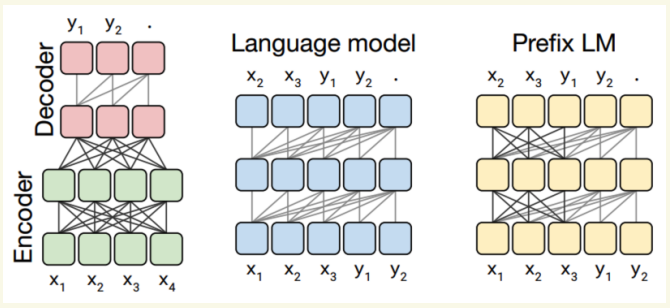


Figure: PLMs architectures

- Different Template and Verbalizer

Scores: PBL vs Fine-Tuning

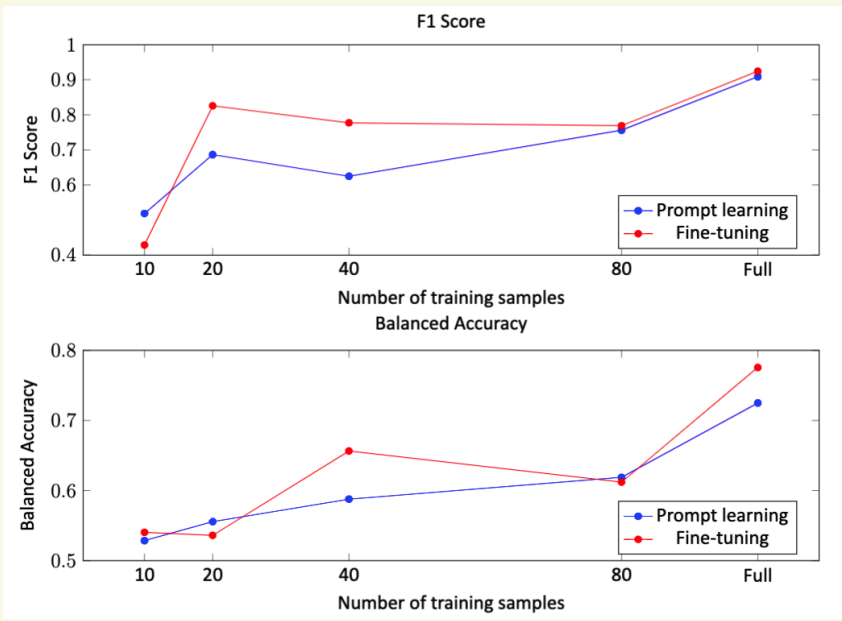


Figure: Result of Few-shot

Results: Different PLMs and Templates/Verbalizers

PLM	Learning rate	F1 score of ON class	Balanced Accuracy
BERT	1E-4	87.29	50.00
	2E-4	**90.75**	**69.72**
	5E-6	90.14	69.57
	6E-5	90.57	70.24
GPT-2	2E-5	**90.79**	**71.19**
	5E-6	90.28	65.58
	6E-5	90.69	70.43
T5	4E-5	**91.24**	**71.43**
	2E-5	90.12	68.36

Table: Result of Different PLMs

Template	Verbalizer	F1 score of ON class	Balanced Accuracy
Manual	Manual	**91.24**	**71.43**
Manual	Soft	90.85	70.52
Soft	Manual	**90.68**	68.33
Soft	Soft	89.80	**72.48**
Mixed	Manual	**90.89**	**72.07**
Mixed	Soft	90.70	69.01

Table: Result of Different Templates and Verbalizers

Outcomes:

- Establish a high baseline score with 90.89% F1 score and 72.0% balanced accuracy by using *prompt-based* learning.
- Improved performance using fine-tuning with the BERT model, resulting in a 92.45% F1 score and 77.56% balanced accuracy.
- **MedTem**: Open-source toolkits and packages for Temporal relation classification tasks on clinical treatment events.

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The University of Manchester | Data-and-Code: https://github.com/HECTA-UoM/MedTem