

Generating multiple-choice questions for medical question answering with distractors and cue-masking

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<https://huggingface.co/datasets/sileod/wikimedqa>

Outline

Context

Medical Multiple Choice QA

Contributions

Unsupervised tuning for MMCQA

Distractor prediction with differential diagnoses

Analysis of masking

New datasets (Wikidoc, WikEM)

Pre-trained models + experiments

Motivation

A 70-year-old man presents to a medical clinic reporting blood in his urine and lower abdominal pain for the past few days. He is also concerned about urinary frequency and urgency. He states that he recently completed a cycle of chemotherapy for non-Hodgkin lymphoma. Which medication in the chemotherapy regimen most likely caused his symptoms?

Cytarabine

Methotrexate

Rituximab

Cyclophosphamide

Prednisone

Source: MedQA

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Side effects [\[edit\]](#)

[Adverse drug reactions](#) from cyclophosphamide are related to the cumulative medication dose and include [chemotherapy-induced nausea and vomiting](#),^[18] [bone marrow suppression](#),^[19] [stomach ache](#), [hemorrhagic cystitis](#), [diarrhea](#), darkening of the skin/nails, [alopecia](#) (hair loss) or thinning of hair, changes in color and texture of the hair, [lethargy](#), and profound gonadotoxicity. Other side effects may include easy bruising/bleeding, joint pain, mouth sores, slow-healing existing wounds, unusual decrease in the amount of urine or unusual tiredness or weakness.^[citation needed] Potential side effects also include leukopenia, infection, bladder toxicity, and cancer.^[20]

Pulmonary injury appears rare,^[21] but can present with two clinical patterns: an early, acute [pneumonitis](#) and a chronic, progressive [fibrosis](#).^[22] [Cardiotoxicity](#) is a major problem with people treated with higher dose regimens.^[23]



Cyclophosphamide

Training methods

- Language modeling

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Cyclophosphamide

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- Language modeling
- diseaseBERT (focused language modeling)

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Cyclophosphamide

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- Language modeling
- diseaseBERT (focused language modeling)
- Ours: multiple choice with distractor prediction

Side effects [\[edit\]](#)

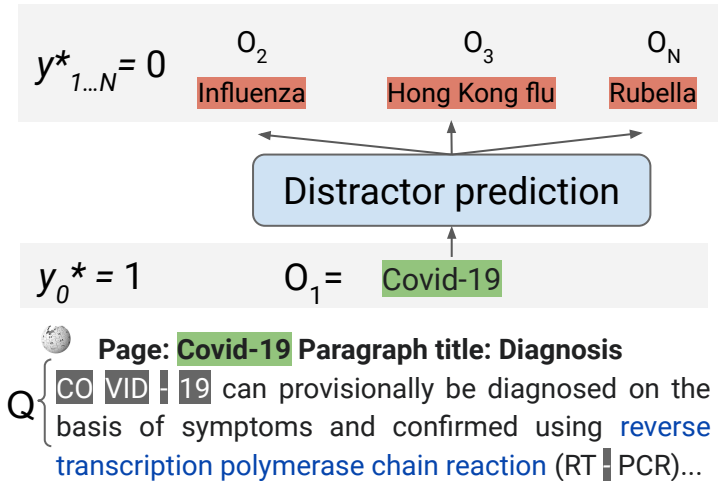
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Cyclophosphamide

Approach

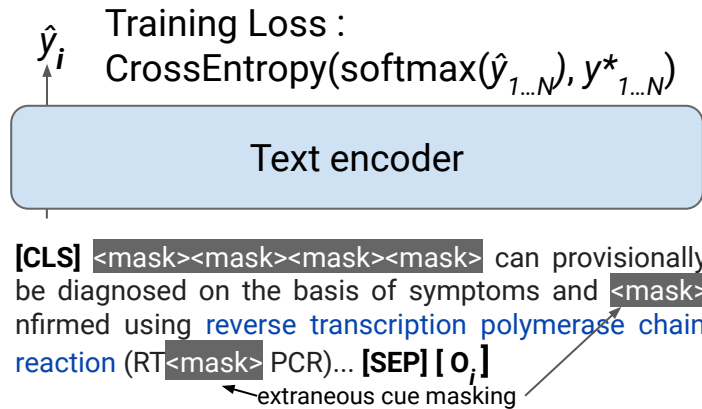


Differential diagnoses cross-linked on DBPedia.

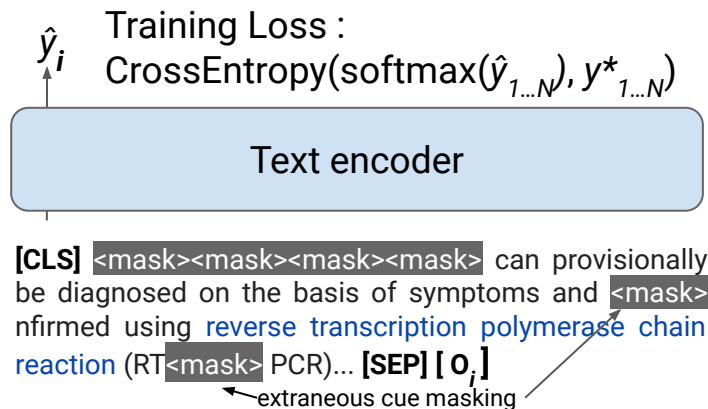
OR

[SentenceBERT matching](#)

Issues with masking



Issues with masking



Loss/Masking strategy	MedQA-USMLE Accuracy
BioLinkBERT-base (Yasunaga et al., 2022)	40.0
+MLM/Token (Jin et al., 2020)	40.1
+MLM/Word	41.2
+Discriminative/Word	42.5
+Discriminative/Probability-Matching	43.6
- Differential diagnoses	42.6

Data

Wikipedia Medicine Portal - 75k paragraphs

Wikidoc (a Wikipedia-like for doctors) -28k paragraphs

WikEM (Wikipedia-like for emergency medicine) - 15k paragraphs

Results

	HEAD-QA+K	MedMCQA	MedMCQA+K	MedQA	MMLU
Previous sota under 340M parameters	42.4	40.0	43.0	44.6	50.7
BioLinkBERT-base (Yasunaga et al., 2022)	40.0	43.4	49.1	40.6	44.5
BioLinkBERT-large (Yasunaga et al., 2022)	44.1	48.3	52.8	44.6	50.6
BioLinkBERT-base+DiseaseBERT	37.8	47.8	44.5	41.2	50.5
BioLinkBERT-base+WikiMedQA	41.0	46.9	49.0	45.7	49.6
BioLinkBERT-large+WikiMedQA	44.5	50.8	53.9	47.2	51.1

Conclusion

Data:

<https://huggingface.co/datasets/sileod/wikimedqa>



Model:

<https://huggingface.co/sileod/BioLinkBERT-large-WikiMedQA>