Enhancing Radiology Report Interpretation with Large-Scale Language Models: A Two-Stage Fine-Tuning Approach

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***Abstract*—Radiology reports contain complex medical terminology and specialized knowledge, making them difficult for both patients and medical professionals to interpret. This study aims to address this challenge by developing a large-scale language model specifically designed for interpreting chest radiology reports. We focus on four key natural language processing (NLP) tasks—summarization, paraphrasing, abbreviation interpretation, and question answering—using a synthetic dataset derived from the MIMIC-CXR reports and GPT-3.5 Turbo. To enhance the model's performance, we propose a two-stage supervised fine-tuning (SFT) process, incorporating real-world medical data from PubMedQA and MedQA, in addition to the synthetic dataset. The resulting models, Model-1 and Model-2, were evaluated based on accuracy, conciseness, and clarity, using test data not seen during training. Experimental results demonstrated that the proposed two-stage SFT method achieved strong performance across all four tasks, providing comparable performance to models such as GPT-3.5, Bard, Llama2, and MedAlpaca in key evaluation metrics, despite using a relatively smaller number of parameters. These findings suggest that synthetic data, when combined with domain-specific datasets, can significantly improve the interpretive capabilities of large-scale language models in the medical domain.**

***Keyword*—Large-Scale Language Model, Radiology Report, Self-Supervised Finetuning, Synthetic Data, Prompt Engineering**

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