SIIM CMIMI24
Oct 21-22 | Boston, MA
Conference On Machine Intelligence In Medical Imaging

Revolutionizing Radiological Research: LLMs for Rapid, Accurate Data Extraction from Clinical Reports

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Introduction/Background

To evaluate the efficacy of Large Language Models (LLMs) in extracting clinically relevant information from MR-guided intervention reports, enabling efficient database creation and comprehensive retrospective analysis, and to introduce RadPrompter, a novel tool enhancing this extraction process.

Methods/Intervention

We employed the Meta-Llama-3-70B-Instruct model to process 2,016 MR-guided intervention reports. The model was tasked with extracting key clinical features, including organ, anatomical location, ablation type, assisted modality, needle specifications, lesion type, and treatment cycles. To optimize extraction, we developed a new tool, RadPrompter, which interfaces with the LLM engine and enhances its information retrieval capabilities. The system utilized 2 Nvidia A100 GPUs and 160 GB of RAM, processing two reports simultaneously with the model's temperature set to 0.0 to minimize hallucination.

Results/Outcome

Leveraging our custom tool, the LLM successfully processed all 2,016 reports in 6 hours and 27 minutes, averaging 15 seconds per report. We manually inspected 200 reports, and It achieved 100% accuracy in extracting the specified clinical data points, demonstrating high reliability in information retrieval from complex medical narratives.

Conclusion

This study showcases the powerful potential of LLMs, augmented by specialized tools like RadPrompter, in revolutionizing radiological research. By rapidly and accurately extracting structured data from unstructured reports, this approach can significantly enhance the efficiency and scope of retrospective analyses. It enables researchers to process large volumes of historical data with unprecedented speed and accuracy.

Statement of Impact

The application of LLMs, coupled with custom extraction tools, in radiology report analysis, represents a paradigm shift in medical research methodology. It offers a scalable solution to the challenge of mining valuable insights from vast repositories of unstructured clinical data. This technology has the potential to accelerate research timelines, uncover novel patterns in patient care, and ultimately contribute to the advancement of personalized medicine in interventional radiology.

Keywords

Large Language Models; Artificial Intelligence; Interventional Radiology