
RSNA Press Release

Researchers Test Large Language Model that Preserves Patient Privacy

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OAK BROOK, Ill. — Locally run large language models (LLMs) may be a feasible option for extracting data from text-based radiology reports while preserving patient privacy, according to a new study from the National Institutes of Health Clinical Center (NIH CC) published in *Radiology*, a journal of the Radiological Society of North America ([RSNA](http://RSNA.org)). LLMs are deep-learning models trained to understand and generate text in a human-like way.



Ronald M. Summers, M.D., Ph.D.

Recently released LLM models such as ChatGPT and GPT-4 have garnered attention. However, they are not compatible with healthcare data due to privacy constraints.

“ChatGPT and GPT-4 are proprietary models that require the user to send data to OpenAI sources for processing, which would require de-identifying patient data,” said senior author Ronald M. Summers, M.D., Ph.D., senior investigator in the Radiology and Imaging Sciences Department at the NIH. “Removing all patient health information is labor-intensive and infeasible for large sets of reports.”

At A Glance

- Researchers tested the feasibility of using a locally run large language model (LLM) to label key findings from chest X-ray reports, while preserving patient privacy.
- The LLM was asked to identify and label the presence or absence of 13 specific findings on the chest X-ray reports.
- The LLM's performance was comparable to the current reference standard.

In this study, led by Pritam Mukherjee, Ph.D., staff scientist at the NIH CC, researchers tested the feasibility of using a locally run LLM, Vicuna-13B, to label key findings from chest X-ray reports from the NIH and the Medical Information Mart for Intensive Care (MIMIC) Database, a publicly available dataset of de-identified electronic health records.

“Preliminary evaluation has shown that Vicuna, a free publicly available LLM, approaches the performance of ChatGPT in tasks such as multi-lingual question answering,” Dr. Summers said.

The study dataset included 3,269 chest X-ray reports obtained from MIMIC and 25,596 reports from the NIH.

Using two prompts for two tasks, the researchers asked the LLM to identify and label the presence or absence of 13 specific findings on the chest X-ray reports. Researchers compared the LLM’s performance with two widely used non-LLM labeling tools.

A statistical analysis of the LLM output showed moderate to substantial agreement with the non-LLM computer programs.

“Our study demonstrated that the LLM’s performance was comparable to the current reference standard,” Dr. Summers said. “With the right prompt and the right task, we were able to achieve agreement with currently used labeling tools.”

Dr. Summers said LLMs that can be run locally will be useful in creating large data sets for AI research without compromising patient privacy.

“LLMs have turned the whole paradigm of natural language processing on its head,” he said. “They have the potential to do things that we’ve had difficulty doing with traditional pre-large language models.”

Dr. Summers said LLM tools could be used to extract important information from other text-based radiology reports and medical records, and as a tool for identifying disease biomarkers.

“My lab has been focusing on extracting features from diagnostic images,” he said. “With tools like Vicuna, we can extract features from the text and combine them with features from images for input into sophisticated AI models that may be able to answer clinical questions.

“LLMs that are free, privacy-preserving, and available for local use are game changers,” he said. “They’re really allowing us to do things that we weren’t able to do before.”

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“Feasibility of Using the Privacy-preserving Large Language Model Vicuna for Labeling Radiology Reports.” Collaborating with Drs. Summers and Mukherjee were Benjamin Hou, Ph.D., and Ricardo B. Lanfredi, Ph.D.

In 2023, *Radiology* is celebrating its 100th anniversary with 12 [centennial issues](#), highlighting *Radiology*’s legacy of publishing exceptional and practical science to improve patient care.

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