ARQUIVOS DE ASMA, ALERGIA E IMUNOLOGIA

A lightweight artificial intelligence assistant for asthma management

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Introduction: Artificial Intelligence (AI) tools have the potential to support clinical reasoning and broaden access to high-quality medical information. However, current models, such as Large Language Models (LLMs), have significant limitations, including high computational costs, risk of errors, and outputs that lack adherence to clinical guidelines. Our central hypothesis is that properly designed Small Language Models (SLMs) can achieve performance comparable to that of LLMs for specialized clinical tasks, such as answering questions regarding asthma management. **Methods:** We developed a SLM utilizing a Retrieval-Augmented Generation (RAG) framework integrated with a Knowledge Graph. The model was exclusively grounded in the Global Initiative for Asthma (GINA) guidelines as its knowledge base. Its responses were compared to those of a widely used, general-purpose LLM, assessing for adherence to GINA guidelines, clinical precision, and clarity. **Results:** The specialized SLM demonstrated high concordance with GINA recommendations, generating clear, concise, and reliable responses. It exhibited performance comparable to that of larger models but with significantly lower computational overhead, enabling its use on standard hardware, such as clinical computers. **Conclusions:** It is feasible to develop safe, accessible, and scientifically-grounded medical AI tools without the need for large-scale technological infrastructure. A lightweight model, specifically grounded in trusted guidelines like GINA, can offer robust support for asthma management, with the potential for application across diverse clinical settings. Financial Support: CNPq, CAPES, Fundação Araucária, Manna Team, and Softex.

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