1. Context and Motivation

- With **huge volumes of medical data** available online, there's a growing need to help users—**both experts (e.g., doctors)** and **novices (e.g., patients)**—find relevant and reliable medical information.

- Current medical search systems still perform poorly despite many advances. This paper aims to understand why and what can be done to improve them.

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2. From Traditional IR to Semantic IR

- **Information Retrieval (IR)** involves:

    - **Indexing**: Creating digital representations (metadata) of documents.

    - **Retrieval**: Matching user queries to these representations to find relevant information.

- Over the decades, IR models have evolved:

    - **Boolean models**: Exact keyword match (yes/no logic).

    - **Vector space models**: Scoring based on term frequency.

    - **Probabilistic models**: Estimating probability of relevance.

    - **Language models**: Predicting term probabilities.

    - **Learning to Rank (LTR)** and **Neural IR models**: Using machine learning to order results based on learned patterns.

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3. Challenges in Medical IR

- Traditional methods use **bag-of-words** representations, which are shallow and don't capture meaning well.

- Two key issues are: