UMed: Personalized Medicine for All

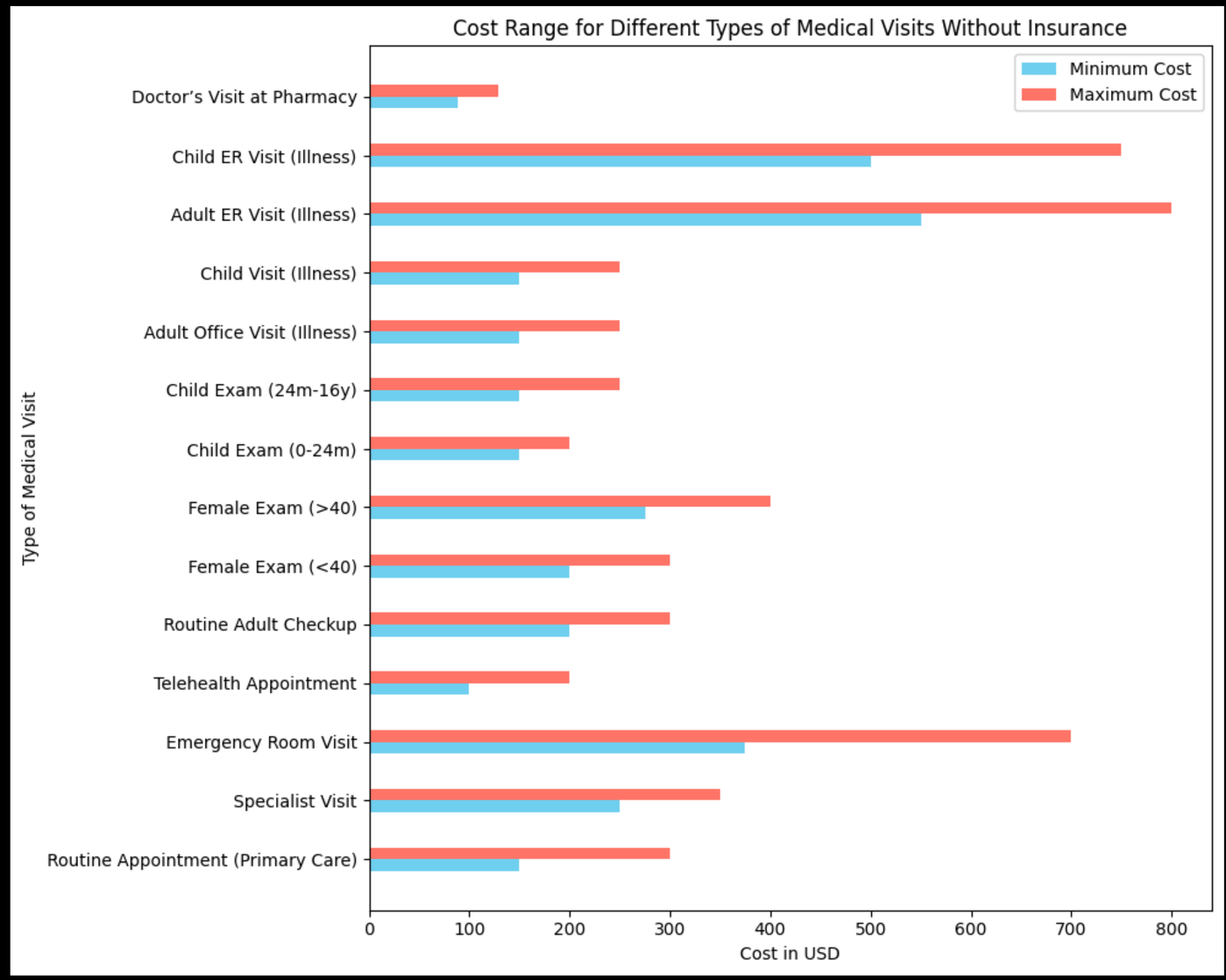
Revolutionizing Healthcare Access and Understanding

Team 7

What?

What?

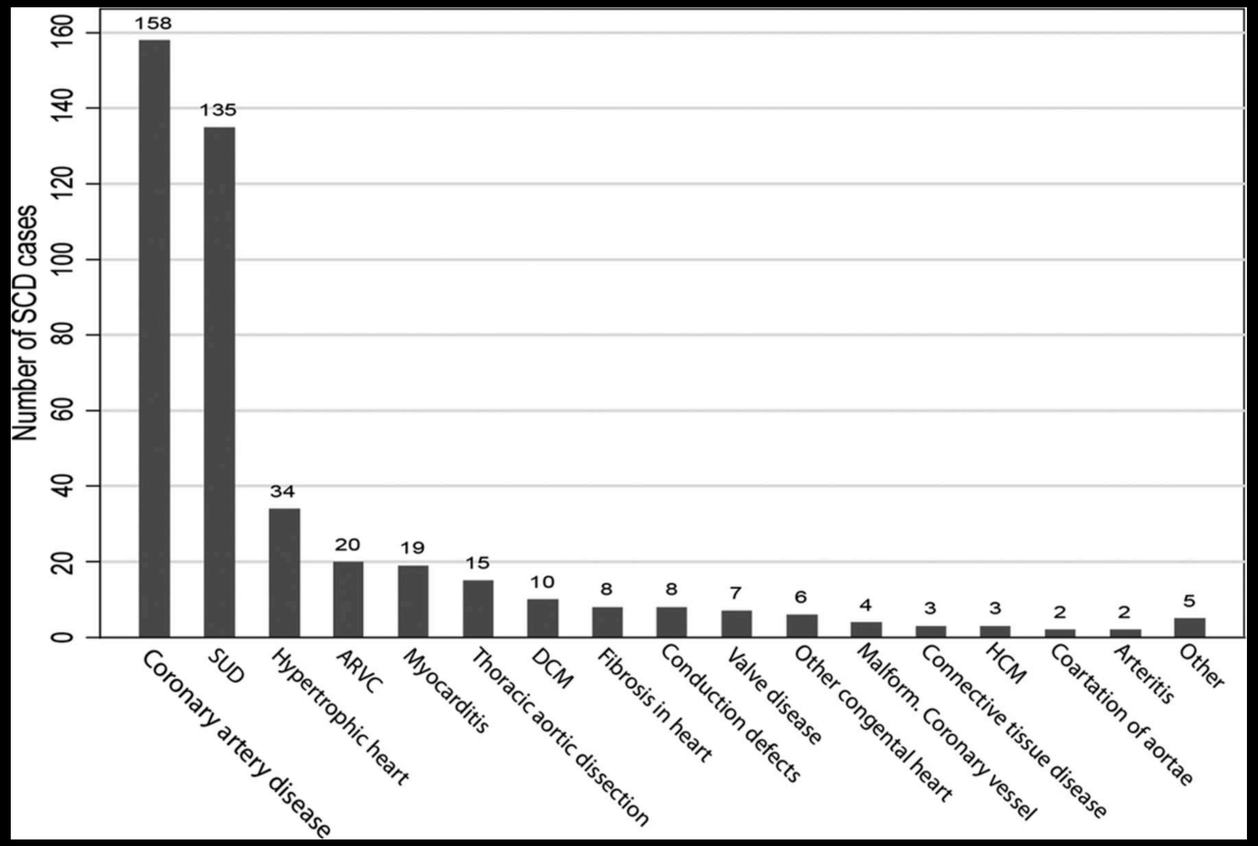
- **Addressing two major healthcare issues:**
  - High cost of doctor consultations
  - Difficulty in finding timely appointments and understanding medical reports
  - Some health insurance do not cover all cost inccured



Why?

Why?

- **Early Disease Detection**: Regular medical tests like blood pressure, cholesterol, and blood sugar assessments can identify potential health issues early, preventing serious conditions from developing.
- **Timely Intervention:** Blood tests reveal signs of conditions like anemia, kidney dysfunction, or high cholesterol, enabling prompt and effective treatment.
- **Tracking Progress of Chronic Conditions:** Routine screenings are crucial for managing ongoing conditions such as diabetes or hypertension, ensuring they remain under control.
- **Cancer Screenings and Early Treatment**: Tests like cancer screenings play a key role in detecting diseases at a treatable stage, significantly improving health outcomes.



Most Sudden Deaths consist of abnormality in the following medical checkups

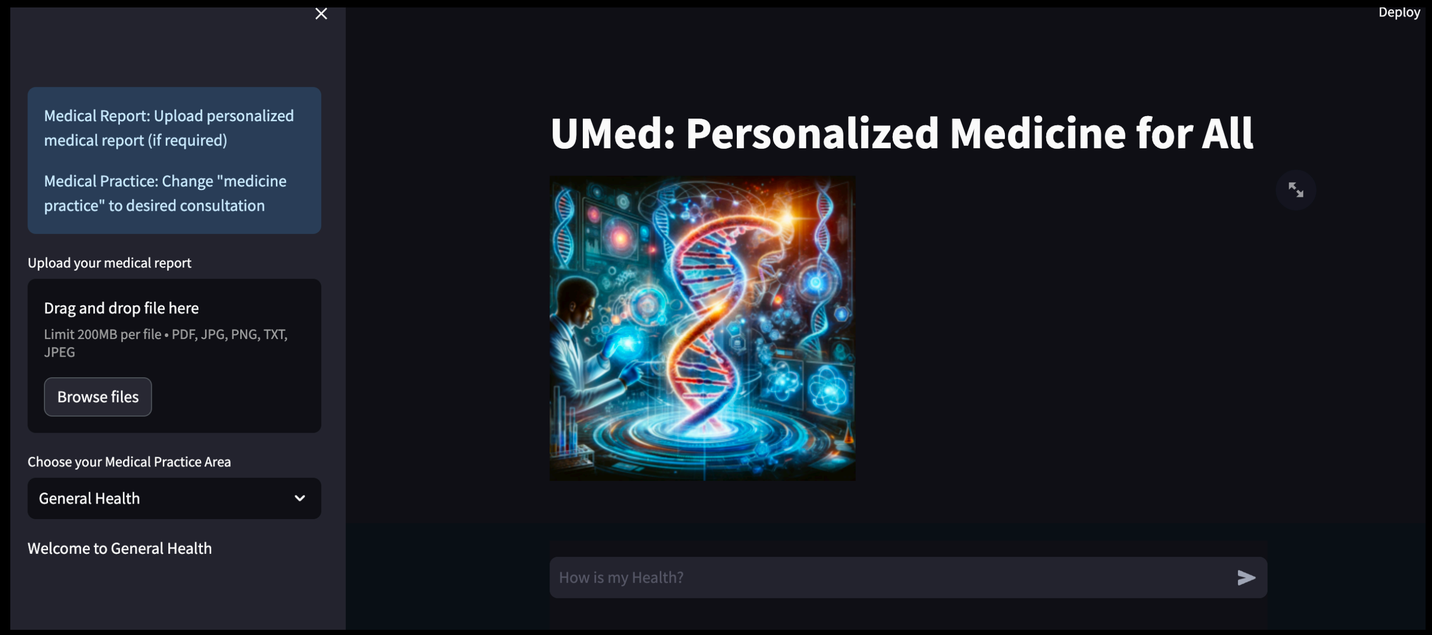
- Complete Blood Count (CBC)
- Basic Metabolic Panel (BMP)
- Comprehensive Metabolic Panel (CMP)
- Lipid Profile
- Thyroid Function Tests
- Coagulation Profile
- Liver Function Tests
- Kidney Function Tests
- Hemoglobin A1c (HbA1c)
- Iron Studies
- Vitamin and Mineral Levels

Note: Medical Test Literature is categorized into different medical practices

What?

What we aim to build?

- **Medical Chatbot Development**: Creating a chatbot focused on understanding personalized medical data based on the medical practice selected
- **Clarification on Medical History/Results**: Providing users with clear explanations regarding their medical records and test outcomes.
- **Reducing Medical Visits:** Aiming to lessen the frequency of hospital or clinic visits, thereby cutting down healthcare costs.
- **Enhancing Understanding of Medical Terminology**: Assisting consumers in comprehending medical terms and requirements for improved self-care awareness.



How?

LLM Primer in a nutshell

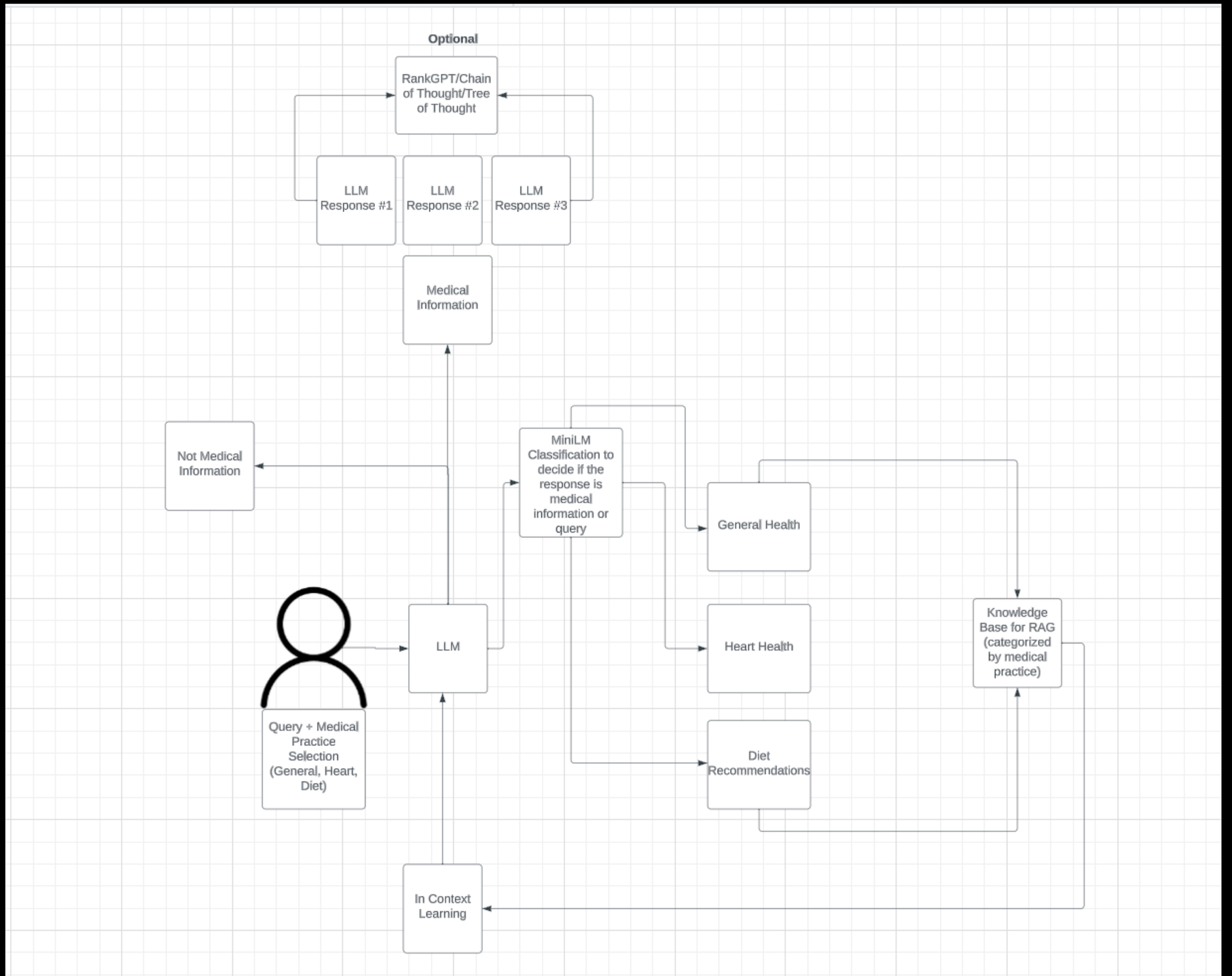
- In the most simplest sense, a basic LLM recipe is comprised of the following steps:
- Step 1: Gather pertaining data (should be diverse and can be of any modality)
- Step 2: Clean and preprocess the data
- Step 3: Tokenize the data (converting words into tokens or numeric representations)
- Step 4: If using an LLM like GPT, use a transformer architecture
- Step 5: Pre-train to predict the next token/word
- Step 6 (**What we had to work on**): In-Context Learning/Supervised fine tuning\PEFT\QLoRA or RLHF to get align the Language Model

Problems with LLM in a medical space

- Needs multiple verifications/evaluation methods
- Hallucination prone
- Major approaches:
  - Fine tuning low latency models
  - RAG (Retrieval Augmented Generation)
  - In Context Learning
  - LLM Reranking methods
    - Tree of Thought
    - Chain of Thought
    - Chain of Density

The power of in-context learning

- In Context Learning is a form of Bayesian Inference where the LM does in-context learning by using the prompt to “locate” the relevant concept it has learned during pretraining to do the task. In our case, by appending relevant medical information, we aim to steer the model to a desired outcome.
- Based on our experiments, larger models such as GPT 3.5, GPT 4 sometimes can perform much better than fine tuning given accurate relevant information
    - Similarity Metrics to enhance the result.


Optional
RankGPT/Chain of Thought/Tree of Thought
LLM Response #1
LLM Response #2
LLM Response #3
Medical Information
Not Medical Information
MiniLM Classification to decide if the response is medical information or query
General Health
Heart Health
Diet Recommendations
Knowledge Base for RAG (categorized by medical practice)
LLM
Query + Medical Practice Selection (General, Heart, Diet)
In Context Learning

Limitations and Future Steps

- Increase LLM response quality
  - RankGPT by combining multiple proprietary and open source LLMs
- Try faster embeddings and nearest neighbors search
- Add human feedback element to be able to RLHF

Thanks! QA?