Title: An Evidence-Synthesis Tool for Traditional Chinese Medicine Clinical Reference

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1. Project Background

Traditional Chinese Medicine (TCM) is a complex medical system where diagnostic and treatment efficacy relies heavily on a practitioner's accumulated experience and deep, nuanced understanding of classical texts. This vast body of knowledge, spanning thousands of years of literature and disparate case notes, represents both a profound asset and a significant operational challenge. For a practitioner, manually searching for analogous historical cases or cross-referencing symptoms across multiple classical schools of thought during a patient consultation is impractical. This knowledge accessibility bottleneck can slow down decision-making, create inconsistencies in care, and steepen the learning curve for junior doctors.

The motivation for this project stems from the unique capability of Large Language Models (LLMs) to address this specific challenge. LLMs excel at ingesting and synthesizing immense volumes of unstructured text, making them an ideal technology to act as a "collective memory" for the field of TCM. This project aims to leverage an LLM not as a decision-maker, but as an intelligent clinical reference assistant. By creating an explainable, evidence-backed tool, we can empower practitioners to query the entire corpus of TCM literature in seconds, helping them validate hypotheses, explore alternative perspectives, and access a breadth of knowledge that would be impossible to hold in human memory alone. Capitalizing on Hong Kong Baptist University's renowned expertise in Chinese Medicine, this project seeks to build a prototype that demonstrates how modern AI can augment, not replace, the diagnostic workflow, ultimately enhancing the practitioner's ability to deliver informed, evidence-based care.

2. Problem / Improvement Areas

The application of modern AI in TCM faces several fundamental challenges, as identified through preliminary research and consultation with clinical practitioners. This project aims to address these issues:

- **Inherent Subjectivity and Lack of a Single "Standard Answer":** TCM practice is highly personalized. Different masters may have different diagnostic interpretations and treatment philosophies for the same condition, making it impossible to train a conventional AI on a single "correct" answer.

- **Data Fragmentation and Verifiability:** High-quality clinical data is often considered proprietary and is rarely shared. Furthermore, symptoms are frequently recorded as subjective text descriptions. Without objective, traceable records (e.g., tongue images), verifying the accuracy of historical data for AI training is a significant challenge.
- **Semantic Ambiguity:** TCM terminology is nuanced and context-dependent. The same symptom can be described in various ways, and the interpretation of classical texts can differ. A simple semantic search may not capture the deep clinical meaning.
- **Practitioner Trust and "Black Box" Aversion:** For any AI tool to be adopted in a clinical setting, it must be fully transparent. Practitioners are trained to rely on evidence from classical texts and case histories and will rightfully reject recommendations from an opaque "black box" system.

3. Proposed Approach

This project will design and implement a system based on a **Retrieval-Augmented Generation (RAG)** architecture, specifically chosen to address the core challenges of trust and explainability. The system will function as an **evidence-synthesis tool**, surfacing relevant information with clear citations, rather than acting as an autonomous diagnostic agent.

The key technical steps are:

1. **Curated Corpus Development:** A specialized knowledge base will be developed using publicly available, authoritative sources (e.g., TCMID, Huatuo-26M) and classical TCM texts. The initial scope will be focused on a specific category of syndromes to ensure depth and quality.
2. **Hybrid Knowledge Representation:** In addition to a standard vector database (e.g., FAISS) for semantic search, the project will explore the creation of a small-scale TCM **terminology knowledge graph**. This will help map synonyms and related concepts, addressing the issue of semantic ambiguity.
3. **Human-in-the-Loop RAG Pipeline:** When a practitioner inputs a patient's symptoms, the system will perform a hybrid retrieval, using both vector search and the knowledge graph to find the most relevant text passages. These passages will be presented to an LLM (e.g., GPT-4o) to synthesize a concise summary of potential patterns, relevant formulas, and conflicting viewpoints found in the literature.
4. **Transparent and Traceable UI:** The user interface will be paramount. Every piece of synthesized information will be explicitly linked back to the source text from the corpus, allowing the practitioner to instantly click through and read the original context. This "glass-box" design is critical for building practitioner trust.
5. **Structured Evaluation:** The system's success will be measured through a multi-faceted approach:
    - **Quantitative:** Using academic benchmarks like TCMEval-SDT to measure the

retrieval accuracy of the system against known test cases.

- **Qualitative:** Conducting user-acceptance testing with a small group of TCM students or practitioners. Feedback will be gathered via structured surveys (using Likert scales) on the system's perceived usefulness, trustworthiness, and usability.

Ethical Considerations: This project will operate strictly with public or appropriately anonymized data. The final tool will be explicitly positioned as a reference aid to support, not direct, clinical decision-making.