

CliniThink: Think Like a Clinician

Multi-Agent Therapeutic Reasoning with Efficient Tools

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Motivation

Large language models (LLMs) alone are insufficient for complex therapeutic reasoning. LLMs have limited knowledge cut-offs and cannot automatically access up-to-date biomedical evidence. Moreover, simply providing more context may degrade performance due to context rot. Consequently, we hypothesized that a system combining external tool calls, context selection and multi-agent coordination would outperform a baseline model.

Our main contributions in this work are

- Clinically inspired multi-agent workflow
- Medical expert guided optimization
- Tools for efficient retrieved chunk scanning

Methodology

Our team designed a **multi-agent pipeline** inspired by clinical workflows, where physicians formulated the information gathering process, collect related information, select evidence and make decisions. The pipeline consists of four interacting phases: **Analysis phase, Planning phase, Execution phase, Answering phase.**

Milestone	Accuracy
Gemini 2.5 Flash (Baseline)	0.6229
Gemini 2.5 Flash + Web Search	0.6541
Gemini 2.5 Flash + ToolUniverse	0.6620
GPT-5 (Baseline)	0.7325
GPT-5 + Web Search	0.7223
GPT-5 + ToolUniverse w/ Filtering	0.7775
Optimized Pipeline	0.7896

Table: Selected models and accuracy scores on Kaggle leaderboard

Results & Findings

Multi-agent pipeline design: Our system breaks each question into four coordinated phases, mirroring clinical reasoning. This staged approach enables targeted tool use and ensures that every intermediate output can be reviewed.

Clinician-guided tool development: From clinicians feedbacks, we modified several ToolUniverse tools to better suit our pipeline. This highlights how critical domain knowledge is when designing and refining tools for therapeutic reasoning.

Key Takeaway

Integrating domain knowledge throughout model and tool development is essential. **Effective clinician-engineer collaboration** is central to building high-performing, trustworthy AI pipelines.

