Project Synopsis

Project Title: AI Finance Agent Team: Retrieval-Augmented Multi-Agent Decision Support for Market Analysis **Domain:** Computational Finance / Artificial Intelligence (Natural Language Processing + Tool-Augmented Reasoning) **Type:** Applied Research and System Development

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1. Problem Statement

In practical portfolio management, users can access abundant information but lack a reliable mechanism to convert unstructured narrative events into defensible investment decisions. Conventional quantitative models require structured numerical features and therefore underperform for open-ended text queries, whereas generic conversational systems often produce responses without verifiable market grounding. This creates a persistent gap between **natural-language user intent** and **evidence-backed financial reasoning**.

The proposed system addresses this gap by implementing a retrieval-first, multi-agent workflow that (a) interprets user prompts, (b) acquires live macro and market signals, (c) consolidates evidence into structured context, and (d) generates concise analytical outputs within interactive latency constraints.

2. Study of Dataset

The platform combines live market telemetry and web intelligence instead of relying on a static local corpus:

- **Yahoo Finance (yfinance):** Live and historical price series, analyst signals, company fundamentals, and recent company-level news.

- **Web Search Layer (DuckDuckGo):** Broader geopolitical and macroeconomic context relevant to asset movement interpretation.

- **Prompt-Derived Signals:** Extracted symbols, entities, and intent tokens from user queries for targeted retrieval and comparison.

3. Exploratory Analysis and Visualization

Exploratory analysis is operationalized through an interactive Streamlit dashboard that exposes retrieval controls, ticker detection, and structured response blocks for rapid scenario evaluation.

- **Investment Compare Mode:** Controlled side-by-side evaluation of two tickers across valuation, momentum, risk, and catalyst dimensions.

- **Source Selection Controls:** Explicit toggles for web search, web news, and market tools to support sensitivity analysis.

- **Raw Evidence View:** Expandable retrieval payloads for transparent manual verification.

- **Structured Analytical Output:** Response format prioritizes precision, comparability, and decision readability.

4. PEAS Framework

A structured PEAS model is applied to define the intelligent behavior of the agent team:

Performance (P)

System performance is evaluated using factual consistency, source coverage, coherence of synthesis, and end-to-end latency. The operational objective is dependable analytical output under interactive response-time constraints.

Environment (E)

The operating environment is dynamic, stochastic, and partially observable. Market states and news narratives evolve continuously, and prompt scope may shift abruptly between company-specific and macro-level perspectives.

Actuators (A)

- Multi-agent orchestration combining web retrieval, finance tools, and LLM synthesis
- Interactive dashboard modules for query execution, comparison, and diagnostics
- Structured answer generation for portfolio-oriented decision support

Sensors (S)

- Natural-language query stream from end users
- Ticker/entity extraction and intent parsing
- Live market and web/news evidence retrieval channels

5. Preprocessing

Preprocessing is intentionally retrieval-first and deterministic in order to reduce hallucination risk and improve reproducibility:

- **Query normalization:** canonicalization of user prompts to stabilize downstream retrieval behavior.
- **Ticker and entity extraction:** symbol detection with alias mapping for robust instrument coverage.
- **Query expansion:** context-aware reformulation to improve recall in search and news retrieval.
- **Evidence filtering:** relevance-based filtering of retrieved snippets before synthesis.
- **Context packaging:** deterministic assembly of compact evidence blocks for Groq reasoning.

6. Project Objectives

Primary Objective: Deliver a robust finance intelligence assistant that transforms natural-language prompts into verifiable, market-grounded analysis via multi-agent orchestration.

- **Reliability:** preserve source-grounded reasoning with deterministic retrieval and transparent evidence flow.
- **Usability:** provide a concise dashboard workflow for exploratory and comparative financial analysis.
- **Extensibility:** maintain modular architecture to integrate additional tools, providers, and specialist agents.

- **Performance:** sustain low-latency execution suitable for iterative, analyst-in-the-loop decision making.