# Reflectify — AI Agent Architecture Document

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## Objective:

Reflectify is an intelligent self-reflection system designed to automate the process of journaling, reflection, and goal setting. It uses multi-agent architecture where each agent specializes in reasoning, planning, execution tracking, and evaluation. The system operates fully offline, simulating human cognitive behavior — observing, recalling, reflecting, and planning future actions.

## Motivation:

Students and professionals often struggle to maintain consistent self-assessment and improvement cycles. Reflectify bridges this gap by acting as a 'digital self-coach', analyzing emotional states, recalling past experiences, and generating actionable next-day goals — making reflection measurable and adaptive.

## System Architecture Overview:

Reflectify's architecture follows a **modular multi-agent design** integrated through a **central orchestrator**. Each agent performs a specialized cognitive task inspired by human reflection processes.

## Core Components:

| Agent | Functionality | Key Outputs |
|---|---|---|
| Reflection Agent | Performs semantic understanding and emotional analysis on user's daily log. | Summary, mood score, activities, suggestions |
| Planner Agent | Converts insights into structured, actionable goals for the next day. | Planned goals |
| Executor Agent | Evaluates goal completion using heuristics and text matching. | Goal status (done/partial/missed) |
| Evaluator Agent | Aggregates performance metrics across sessions. | Consistency, improvement, feedback |
| RAG Module | Retrieves contextually similar reflections from memory. | Retrieved past context |
| Orchestrator | Coordinates all agents and stores outputs in logs. | Comprehensive reflection record |

## Interaction Flow:

### The interaction flow is given in order:

1. User inputs a short reflection (2–4 sentences).
2. Reflection Agent analyzes and summarizes.
3. RAG module retrieves similar past reflections.
4. Planner Agent generates new goals.
5. Executor Agent evaluates previous goals.
6. Evaluator Agent measures overall performance.
7. System saves all data into persistent JSON memory.

## Models and Methods:

| Component: | Model / Method: | Reason for Choice: |
|---|---|---|
| Sentiment Analysis | TextBlob (lexicon-based) | Lightweight and explainable sentiment scoring. |
| RAG Simulation | Keyword-based retrieval | Fast and fully offline contextual recall. |
| Planner Logic | Rule-based goal generation | Interpretable and deterministic output. |
| Evaluation | Custom Python metrics | Transparent consistency and mood tracking. |
| Visualization | Matplotlib | Simple, clear, and publication-ready plots. |

## Design Rationale:

The system is designed to be modular, interpretable, and computationally efficient. Multi-agent structure allows separation of reasoning, planning, and evaluation tasks, ensuring clarity and scalability. Using lightweight models ensures smooth operation on CPU without external APIs.

## Evaluation Metrics:

• Consistency Rate – Measures user's regularity in reflections.
• Goal Completion Rate – Tracks achieved goals.
• Average Mood Score – Aggregates daily sentiment.
• Improvement Index – Quantifies change in mood over time.

## Limitations and Future Scope:

| Limitation: | Future Improvement: |
|---|---|
| Keyword-based RAG cannot detect semantic similarity. | Integrate embedding-based semantic RAG (SentenceTransformers). |
| Basic sentiment scoring model. | Fine-tune lightweight LoRA model for emotion detection. |
| Manual input only. | Add voice-based or UI input through Streamlit/Gradio. |
| Static visualization. | Extend with interactive dashboards for trends and habits. |

## References:

1. Anthropic (2024). Building Effective AI Agents.
2. OpenAI Research (2023). Multi-Agent Collaboration and RAG Systems.
3. Zhang et al. (2024). Effective Design of LLM-Based Cognitive Agents (arXiv:2405.10467v4).
4. Mlodinow, L. (2023). Reflective Intelligence and Adaptive Behavior.