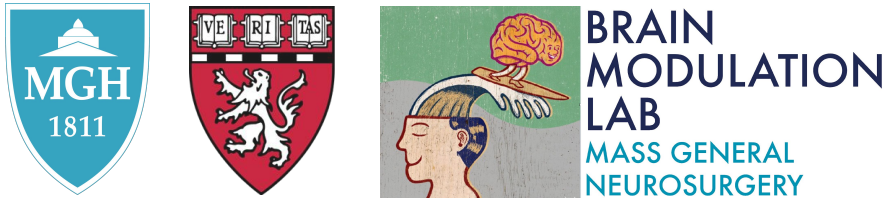
SeizureScoreAI: Multi-Agent Clinical Reasoning System

Vineet Reddy



SeizureScoreAI - Enhancing Post-Surgical Outcome Evaluation

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- **Objective:** Simulate epileptologists' clinical reasoning to assign ILAE (International League Against Epilepsy) outcome scores after epilepsy surgery.
- **Core Function:** Automates interpretation of clinical notes using a multi-agent system driven by Large Language Models (LLMs).
- **Relevance:** Streamlines decision-making, ensuring reproducibility and transparency in outcome reporting.
- **Adaptability:** While the system is tuned to generate ILAE scores, it can be fully adapted to generate Engel scores instead.

ILAE Outcome Scale

Class 1: Completely seizure free; no auras

Class 2: Only auras; no other seizures

Class 3: 1 to 3 seizure days per year; ± auras

Class 4: 4 seizure days per year to 50% reduction of baseline seizure days; ± auras

Class 5: Less than 50% reduction of baseline seizure days; ± auras

Class 6: More than 100% increase of baseline seizure days; ± auras

Epilepsy-Focused Pipeline

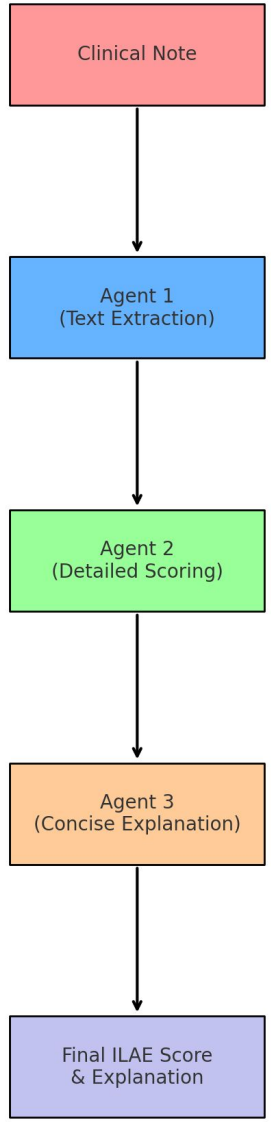
3-Agent System:

1. **Clinical Information Extractor**:
   - Identifies key data from clinical notes:
     - **Seizure recurrence**
     - **Aura presence**
     - **Baseline vs. post-operative seizure frequency**
2. **ILAE Score Calculator**:
   - Implements ILAE-defined scoring criteria:
   - Incorporates nuanced clinical reasoning for score determination.
3. **Concise Reporter**:
   - Generates user-friendly summaries:
     - Final **ILAE score**.
     - Key influencing factors from clinical note text.
     - Clinical logic supporting the result.

Workflow:

1. **Input**: Operative clinical notes.
2. **Processing**: Extraction → Classification → Scoring.
3. **Output**: Transparent, structured score reports and explanations.

SeizureScoreAI Clinical Note Processing



Enhancing Post-Surgical Outcome Evaluation

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Features

- **Epileptology-Specific:** Tailored for seizure outcomes and ILAE scoring.
- **Streamlit Frontend:** Easy-to-use portal for efficient clinical note processing.
- **Backend:** Advanced multi-agent LLM pipeline for structured data analysis. Can be used to loop through thousands of clinical notes with inexpensive API costs.
- **Outputs:** Provides JSON-formatted reasoning consistent with ILAE guidelines.

Limitations

- **Not HIPAA-Compliant:** Avoid using protected health information (PHI) until future updates.
- **Assists, Not Replaces:** Complements expert judgment but does not substitute it.

Get Involved

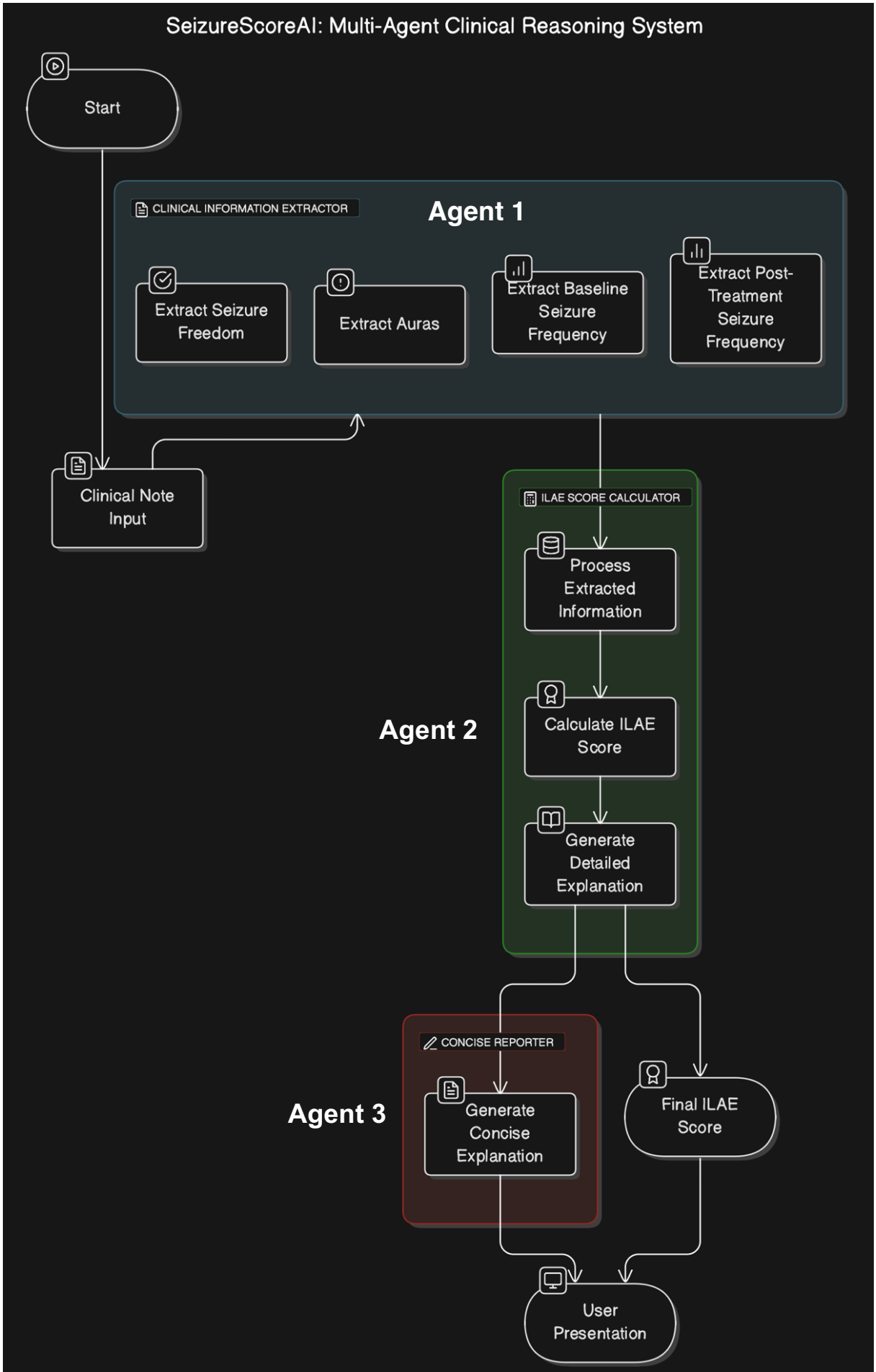
- **Explore:** Visit the GitHub Repository for more details.
- **Collaborate:** Help refine this epilepsy-focused AI system!

Contributors

This project builds upon an original AI ATL Hackathon project developed by Vineet Reddy, Viresh Pati, MukProgram, and Sachi Goel. After the hackathon, I revamped the project to create the advanced multi-agent RAG system and updated interface presented today.

- **Viresh Pati**: Contributed to the design of the initial named entity recognition (NER) and knowledge graph retrieval-augmented generation (KG RAG) system, which has since been replaced with the multi-agent RAG system currently in use.
- **Mukesh**: Helped develop the backend for the original NLP-styled NER and KG RAG system.
- **Sachi Goel**: Designed the initial Streamlit frontend, which has been revamped into the current version.

Their contributions laid the foundation for the advanced multi-agent RAG system and user interface enhancements that define the project today.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Agent 1
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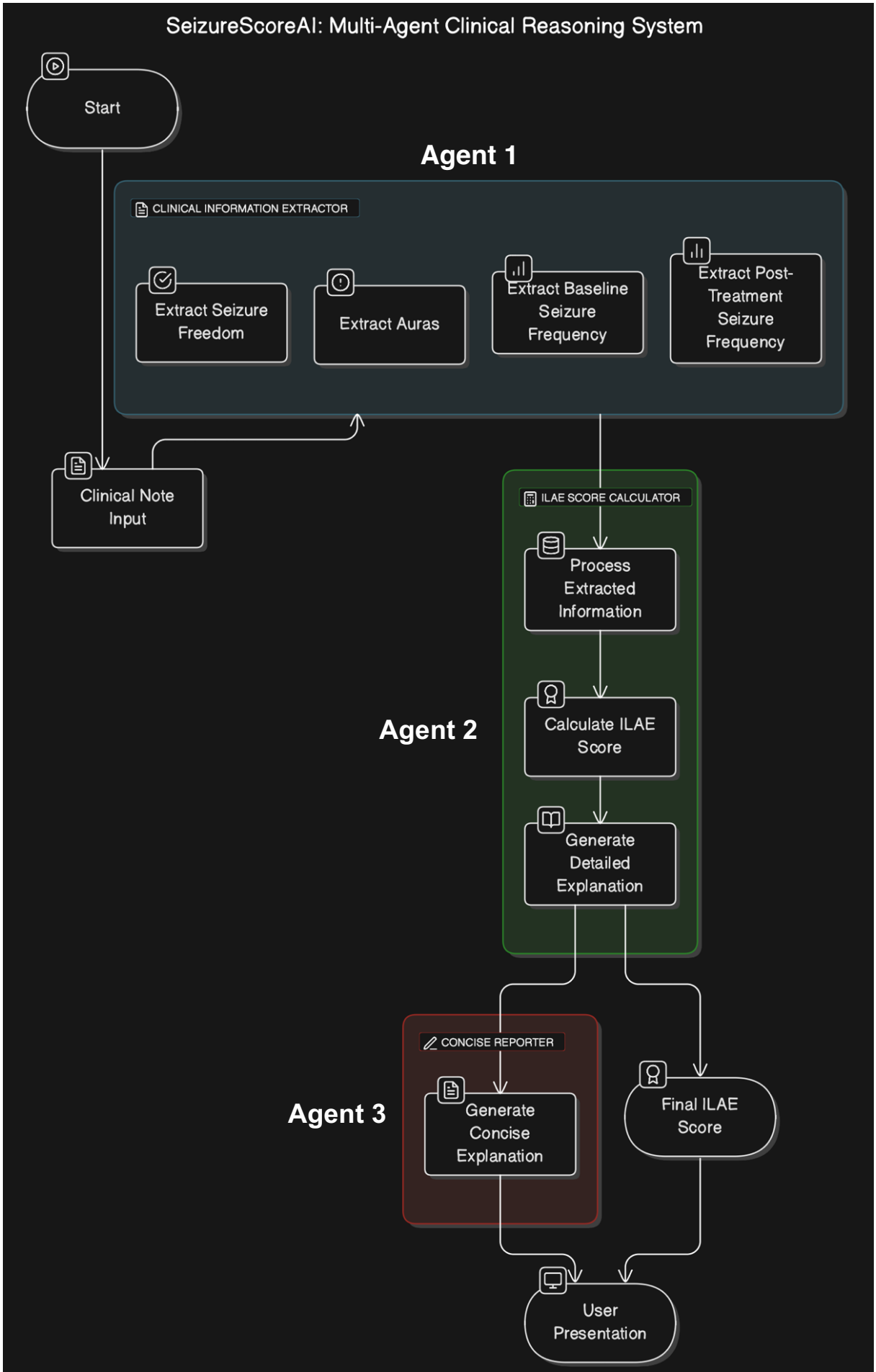
Extract Auras
Extract Baseline Seizure Frequency
Extract Post-Treatment Seizure Frequency
Clinical Note Input
ILAE SCORE CALCULATOR
Process Extracted Information
Calculate ILAE Score
Agent 2
Generate Detailed Explanation
CONCISE REPORTER
Agent 3
Generate Concise Explanation
Final ILAE Score
User Presentation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