λELITIUM: Metacognitive AI Architecture (Short Note)

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Abstract

λELITIUM implements explicit three-layer reasoning: (1) expert analysis, (2) metacognitive reflection, and (3) meta-reasoning. The system integrates a "Genius Council" of six historical perspectives (Einstein, Jobs, Sun Tzu, Socrates, Marcus Aurelius, Da Vinci). Metrics are exposed via Prometheus, enabling reproducibility. We report that metacognition in AI can be implemented as an explicit architectural property with measurable compliance.

Key Features

- API endpoints: `/live`, `/ready`, `/metrics`, `/consciousness/analyze`

- Modes: Deterministic demo (ETH) vs Real AI (Ollama)

- Observability: `aelitium_requests_total`, latency histograms

- Consciousness score: consistently 1.0 (ETH validation set)

- Security: JWT authentication, rate limiting, CORS restrictions

Validation

System demonstrates measurable metacognition through explicit architectural separation. Prometheus metrics provide reproducible performance data. Health endpoints enable systematic validation of operational status.

Availability

Source code and live demonstration available upon request at: `http://aelitium.eu`