

Explainable Graph-Based AI for Multi-Source Intelligence Analysis

Summit Cognitive · SBIR Phase I · Topic Area: AI-Enabled Intelligence Analysis

PROBLEM	SOLUTION
<p>The challenge: Intelligence analysts operate in environments defined by high-volume, fragmented, multi-source data streams.</p> <p>Three critical failure modes: Fragmentation — data siloed across 4–7+ tools Opacity — AI outputs lack explainability/traceability Shallow analysis — indirect (multi-hop) relationships remain invisible to conventional link analysis</p> <p>Consequence: missed threats, delayed decisions, low analyst trust in AI-assisted outputs.</p>	<p>Summit Cognitive's approach: Graph-native AI system unifying multi-source intelligence data with explainable reasoning.</p> <p>System pipeline: Ingest → Neo4j Knowledge Graph → GraphRAG Hybrid Reasoning → Explainability Layer (Why-Path) → Tamper-Evident Provenance Chain</p> <p>Validated scenario: identified sanctioned entity exposure through 5-hop ownership chain (Apex Global → Frontline → Nexus → [TARGET]) — not detectable by direct matching.</p>
INNOVATION	IMPACT
<p>What makes this technically novel:</p> <ol style="list-style-type: none"> 1. Multi-hop detection (≥5 hops) Graph traversal + semantic retrieval combined; detects indirect relationships invisible to keyword or vector-only approaches. 2. Hybrid GraphRAG reasoning Structural graph paths + semantic context combined for non-obvious relationship discovery. 3. 100% explainability coverage Every output includes source attribution, relationship path, and deterministic reasoning trace. No black-box outputs — ever. 	<p>Measured performance vs. baselines:</p> <ul style="list-style-type: none"> +27–36 pp multi-hop detection rate (vs. keyword / vector-only) 64% faster time-to-insight (6.5 min vs 18.2 min median) +19 pp precision@k improvement +25 pp recall@k improvement 100% explainability coverage 87% analyst agreement: 'actionable' <p>Dual-use: defense intelligence + financial crime + supply chain + cyber intelligence.</p>