International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2026.0131
e ISSN: 2584-2854
Volume: 04 Issue: 04
April 2026
Page No: 856 - 860

Geopulse Ai – Global Conflict Risk & Market Impact Intelligence

Muaawiyah Sadique[1], Prof. P. Srinivasan M.E[2]
[1]Department of Electronics and Communication Engineering, Sona College of Technology, Salem – 636 005 (Autonomous), Anna University, Chennai 600 025
[2]Assistant Professor, Department of ECE, Sona College of Technology, Salem – 636 005
Project Supervisor
Emails: *mavisadiq@gmail.com[1], srinivasanp@sontech.ac.in[2] ,mavisadiq@gmail.comsrinivasanp@sontech.ac.in[3]*

Abstract
Armed conflicts, economic sanctions, and political instability consistently rank among the strongest catalysts for short-term volatility in global financial markets. Yet despite this widely recognized link, virtually all mainstream trading platforms handle market data and geopolitical intelligence in complete isolation, depriving analysts of the context required to interpret price movements and anticipate future direction. This paper introduces GeoTrade (GeoPulse AI), an AI-driven geopolitical intelligence platform engineered to transform real-time global news into structured, actionable financial trading signals. The system continuously tracks twelve geopolitical hotspots worldwide, applying a composite scoring framework that fuses live technical indicators (RSI-[14], MACD, EMA-[20]) with zone-specific geopolitical heat indices across twelve financial instruments covering six asset classes. Natural language market analysis and reasoning are generated through Anthropic's Claude Sonnet large language model, accessed via the Messages API. The platform is implemented as a React.js single-page application featuring Three.js WebGL [3]D globe visualization, a five-timeframe live candlestick chart engine, and a real-time intelligence feed. Evaluation results confirm [100]% signal accuracy for zone-asset correlations, a median Claude API response latency of [1].[8] seconds, and verified cross-browser compatibility across Chrome, Firefox, and Edge.

Keywords: *Geopolitical intelligence, financial trading signals, React.js, Three.js, Claude AI, RSI, MACD, EMA, geopolitical heat index, large language models, market prediction, web-based dashboard.*

1. Introduction
Today's global financial ecosystem is fundamentally shaped by geopolitical forces. Crude oil prices spike sharply when instability grips the Persian Gulf; gold attracts capital as a protective store of value amid armed hostilities; foreign exchange markets swing in direct response to sanctions regimes, electoral outcomes, and diplomatic ruptures. Despite the well-documented influence of these events on asset prices, the financial technology industry has largely failed to bridge the gap — mainstream trading platforms still treat market data and geopolitical developments as independent, unrelated data streams, leaving practitioners without the integrated intelligence required to understand the drivers behind price action or to project its probable continuation.

GeoTrade addresses this gap by functioning as a web-based, AI-augmented geopolitical intelligence platform that translates live global conflict data and risk assessments directly into structured financial market signals. Developed using React.js for its application framework, Three.js for immersive 3D geographic visualization, and powered by Anthropic's Claude Sonnet large language model, GeoTrade represents an innovative intersection of geopolitical analysis, financial engineering, and applied artificial intelligence. The platform tracks twelve geopolitical hotspots — from the Strait of Hormuz and Eastern Front to the Taiwan Strait and Gaza/Levant region. Each zone is assigned a real-time heat index (0.0–1.0) representing current threat intensity, which directly influences trading signals for linked financial instruments.

1.1. Scope
The system is deployed as a single-page web application. Analysts navigate twelve global hotspot zones on an interactive 3D globe, select from twelve financial instruments spanning six asset categories,

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2026.0085
e ISSN: 2584-2854
Volume: 04 Issue: 04
April 2026
Page No: 856 - 860

and receive computed trading signals from both technical analysis and geopolitical risk scoring. Five timeframe modes are supported: 5-minute, 15-minute, 1-hour, 4-hour, and daily. The system operates without server infrastructure, backend database, or authentication requirements.

1.2. Objectives

(1) Build a full-stack React.js SPA with no backend dependencies. (2) Implement a Three.js 3D globe with WebGL raycasting-based click detection. (3) Develop a live candlestick chart engine across five timeframe modes. (4) Implement RSI-14, MACD (EMA12–EMA26), and EMA-20 directly from candle close data. (5) Design a composite signal engine blending technical and geopolitical scores. (6) Integrate Claude Sonnet API for natural language geopolitical analysis returning structured 12-field JSON. (7) Support twelve instruments across six asset classes with per-instrument sensitivity profiles. (8) Provide real-time intelligence feed, price tickers, alert notifications, and watchlist panel.

2. Literature Survey

Caldara and Iacoviello (2022) introduced the Geopolitical Risk (GPR) Index, demonstrating that elevated geopolitical risk significantly reduces investment and equity returns while driving commodity prices upward — the theoretical basis for GeoTrade's heat index concept [1]. Bouri et al. (2018) confirmed that oil markets exhibit asymmetric volatility responses to geopolitical shocks, informing GeoTrade's higher heat amplification for energy assets [2]. Pring (2002) established RSI threshold definitions (oversold 70) directly implemented in the GeoTrade signal engine [4]. Murphy (1999) documented MACD derivation as EMA(12)−EMA(26), followed precisely in GeoTrade's implementation [5]. Wilder (1978) originally developed the RSI formula over a 14-period rolling window, consistent with GeoTrade's specification [6]. Brown et al. (2020) established that large language models possess emergent financial reasoning capabilities without task-specific training, motivating Claude Sonnet integration [10]. Wei et al. (2022) demonstrated that chain-of-thought prompting significantly improves multi-step reasoning performance, directly applied in GeoTrade's structured prompt engineering [15]. Bloomberg LP at USD 24,000/year per user represents the commercial benchmark that GeoTrade surpasses functionally at negligible cost using open-source web technologies [16].

3. System Analysis

3.1. Existing System

Established technical analysis platforms such as TradingView and MetaTrader 4/5 evaluate price behavior in isolation from geopolitical events, processing chart patterns without any mechanism to incorporate real-world political developments. Bloomberg Terminal, at approximately $24,000 per user per year, juxtaposes news and financial data side-by-side but provides no automated analytical reasoning layer to derive actionable signals. NLP-based tools such as FinBERT perform offline sentiment classification but are not integrated into live, multi-asset signal pipelines. Critically, no existing solution offers per-instrument geopolitical sensitivity weighting — a mechanism that dynamically adjusts signal strength based on each asset class's empirically observed responsiveness to geopolitical shocks.

3.2. Proposed System

GeoTrade uses React.js 18, Three.js r128, and Anthropic's Claude Sonnet API. A hybrid composite signal engine combines technical scores (55% weight) with geopolitical heat scores (45% weight). Safe-haven assets (Gold, Silver) receive higher heat amplification (×40) than energy assets (×30) or forex/crypto (×15), reflecting their historically stronger response to political risk. The Claude AI integration uses a precisely engineered prompt providing asset symbol, price, zone risk level, heat index, sensitivity rating, bull/bear triggers, and three current zone headlines — returning a structured 12-field JSON response in real time.

4. Proposed Methodology

4.1. System Architecture

GeoTrade is a client-side React.js SPA with no server-side infrastructure. Five principal subsystems interact through shared React state: (1) Geographic Visualization Module — Three.js globe and 2D Mercator map. (2) Market Data Module — price simulation and candle generation. (3) Technical

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2026.0085
e ISSN: 2584-2854
Volume: 04 Issue: 04
April 2026
Page No: 856 - 860

Analysis Engine — RSI, MACD, EMA, composite signal scoring. (4) AI Intelligence Module — Claude API calls, prompt construction, fallback logic. (5) UI Presentation Layer — dashboard panels, alerts, intelligence feed shown in Table 1.

Table 1 System Architecture

Component	Technology Used
Root Application Shell	React.js 18, useState/useEffect/useRef
3D Globe Visualization	Three.js r128, WebGLRenderer, Raycaster
Candlestick Chart	Custom SVG renderer, random walk sim
Technical Analysis Engine	Pure JS RSI/MACD/EMA computation
AI Analysis Module	Anthropic Claude Sonnet API, fetch()
Price Ticking System	setInterval, useRef stable callbacks

4.2. 5-Layer Working Principle

Layer 1 — Geographic Risk: Each zone carries a heat index (0.0–1.0). Critical zones include Strait of Hormuz (0.94), Gaza/Levant (0.91), Eastern Front (0.87). Layer 2 — Price Simulation: Candles generated by random walk with per-timeframe volatility (5M: ×0.35; 1D: ×4.8). Prices tick every 2 seconds, new candles every 8 seconds. Layer 3 — Technical Analysis: RSI-14, MACD, EMA-20 computed from close arrays; technical score starts at 50, adjusted ±25 per indicator. Layer 4 — Composite Signal: (Tech×0.55)+(Geo×0.45). Score >62 = BUY; <42 = SELL; 42–62 = HOLD. Price targets: BUY=price×1.018, SELL=price×0.982. Layer 5 — AI Analysis: Claude Sonnet API called on every asset/zone change, returning 12-field JSON shown in Table 2 .

4.3.Software Stack

Table 2 Technology and Role

Technology	Role
React.js 18	SPA framework, hooks-based state
Three.js r128	WebGL 3D globe visualization
Anthropic Claude API	Natural language AI analysis
ResizeObserver API	Reliable Three.js initialization
SVG (Inline React)	Charts, maps, sparkline panels
JavaScript ES2022	async/await, optional chaining

5. Technical Analysis Module

5.1. Rsi-14 Calculation

RSI uses Wilder's smoothing over 14-period candle close differences. RSI = 100 − (100/(1+avgGain/avgLoss)). Signal engine contributions: RSI 70: −25 pts (overbought).

5.2. MACD And EMA

EMA(t)=Close(t)×k+EMA(t−1)×(1−k), k=2/(period+1). MACD=EMA(12)−EMA(26). Positive MACD: +12 pts. EMA-20 used as trend indicator: price above EMA-20 adds +10 pts; below subtracts 10 pts.

5.3. Composite Signal Engine

Technical score: 50 base, adjusted by RSI (±25), MACD (±12), EMA-20 position (±10), trend momentum (±8), clamped to [5–95]. Geopolitical score: safe-haven = 40+(heat×40); energy = 40+(heat×30); others = 40+(heat×15). Composite = Tech×0.55 + Geo×0.45. BUY: >62; SELL: <42; HOLD: 42–62. R:R ratio ≥ 1.29:1.

6. AI Integration Module

6.1. Claude Api Integration

The AI module integrates claude-sonnet-4-20250514 via POST to https://api.anthropic.com/v1/messages(max_tokens: 900). The analyze() callback is defined with useCallback([]) for a stable function identity. React refs — akRef, zidRef, prRef — ensure current

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2026.0085
e ISSN: 2584-2854
Volume: 04 Issue: 04
April 2026
Page No: 856 - 860

asset/zone values are read rather than stale closure captures, solving the closure-staleness problem common in async React callbacks.

6.2. Prompt Engineering

The prompt provides: asset symbol/name, current price, zone name/risk level, heat percentage, geo sensitivity class, bull/bear trigger conditions, and three current zone headlines. Claude returns 12-field JSON: sentiment, strength, reliability, signal, confidence, reasoning, key_risk, target_price, stop_loss, timeframe, sector_impact[], geo_premium. The instruction 'Respond ONLY with valid JSON, no markdown' achieves 100% structured output compliance in all tests.

6.3. Fallback System

buildFallback() applies deterministic rules when API is unavailable: safe-haven assets in high-heat zones (>0.6) receive BULLISH/BUY; energy assets receive BULLISH/BUY citing supply disruption; others receive NEUTRAL/HOLD. Output is format-identical to API output, ensuring consistent UI rendering under all network conditions.

7. Results And Discussion

GeoTrade was tested across all twelve instruments, five timeframes, and twelve geopolitical zones on Chrome 122, Firefox 123, and Edge 122 shown in Table 3.

Table 3 Metric and Result

Metric	Result
Globe init (ResizeObserver)	100% success — all browsers
Zone click detection accuracy	100% — all 12 zones correct
Timeframe switch latency	<50ms (imperceptible)
Signal computation time	<5ms full RSI/MACD/EMA pipeline
Claude API median latency	~1.8 seconds per request
AI context accuracy	100% via ref pattern fix
Price tick reliability	2s interval ±100ms tolerance
Cross-browser compatibility	Chrome, Firefox, Edge verified

With Strait of Hormuz active (heat=0.94), WTI and Brent generated BUY signals (composite 75–82) via energy amplification. Gold and Silver generated strong BUY signals (78–85) via safe-haven amplification (×40). EUR/USD generated HOLD (52–60), correctly reflecting its lower geopolitical sensitivity (×15). All RSI, MACD, and EMA outputs matched manually computed values within floating-point tolerance. The Claude AI reasoning field consistently referenced the specific asset and zone combination, confirming prompt engineering effectiveness.

Conclusion

GeoTrade demonstrates a production-quality AI-powered geopolitical intelligence platform bridging the gap between global political events and financial market analysis. The ResizeObserver-based Three.js initialization resolves a critical rendering race condition. The React ref pattern ensures accurate asset-zone AI context across rapid user selections. The per-asset sensitivity model produces differentiated, theoretically grounded signals across asset classes. The platform demonstrates that sophisticated financial intelligence tools can be built entirely in the browser using open-source web technologies and commercial AI APIs at negligible cost — accessible for academic research and independent financial analysis.

Future work includes integration with real-time market data feeds (Alpaca, Polygon.io), dynamic geopolitical heat scoring via GDELT/NewsAPI, portfolio backtesting engine, and a mobile-responsive redesign.

References

[1]. Caldara, D. & Iacoviello, M. (2022). Measuring Geopolitical Risk. American Economic Review, 112(4), 1194–1225.
[2]. Bouri, E. et al. (2018). Return and Volatility Transmission Between Oil Prices and Related Markets. Emerging Markets Review, 34, 124–142.
[3]. Balcilar, M. et al. (2018). Risk Spillover Across Oil Market. Economic Modelling, 74, 51–65.
[4]. Pring, M.J. (2002). Technical Analysis

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2026.0085
e ISSN: 2584-2854
Volume: 04 Issue: 04
April 2026
Page No: 856 - 860

Explained. 4th ed. McGraw-Hill.
[5]. Murphy, J.J. (1999). Technical Analysis of Financial Markets. New York Institute of Finance.
[6]. Wilder, J.W. (1978). New Concepts in Technical Trading Systems. Trend Research.
[7]. Chan, E.P. (2009). Quantitative Trading. Wiley Trading.
[8]. Loughran, T. & McDonald, B. (2011). Textual Analysis and 10-Ks. Journal of Finance, 66(1), 35–65.
[9]. Malo, P. et al. (2014). Semantic Orientations in Economic Texts. JASIST, 65(4), 782–796.
[10]. Brown, T.B. et al. (2020). Language Models are Few-Shot Learners. NeurIPS, 33, 1877–1901.
[11]. Bostock, M. et al. (2011). D3: Data-Driven Documents. IEEE TVCG, 17(12), 2301–2309.
[12]. Diehl, S. et al. (2010). Illustrative Globe Rendering. ACM SIGGRAPH Asia.
[13]. Cabello, R. et al. (2024). Three.js: JavaScript 3D Library. github.com/mrdoob/three.js
[14]. Anthropic (2023). Claude Model Card. anthropic.com/model-card
[15]. Wei, J. et al. (2022). Chain-of-Thought Prompting. NeurIPS, 35, 24824–24837.
[16]. Bloomberg LP (2024). Terminal Documentation. bloomberg.com/professional/