

TheAlphas One-Pager

MIT HackNation 2025 – AlphaEarth Insurance Challenge

Challenge Tackled

Problem: Insurance companies rely on outdated historical data and manual claims assessment, causing slow disaster response and inaccurate risk pricing as climate patterns shift rapidly.

Solution: Built **AlphaEarth Risk and Insurance Payout Compass**, a real-time multi hazard risk platform generating Low/Medium/High risk scores for flood, hurricane, and wildfire exposure across U.S. counties using live climate data and physics-based formulas.

User: Insurance underwriters and claims adjusters needing rapid, data-driven risk assessments to price policies and automate payouts based on natural calamity prediction and past payouts.

Tools / ML Models Used

Open-Meteo ERA5 – Daily precipitation, wind, temperature, humidity

FEMA NFIP API – Historical flood payout claims data

ML Linear Regression Model – Trained on historical FEMA NFIP payout data (floods, storms, wildfires) to predict future claim amounts based on climate markers

Google Maps + GeoJSON – County visualization

Python – Rolling windows, Fosberg Fire Weather Index, Vapor Pressure Deficit

Node.js/Express – API orchestration

React + TypeScript – Interactive dashboard with CSV export

What Worked Well

Climate-Based Scoring: Converted weather data into Low/Medium/High risk categories using domain thresholds

Multi Hazard Coverage: Three algorithms for flood, hurricane, and wildfire risks

County Granularity: Automated state detection, computed risk for 50+ counties per query

Predictive ML Model: Linear regression correlates climate markers with FEMA NFIP payouts to forecast claims

What Was Challenging

Data Integration: Coordinating three async APIs with rate limits and missing data

Geospatial Accuracy: Custom point-in-polygon algorithms to detect county/state boundaries

Performance: Styling 50+ county polygons caused lag—fixed via GeoJSON caching and batching

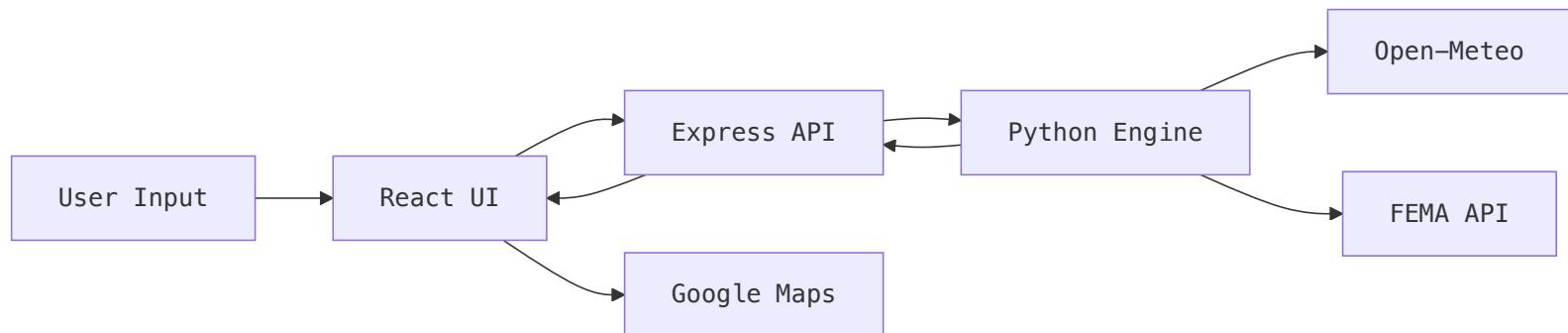
How You Spent Your Time (24 Hours)

0-3h Research: Explored FEMA API, Open-Meteo endpoints, mapped system architecture

3-8h Data Pipeline & ML: Fetched NFIP claims, integrated ERA5 climate data, trained linear regression model on payout data

8-16h Risk Algorithms: Implemented flood/hurricane/wildfire scoring with rolling window calculations
16-20h Frontend: React dashboard, Google Maps integration, county boundary rendering
20-24h Integration: Connected backend to Python processing, integrated ML predictions, CSV export, demo videos

Architecture



Data Sources: Open-Meteo ERA5 Archive, FEMA NFIP Claims API, Plotly US Counties GeoJSON

Reflection: "With 24 more hours, we'd create a chat-based conversational agent that would provide more contextual evidence on what is happening behind the scenes and a RAG pipeline with access to our database for custom calls."

Team: TheAlphas | **Track:** VC Big Bets

GitHub: <https://github.com/shivani1805/AlphaEarth-HackNation-MIT/>

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