इसरो isro

BHARATIYA ANTARIKSH HACKATHON 2025

Powered by H2S HACK2SKILL

Team Name : Brush and Biscuits everyDay

Team Leader Name : Shreyank S

Problem Statement : 4. Designing a chain of thought based LLM system for solving complex spatial analysis tasks through intelligent geoprocessing orchestration.

Crew Members

Team Leader: Shreyank S

Name: Shreyank S
College: IIIT Kota

Team Member-1:

Name: Riya K Alex
College: UVCE , Bengaluru

Team Member-2:

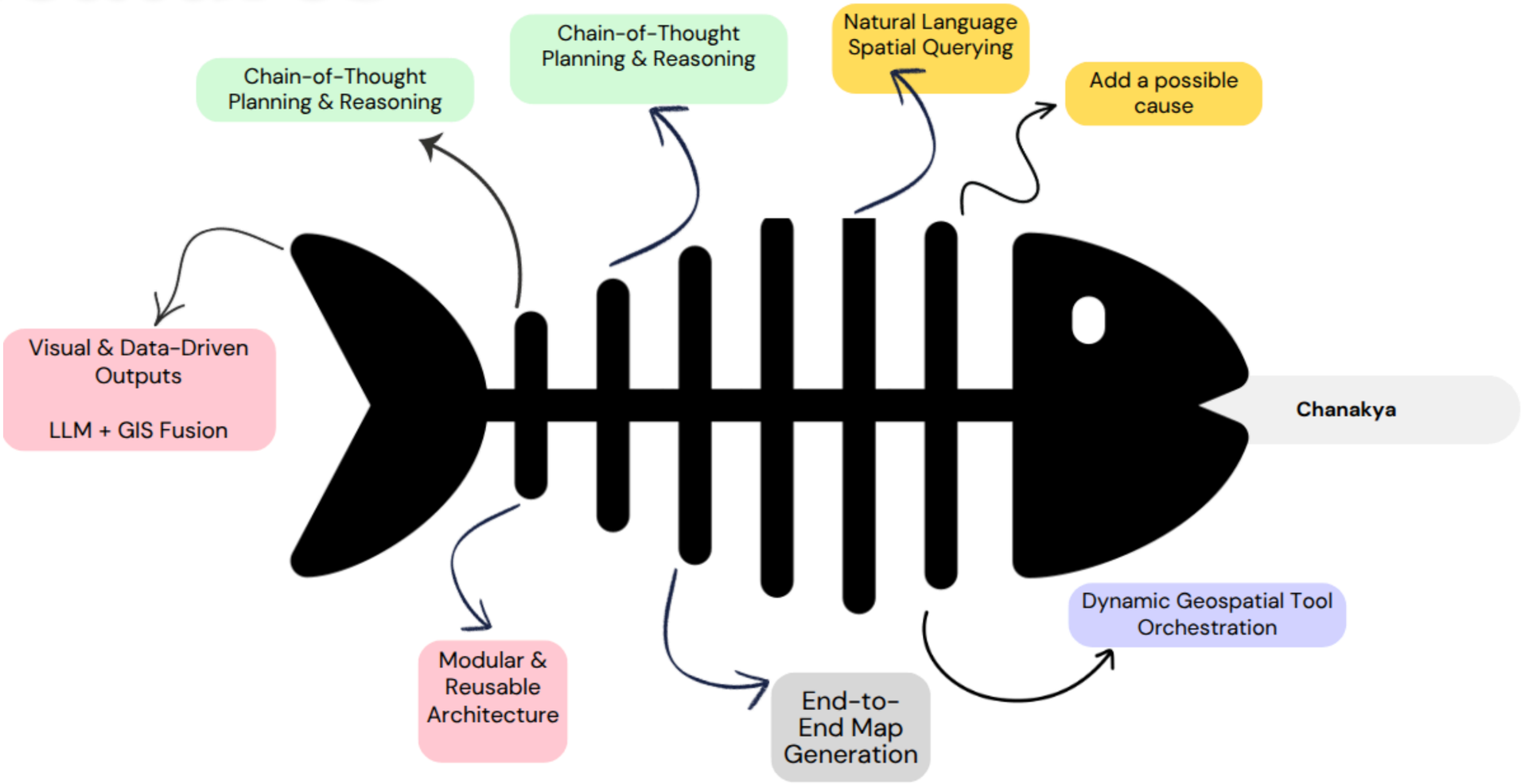
Name: Deizma Maria Crasta
College: Akash Institute of Engineering & Technology , Bengaluru

PROBLEM STATEMENT	**Designing a chain of thought based LLM system for solving complex spatial analysis tasks through intelligent geoprocessing orchestration.**
Objective	Design a system that solves complex Geo-spatial problems through logical step-by-step geoprocessing.
Approach	Adopt a reasoning-based workflow that mirrors expert decision-making in Geospatial tasks
Process Management	Intelligently orchestrate geoprocessing tools like buffering, overlay, and spatial joins.
Efficiency & Accuracy	Ensure each processing step adds value and improves overall spatial outcomes.
Real-World Applications	Enable solutions for urban planning, environmental hazards, and infrastructure development.
Scalability	Build a flexible system that adapts to diverse datasets and growing analytical complexity.

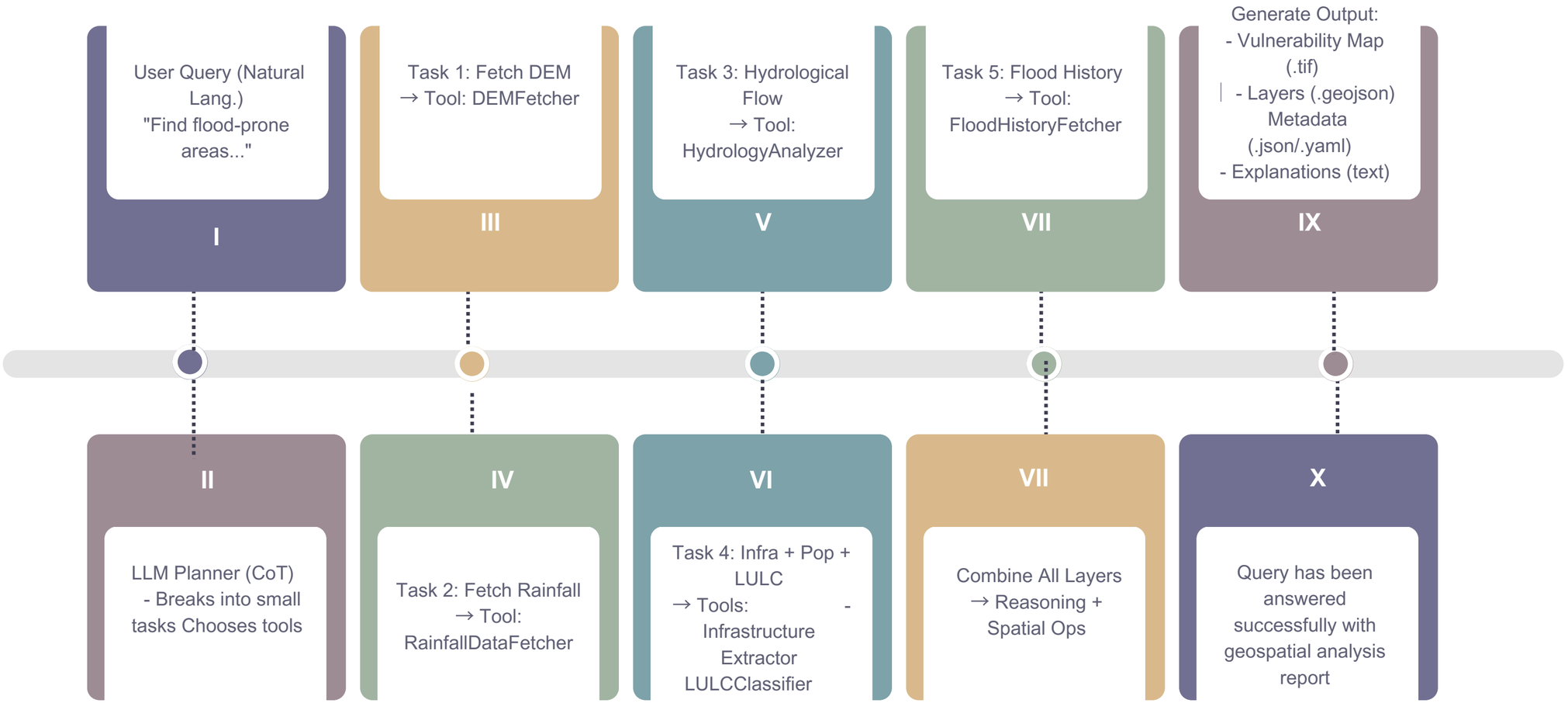
What Sets Us Apart

Static rule-based GIS tools	Dynamic, intelligent reasoning with LLM
No explainability in decision layers	Natural language explanations + visualization in every layers
Black-box Models for disaster and site mapping like problems	Step-by-step geoprocessing for better information utilization
Manual geospatial workflows for every problem statement	Automated tool chaining workflow

core features

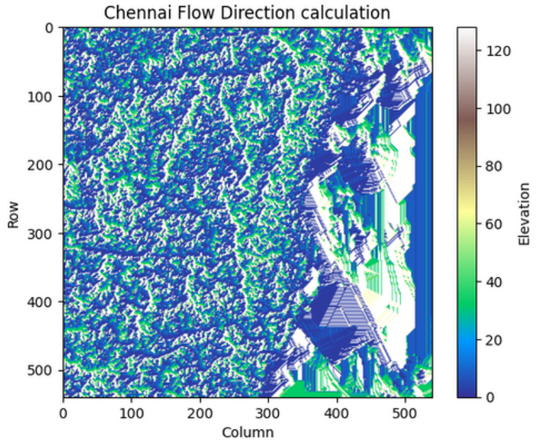


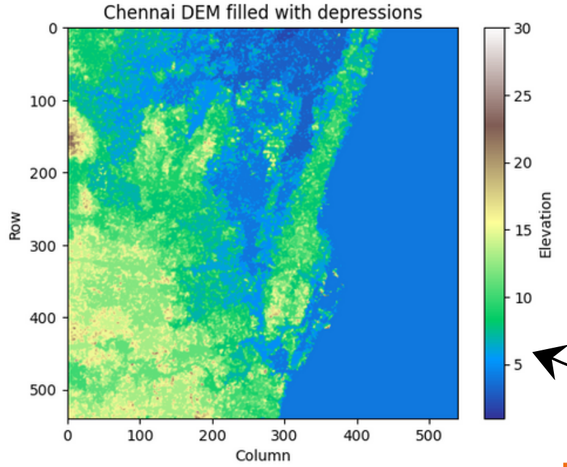
use case

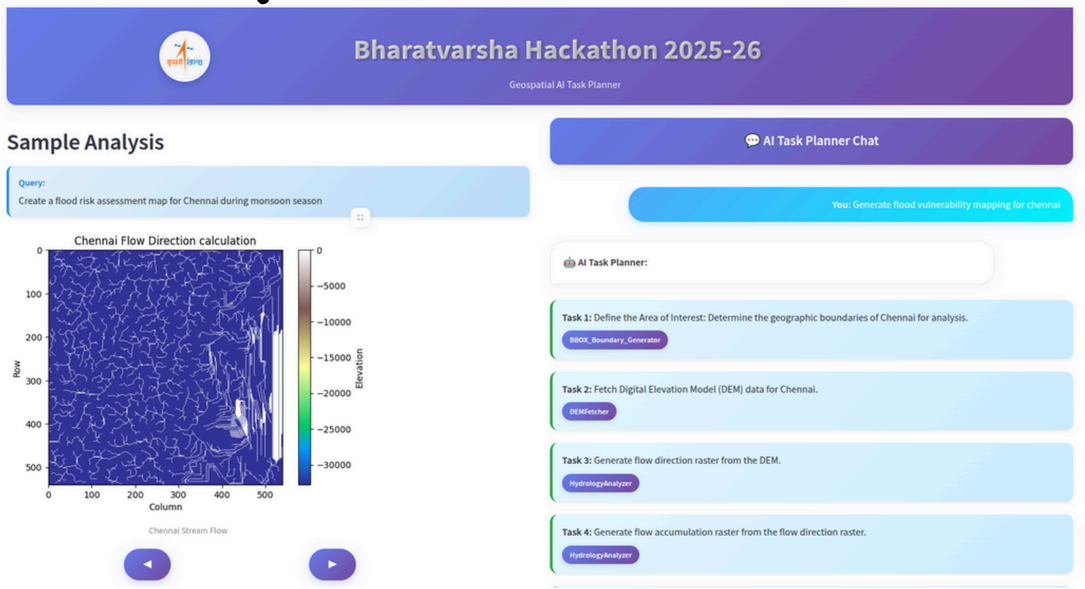

User Query (Natural Lang.)
"Find flood-prone areas..."
I
LLM Planner (CoT)
- Breaks into small tasks Chooses tools
II
Task 1: Fetch DEM
→ Tool: DEMFetcher
III
Task 2: Fetch Rainfall
→ Tool: RainfallDataFetcher
IV
Task 3: Hydrological Flow
→ Tool: HydrologyAnalyzer
V
Task 4: Infra + Pop + LULC
→ Tools: - Infrastructure Extractor
LULCClassifier
VI
Task 5: Flood History
→ Tool: FloodHistoryFetcher
VII
Combine All Layers
→ Reasoning + Spatial Ops
VII
Generate Output:
- Vulnerability Map (.tif)
- Layers (.geojson)
Metadata (.json/.yaml)
- Explanations (text)
IX
Query has been answered successfully with geospatial analysis report
X

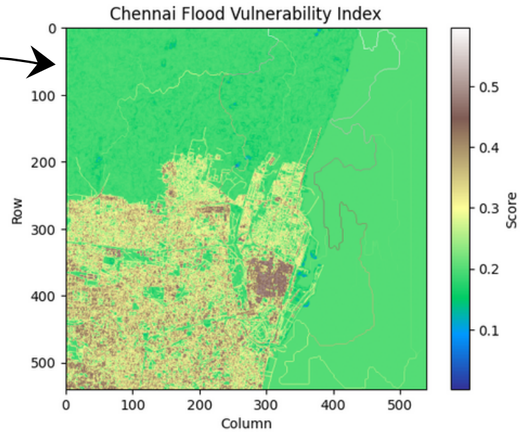
Powered by H2S

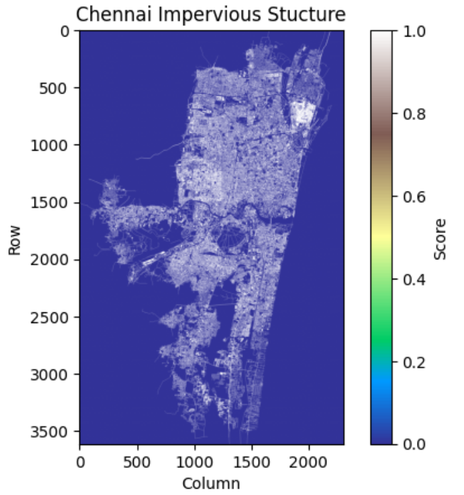
Visual MOCKUP



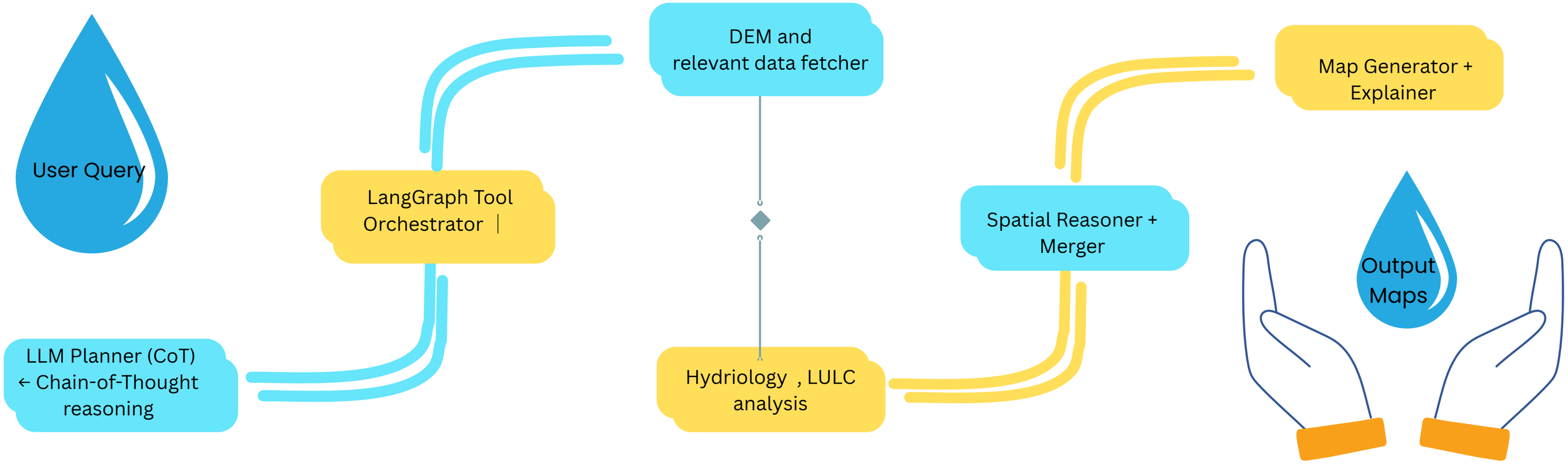




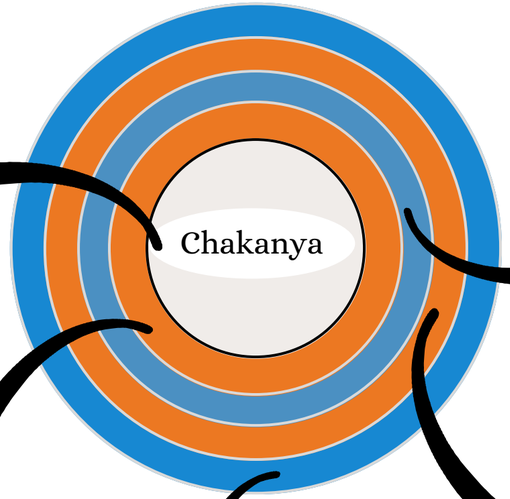




Solution Architecture



Software Ecosystem



Agentic AI-Tools
- Google gemini
- LangGraph
- LangChain

Data Formats and Database
- AWS S3 Bucket
- GeoTIFF
- GeoJSON
- YAML / JSON

Geospatial Tools
- GeoPandas
- WhiteboxTools
- Rasterio
- OSMnx

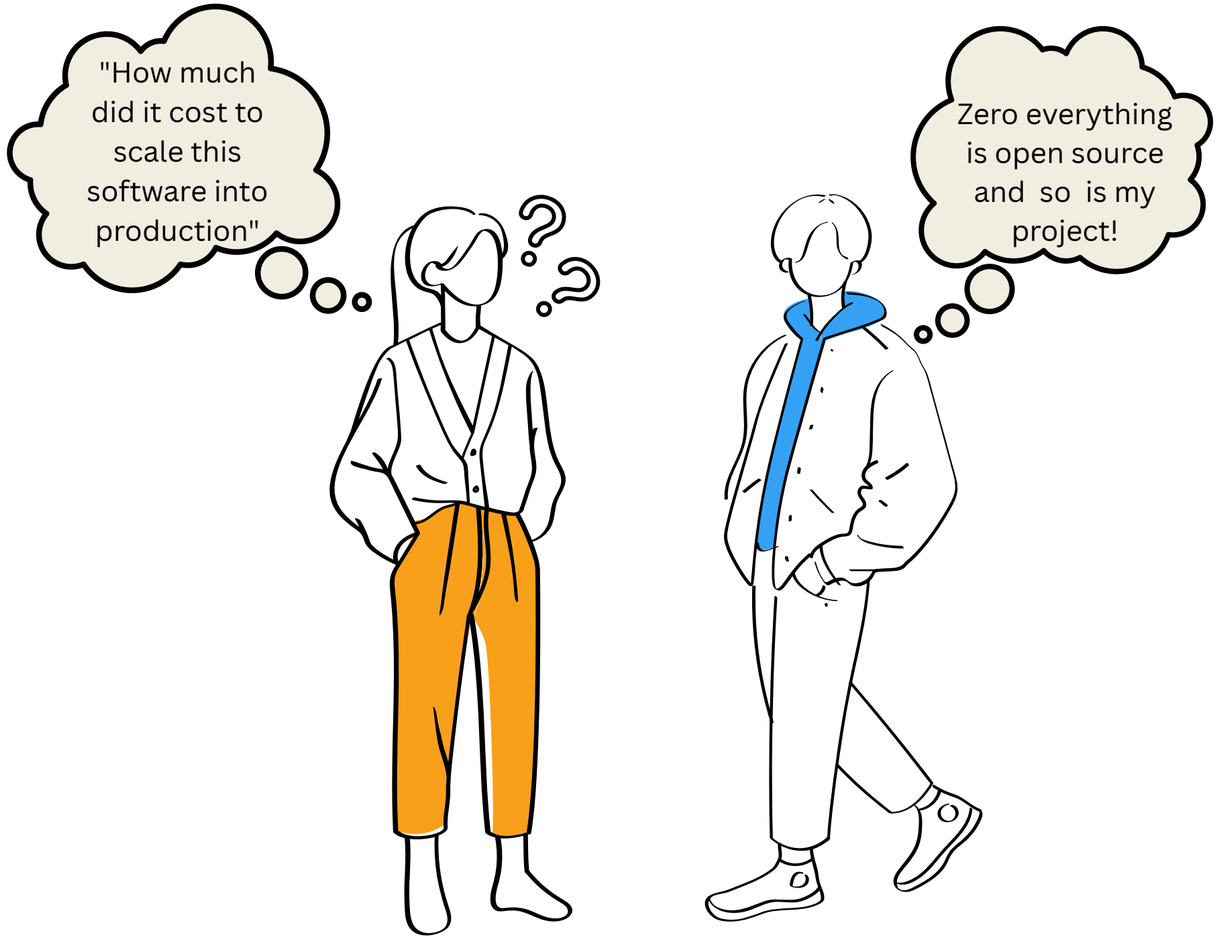
Visualization and UI
- Streamlit
- Folium
- Matplotlib

Data APIs & Libraries
- OpenStreetMap (OSM)
- NASA GPM / IMD
- ESA WorldCover – LULC

COST ESTIMATION

LLM Usage - Google Gemini	OPEN SOURCE
Geospatial Processing - Geopandas , whitebox	OPEN SOURCE
Backend Server / Compute - Huggingface	OPEN SOURCE
Data Collection APIS - OSMNX, EDM,NASA,Bhoonidhi	OPEN SOURCE
Storage (for raster/vector data)	Local Storage(HF)

HuggingFace Demo



Planned Enhancements & Integrations

- AI-Driven Vulnerability Scoring Engine
- Tidal + Storm Surge Simulations
- Rainfall Intensity-Based Alerts
- Dynamic Population Exposure Models
- Higher Resolution DEMs for Urban Mapping

Powered by H2S

BHARATIYA ANTARIKSH HACKATHON 2025

THANK YOU