Generative AI Workflows for Climate Risk Modeling in Food Systems

Integrating AI-driven climate resilience into DevOps pipelines for global food security

SPEAKER INTRODUCTION

Poshan Kumar

Data, AI & Analytics Architect

Leading innovation at the intersection of enterprise technology and sustainable agriculture. Specializing in AI/ML infrastructure, climate-focused solutions, and DevOps transformation for mission-critical systems.

Conf42 DevOps 2026

⚠ THE CHALLENGE

Climate Volatility Threatens Global Food Systems

Rising temperatures, unpredictable weather patterns, and extreme events are disrupting agricultural yields worldwide. Digital agriculture teams need intelligent tools that integrate seamlessly into existing data pipelines to anticipate and respond to these challenges.

The Convergence Opportunity

DevOps Maturity

Scalable CI/CD pipelines, containerization, and infrastructure-as-code enable rapid deployment of complex AI workloads

Generative AI Capabilities

Advanced models can synthesize climate scenarios, generate adaptive strategies, and automate stakeholder communications

Climate Data Availability

Historical weather records, satellite imagery, and predictive climate models provide rich training datasets

When we combine mature DevOps practices with generative AI and comprehensive climate data, we unlock new pathways for for agricultural resilience.

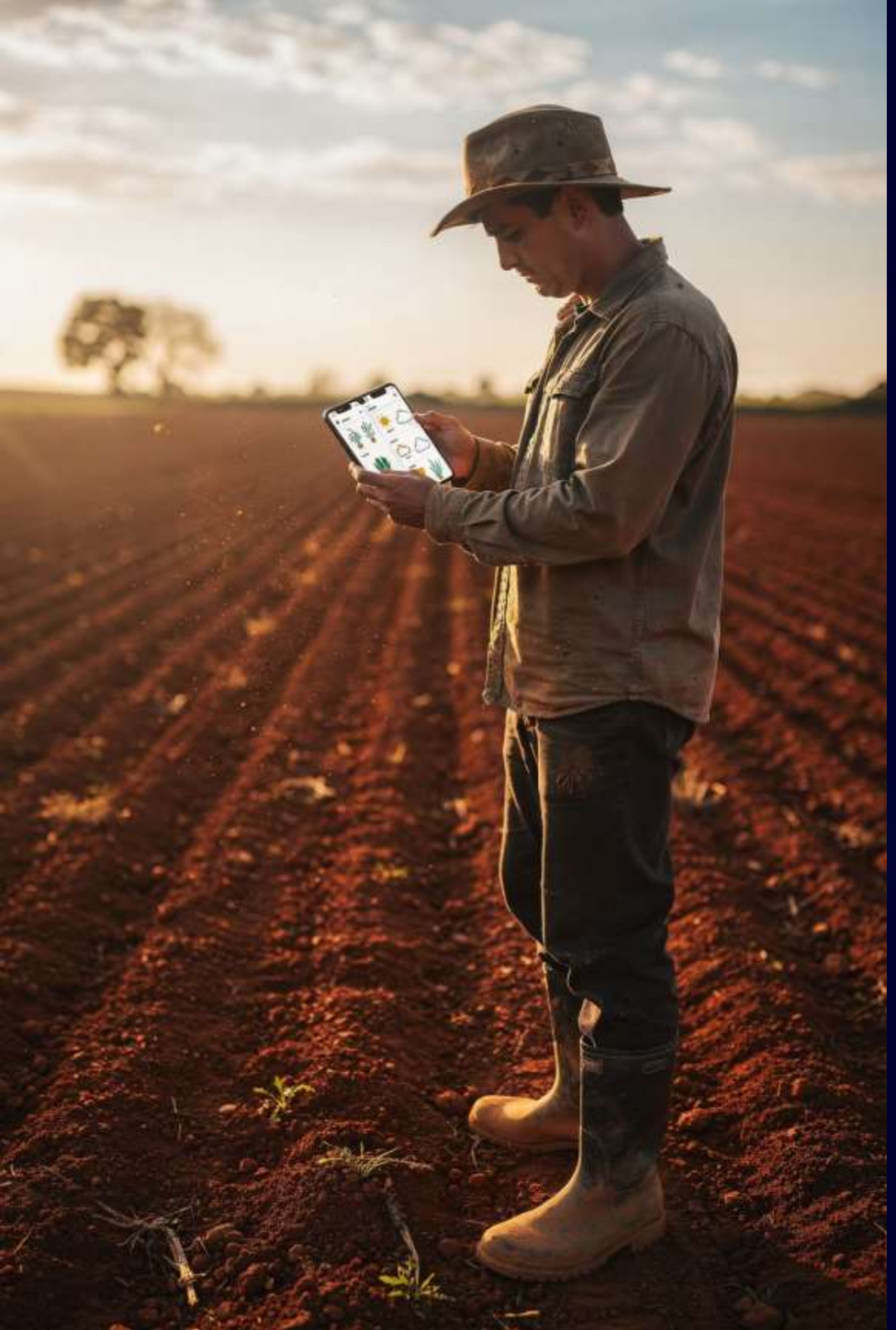
CORE CAPABILITY #1

Climate Scenario Modeling

Synthetic Climate Event Generation

Using historical weather data and projected climate models, generative AI creates realistic simulations of extreme events including droughts, floods, and heatwaves.

These synthetic scenarios enable teams to estimate crop yield responses responses under various stress conditions, providing actionable intelligence for planning and mitigation.



From Technical Output to Field-Ready Intelligence

01

Ingest Climate Data

Historical records, satellite imagery, and forecasting models

02

Generate Scenarios

AI synthesizes drought, flood, and temperature stress events

03

Model Crop Response

Estimate yield impacts across varieties and growth stages

04

Translate for Stakeholders

Convert technical outputs into farmer-friendly formats and visualizations

CORE CAPABILITY #2

Adaptive Strategy Generation

Generative AI proposes localized interventions tailored to regional conditions, combining agronomic best practices with real-world constraints.

Localized Intervention Recommendations

Crop Rotation Plans

Optimized sequences based on soil health, pest cycles, and climate projections

Irrigation Adjustments

Precision watering schedules adapted to predicted rainfall and soil moisture

Resilient Seed Selection

Varieties with enhanced drought tolerance, heat resistance, or shorter growing cycles

Financial Mechanisms

Insurance products, subsidy programs, and risk-sharing models aligned with regional economics

All recommendations are mapped to regional soil types, water availability, and socio-economic factors.

CORE CAPABILITY #3

Automated Brief Generation

Evidence-Based Communication

Generative AI synthesizes complex climate risk data into concise reports tailored for different audiences: policymakers, agribusinesses, and NGOs.

These briefs summarize key risks, outline recommended interventions, and quantify potential economic impacts to support timely decision-making.

DevOps Integration Architecture

Data Ingestion

Climate APIs, satellite feeds, agricultural databases

AI Processing

Scenario generation, strategy modeling, brief creation

Version Control

Model versioning, pipeline configuration, reproducibility

Testing & Validation

Automated accuracy checks, bias detection, output validation

Deployment

Container orchestration, scaling, monitoring

Practical Implementation Considerations

Model Versioning

Track AI model iterations alongside code changes using MLOps best practices and artifact registries

Scalable Pipelines

Containerized workloads with auto-scaling capabilities to handle peak computational demands during growing seasons

Continuous Testing

Automated validation of scenario accuracy, recommendation relevance, and output quality across diverse regions

Monitoring & Observability

Real-time tracking of model performance, data drift, and system health with alerting and remediation workflows

Real-World Impact Across the Ecosystem

Farmers & Field Teams

Receive actionable guidance on planting resource allocation, and risk mitigation tailored to local conditions

Policymakers

Access evidence-based briefs that quantify climate risks and evaluate intervention strategies for regional planning

Agribusinesses

Optimize supply chain resilience and investment decisions using predictive climate scenario analysis

NGOs & Development Orgs

Target resources effectively with data-driven insights into vulnerable regions and high-impact interventions

The Path Forward

Building Climate Resilience at Scale

By embedding generative AI into DevOps workflows, we create systems that are not only intelligent but also maintainable, scalable, and continuously improving.

This approach transforms climate risk from an abstract threat into a manageable challenge with concrete, data-driven solutions.

The future of food security depends on our ability to combine agronomic expertise, climate science, and modern software engineering practices.

Key Takeaways

Integrate AI into Pipelines

Treat generative AI models as versioned, testable components within your DevOps infrastructure

Focus on Practical Outputs

Prioritize solutions that deliver actionable intelligence to farmers, policymakers, and stakeholders

Enable Continuous Adaptation

Build systems that learn from outcomes and improve recommendations as climate patterns evolve

Thank You!

Poshan Kumar | Data, AI & Analytics Architect

Conf42 DevOps 2026.