

The Violence & Impacts Early-Warning System

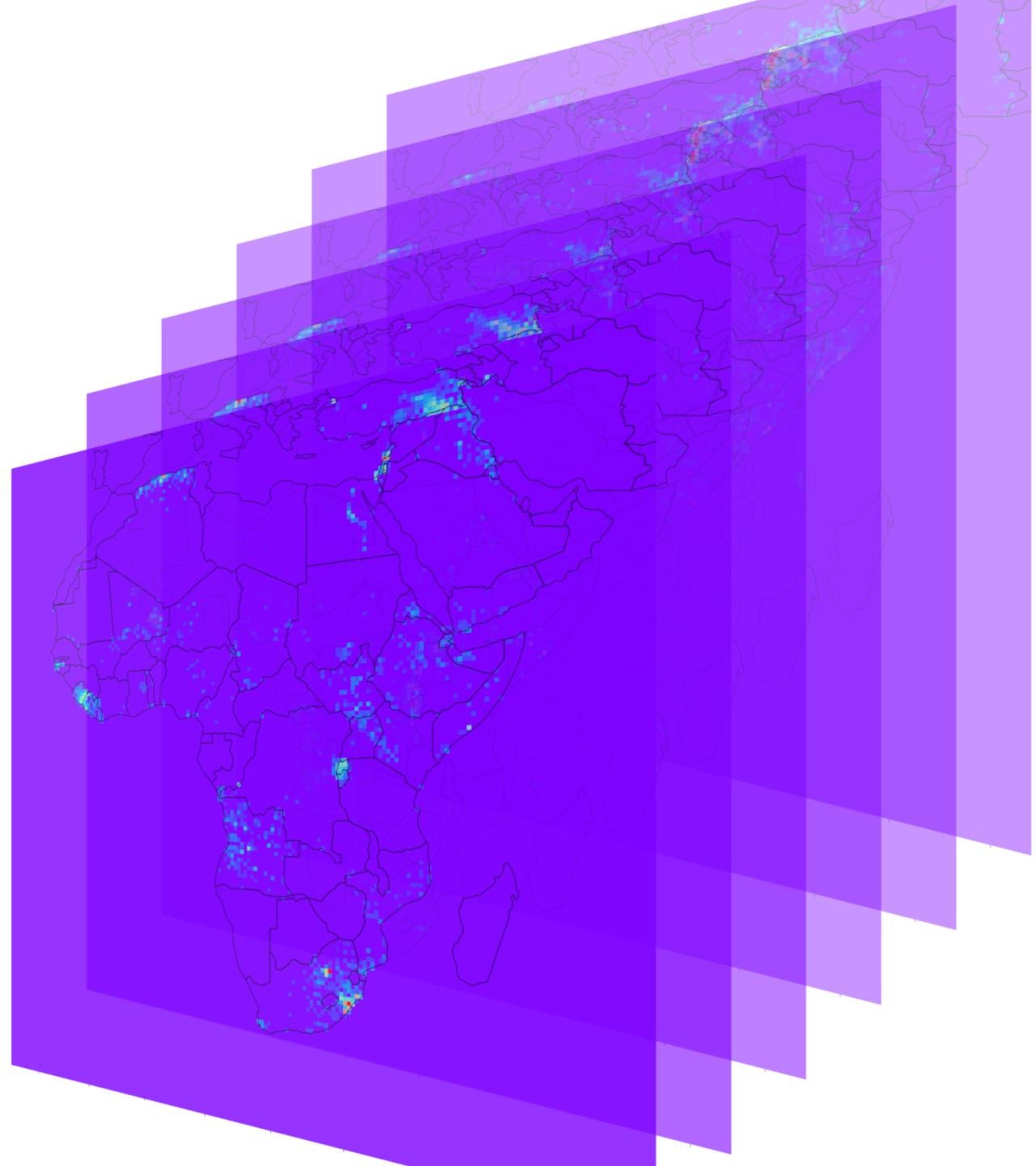
Machine Learning for Anticipatory Action



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PRIO



The **unreasonable** effectiveness of being prepared:

We check the weather forecast, so we don't leave the house without an umbrella on a rainy day.

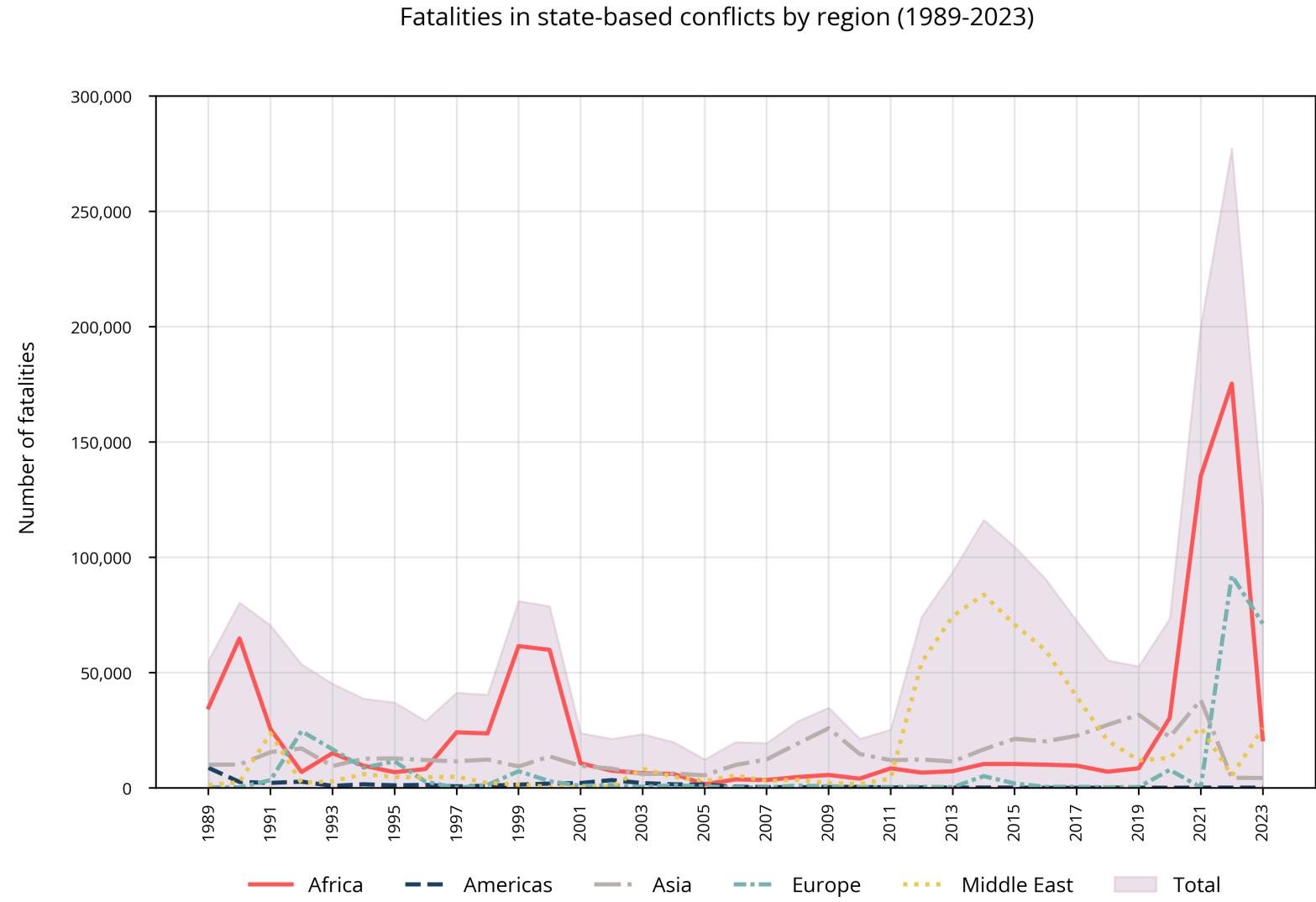
We check the calendar, to make sure we don't double-book ourselves or miss that very important thing.

We check traffic before we commute, to avoid getting stuck in rush hour and get where we need to be on time.



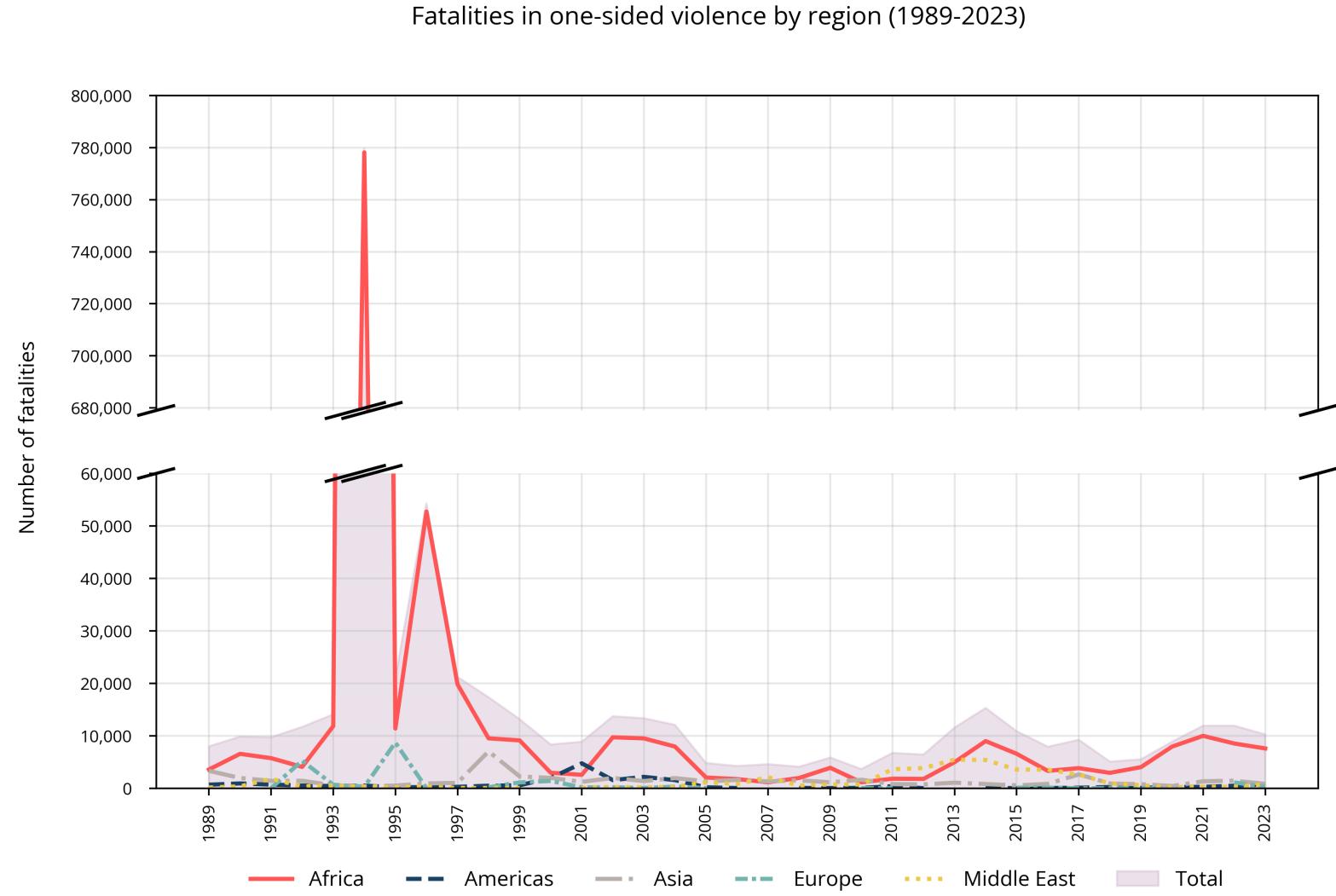
In life, preparation saves us from inconvenience. In violent conflict, preparation could save lives.

**State-based
conflicts remain
deadly, with
significant loss of life
each year.**



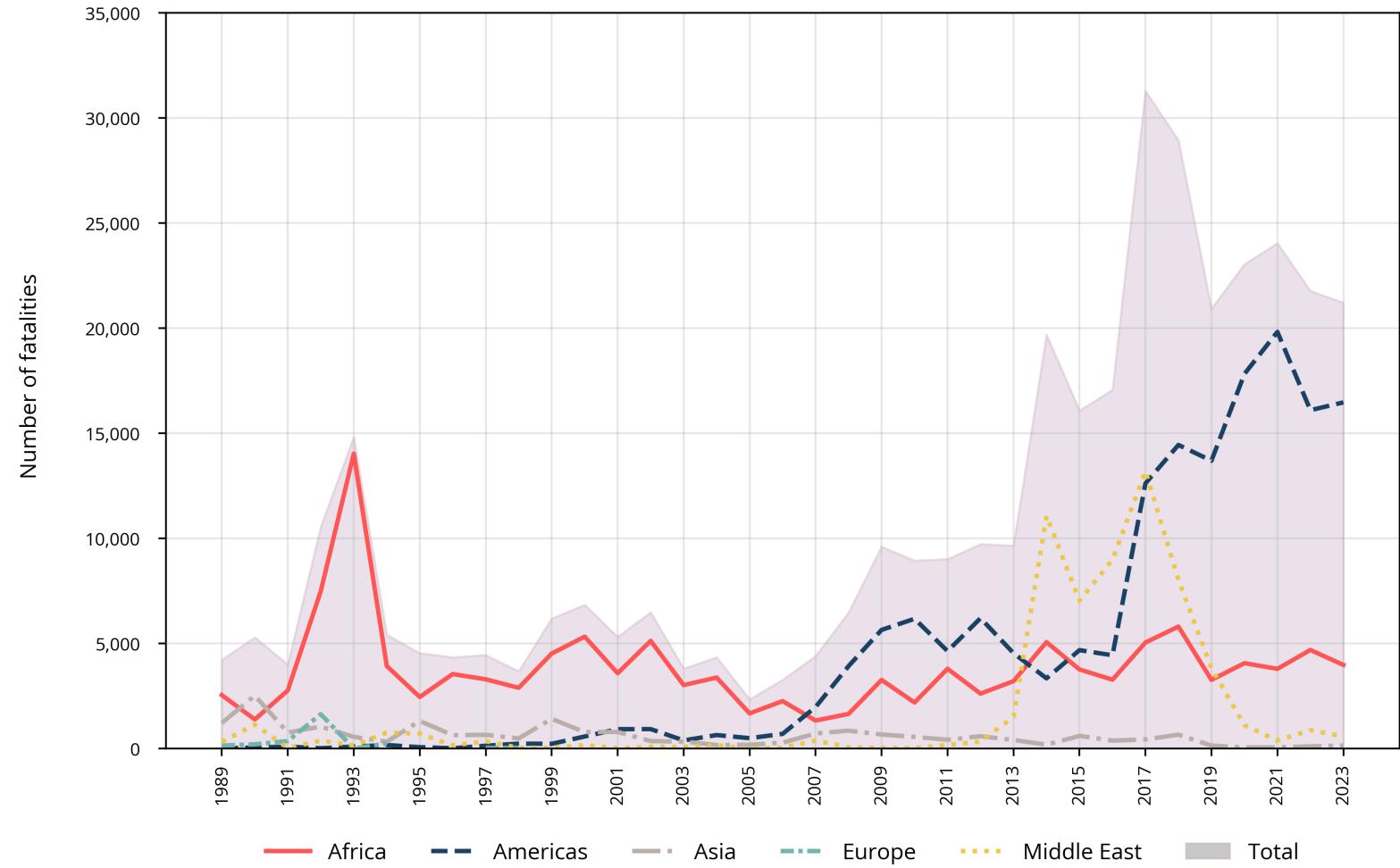
Based on UCDP 24.1 data

One-sided violence
against civilians
continues to take a
devastating toll.



Fatalities in non-state conflicts by region (1989-2023)

Non-State conflicts
drive increasingly
high counts of
fatalities.



Based on UCDP 24.1 data

A global challenge with **no singular solution**

- Conflicts are **highly complex**, crossing borders and involving intricate networks of state and non-state actors.
- The ability of international organizations to prevent or intervene is **increasingly constrained**.
- Individual nations often lack the political will, capacity, or resources to address **conflict or its root causes** alone.

As such, **violent conflict is likely to persist**, inflicting substantial human suffering and hardship for the foreseeable future. Yet..

With timely insights, we can shift from reactive responses to anticipatory actions.

Turning anticipation into **action**

Early Warning Systems (EWS) can provide critical insights, empowering humanitarian actors to respond proactively.

- Resource allocation to areas of greatest need.
- Timely deployment of aid workers.
- Civilian evacuation before crises escalate.

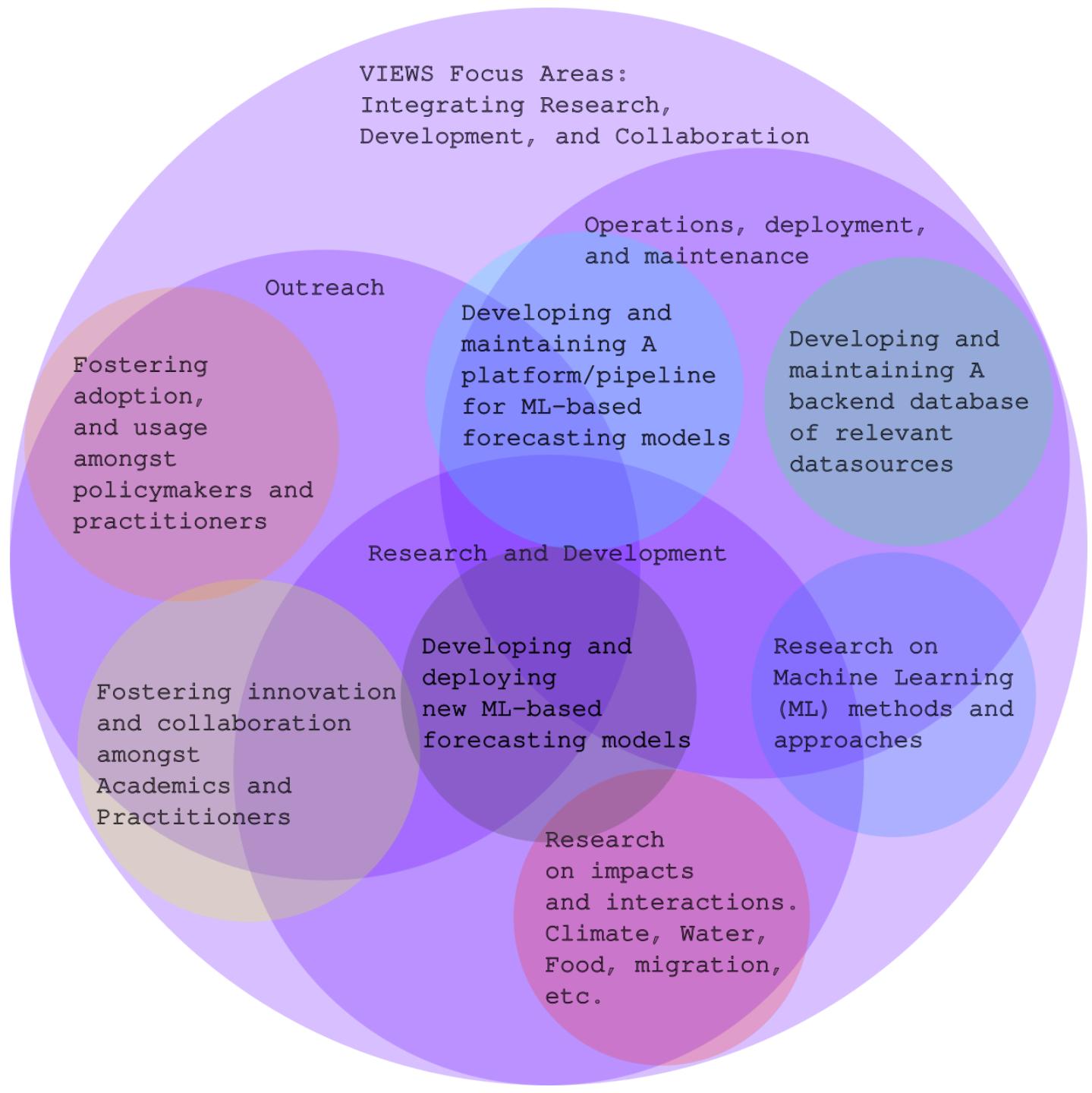
By anticipating conflict, EWS' can **help reduce** human suffering and save lives.



VIEWS: developing the next-generation of early warning systems

VIEWS is More than an EWS...

But, the focus here will be on the operational EWS.



What the operational VIEWS system **is**:

- A comprehensive (and expanding) collection of **Machine Learning (ML/AI)** models designed for conflict forecasting.
- The models **trained on extensive historical conflict data** to predict future risks with precision.
- A versatile platform enabling robust **research, development, and seamless deployment**.
- Focused on delivering **data-driven insights** to empower humanitarian actors, stakeholders, and policymakers to take **early action**.

What the operational VIEWS system delivers:

Forecasting:

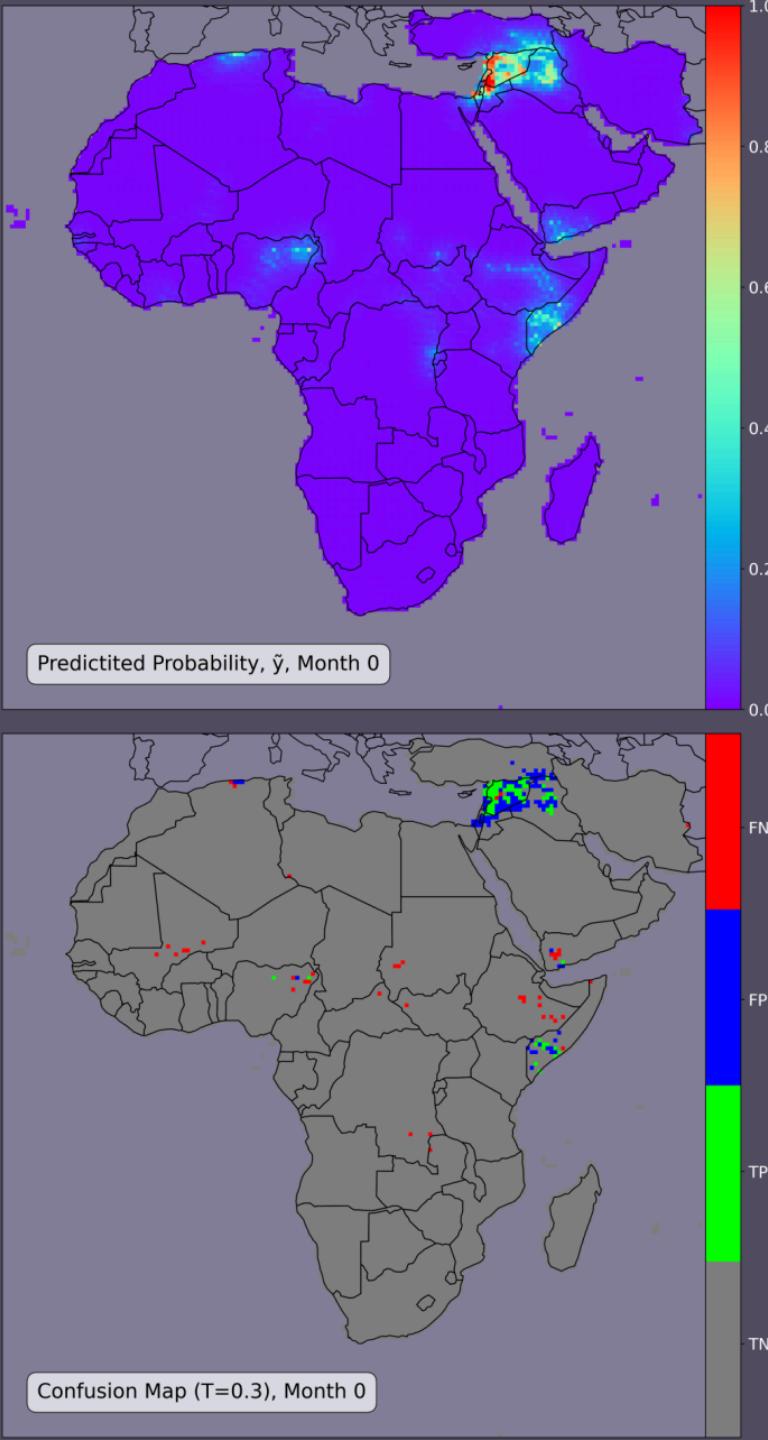
- The expected probability of future violent conflict.
- The expected number of future conflict fatalities.

Global and local coverage:

- Country-level predictions worldwide.
- Detailed grid-level forecasts for Africa and the Middle East (expanding soon).
- Actor-dyad level forecast coming soon.

Monthly projections:

- Updated monthly
- Providing forecasts for up to 36 months ahead.



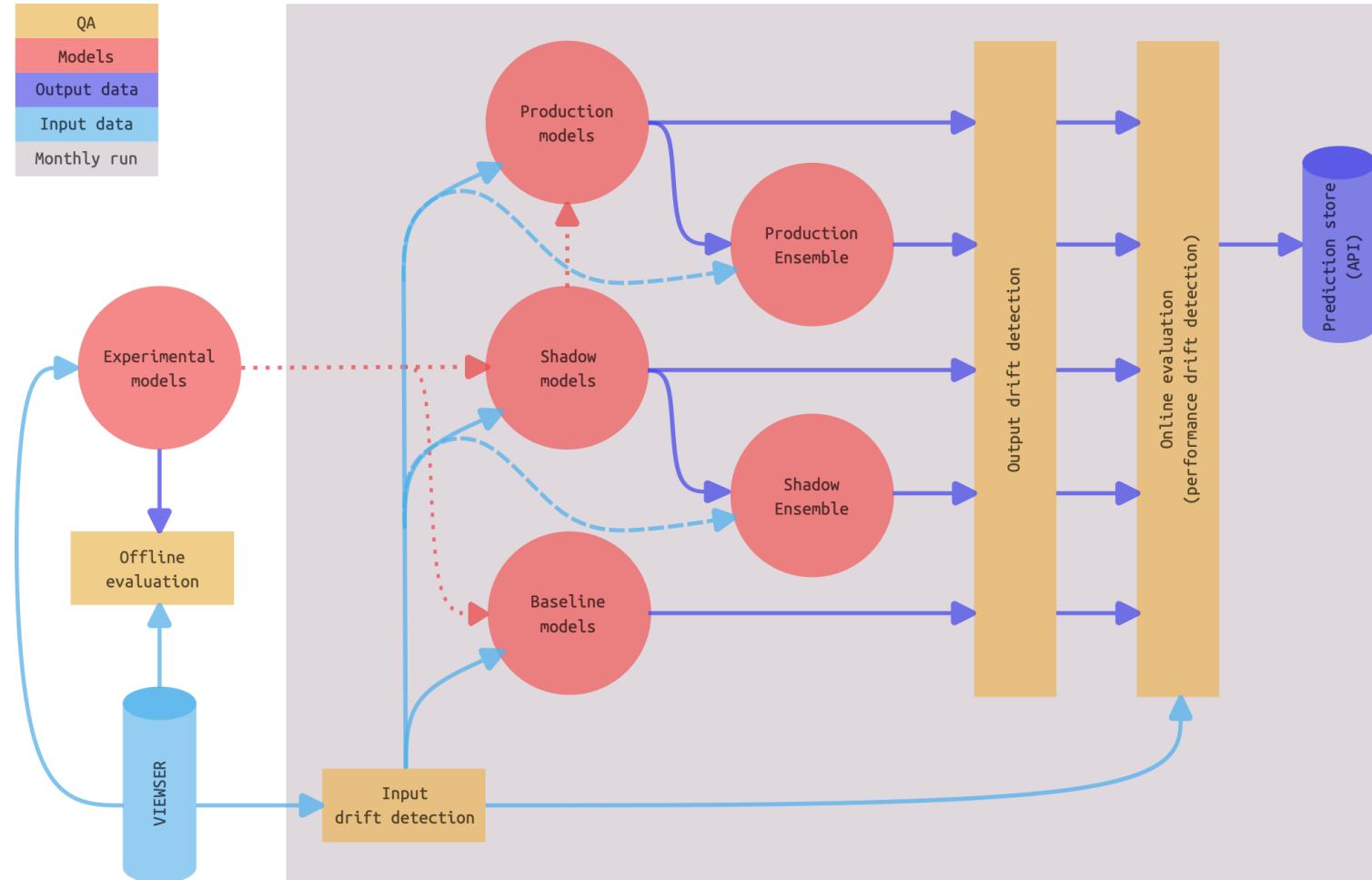
The **ML** platform

Our platform powers:

Robust quality assurance to maintain accuracy and reliability.

Rigorous model comparison for continual refinement of predictions.

Model aggregations to enhance performance.



Built for scalability and transparency

Our platform adapts to evolving demands with:

- Flexible architecture capable of integrating **new and complex data sources**.
- The ability to incorporate **new cutting-edge models**, ensuring state-of-the-art predictions.
- **Transparent processes to foster trust** in the system and its forecasts.
- A commitment to **continuous improvement**, informed by feedback and advances in technology.

Our mission is to **deliver reliable, actionable insights** through a scalable, transparent, and future-ready system.

Examples of data sources used:

- !! **UCDP**: Monthly updated geolocated event data on armed conflicts, including information on actors, locations, and intensity (Current target of our models)
- ★ **ACLED**: Real-time geolocated event data tracking political violence and protests, including conflict events, fatalities, and involved actor
- ⚖ **DEMSCORE**: A large collection of datasets covering for instance regime types, quality of government, environmental factors, migration and much more
- 🌐 **WDI**: a database containing information on global development, including economic, social, and environmental indicators
- 📰 **Factiva**: A comprehensive global news-wire database offering up-to-date insights from reputable sources.

Examples of ML models employed:

- 🤖 **Conventional ML models:** XGBoost and LightGBM uncover patterns in large conventional datasets.
- 👾 **Bespoke deep learning models:** HydraNet forecasts multiple conflict outcomes using temporospatial data.
- 🎲 **Probabilistic models:** Hurdle models handle sparse, zero-inflated data while Hidden Markov Models (HMMs) capture temporal conflict dynamics.
- 🐦 **NLP models:** Extract insights from news wire data, with a growing focus on LLMs and RAG systems.

VIEWS as a complement to traditional risk analysis

Systematic and data-driven: Reduces cognitive bias and ensures consistent analysis.

Focus on protracted conflicts: Keeps attention on long-running conflicts that might otherwise fade from focus.

Spotlighting critical low-risk conflicts: Identifies seemingly low-risk conflicts with high potential for devastating outcomes.

Recognizing compound risks: Detects hidden patterns where interconnected risks amplify conflict.



What makes good data for conflict forecasting?

Timely: Data must be consistently maintained and updated frequently - at least monthly - to ensure continuity, capture emerging risks, and respond effectively to rapidly evolving situations.

Granular: Sub-national resolution is critical for identifying localized conflict dynamics and hotspots, ensuring targeted and effective interventions.

Reliable: Data quality hinges on minimizing non-random missingness, especially temporal or spatial gaps in volatile regions.

Uncertainty: Ideally data should include clear estimates of uncertainty - such as confidence intervals or probabilistic ranges and not only a point estimate.

Challenges most data sources

Timeliness gaps: Many sources are updated annually or semi-annually, failing to keep pace with rapidly changing realities.

Insufficient granularity: Many sources lack sub-national detail, limiting its utility for local conflict forecasting and derived action.

Measurement biases: Gaps and distortions - especially in conflict-affected regions - undermine reliability and skew results.

Incomplete global coverage: Promising datasets are often regionally limited or exclude key conflict zones.

Simple point estimates: Even when data is highly uncertain, point estimates are often provided without clarifying confidence levels, limiting informed decision-making.

Event data is currently our most important sources

This is why conflict event data, such as **UCDP and ACLED**, is currently the strongest data source for our system.

These datasets deliver by far the most predictive power to our models.

What makes a **good model**?

Precision: Delivers precise predictions for both conflict probabilities and expected fatalities.

Scalability: Easily adapts to expanding datasets, additional regions, and complex conflict dynamics.

Robustness: Handles uncertainty, biases, and sparse data while maintaining consistent performance.

Timeliness: Generates forecasts efficiently to support real-time or near real-time decision-making.

Actionability: Provides outputs that are understandable and directly applicable to practitioner and stakeholder needs.

Challenges with many models

Generalization to unseen data: Models often struggle to generalize, especially with small sample sizes, zero-inflated data, and static assumptions.

Handling sparse and skewed data: Sparse, inconsistent, or zero-inflated spatiotemporal data often requires specialized handling.

Managing computational costs: Large spatiotemporal grids and manual preprocessing demand significant resources, limiting scalability.

Quantifying and communicating uncertainty: Many models fail to quantify or communicate uncertainty, reducing trust and usability for decision-making.

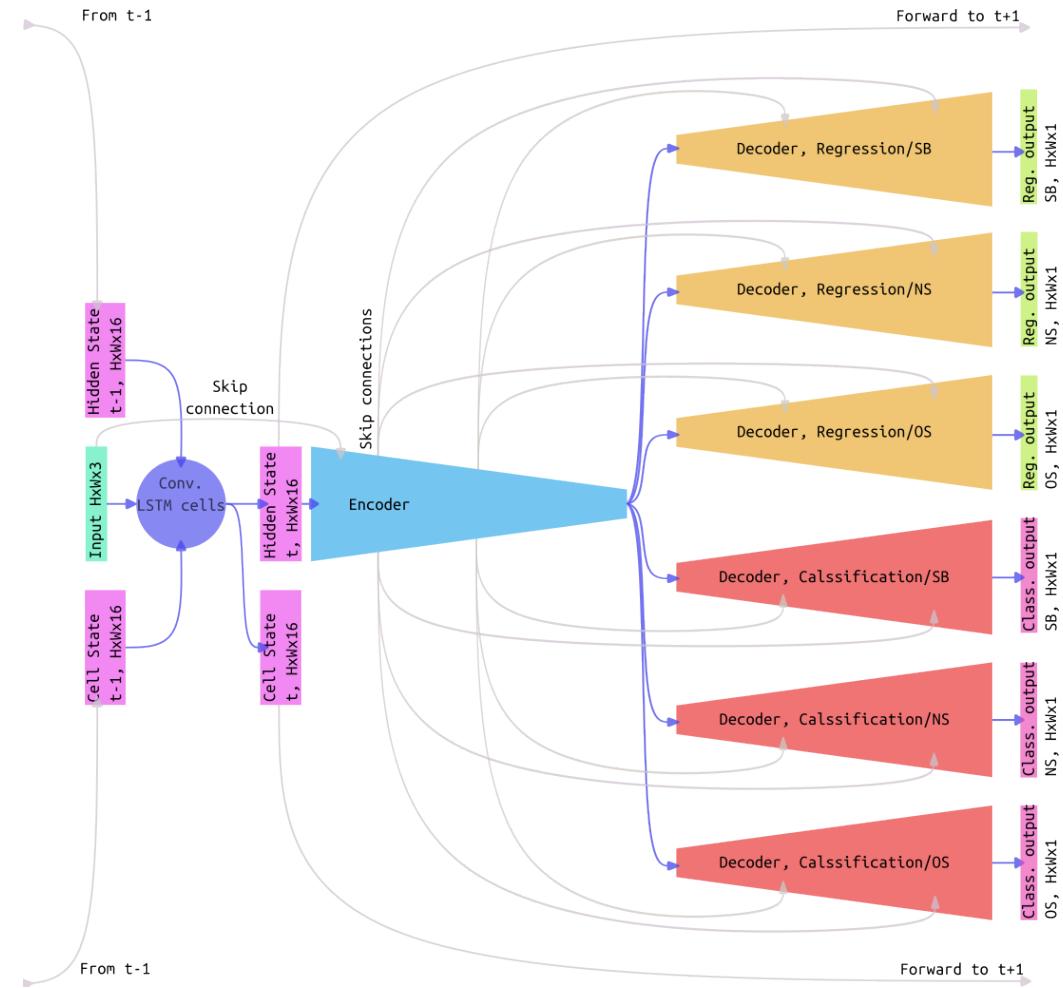
Levering innovative solutions

In-house models: Tailored to conflict forecasting challenges like zero-inflated data and spatiotemporal dynamics.

Evolving designs: Integrating the latest advancements in machine learning for cutting-edge performance.

Open to innovation: Exploring new solutions from the research community to address emerging needs.

This approach ensures our system stays robust, scalable, and effective.



Tangible Impact: VIEWS in the Real World

Engaging with **Policymakers and Practitioners**

Actively collaborate with policymakers and practitioners to unlock the potential of **AI-driven conflict forecasting** in real-world operations.

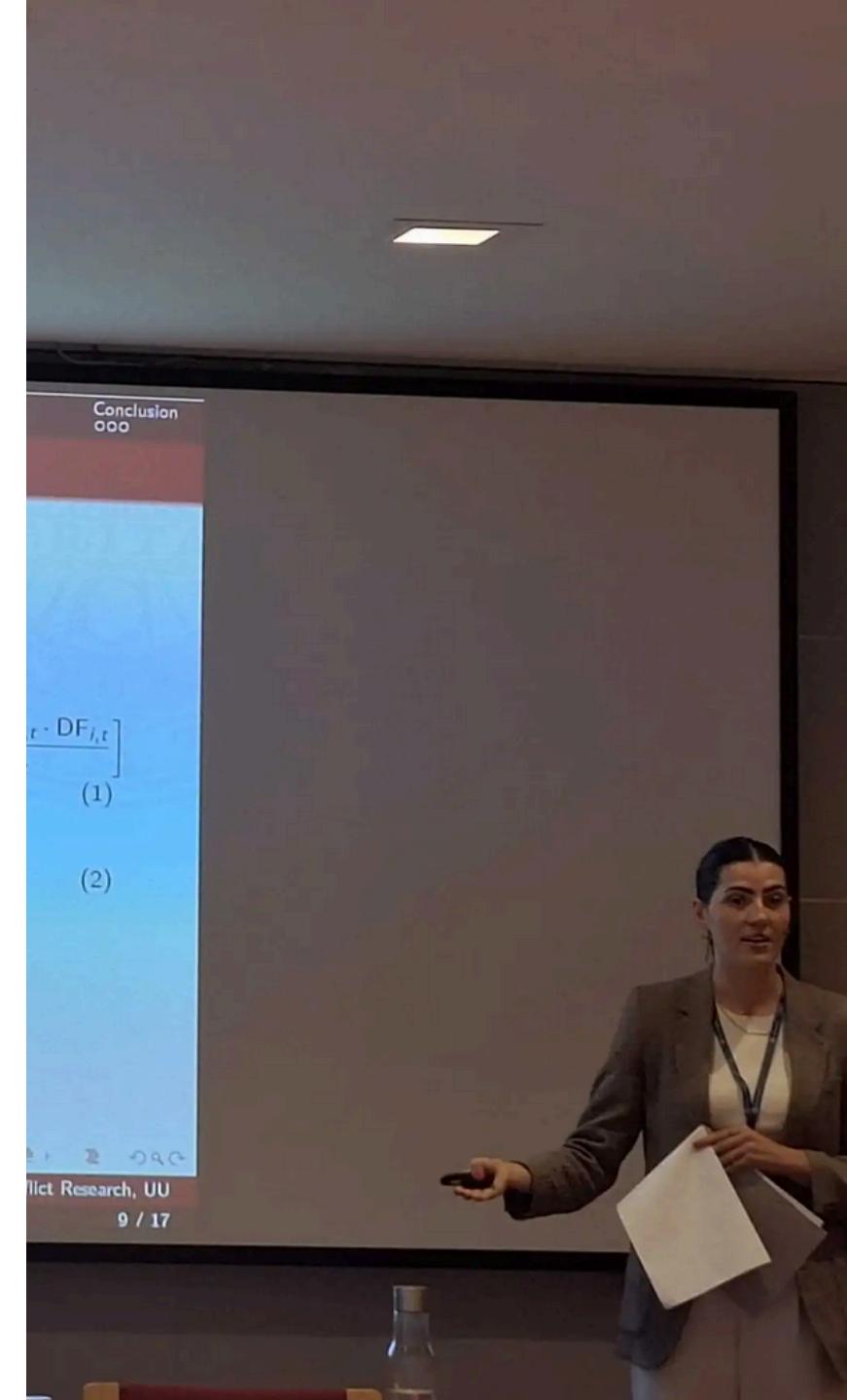
Through commissioned research and proof-of-concepts, we leverage our experience and tools to improving their systems for **decision-making and crisis management**.



Supporting Strategic Planning and Risk Modeling

Our forecasts aims to support organizations like **UNHCR, UNESCWA, UNDP, FAO, the German FFO, and the UK FCDO** in strategic planning and risk modeling.

We want to generate insights which organizations like these can rely on to better anticipate conflict risks and **respond more effectively to emerging crises**.

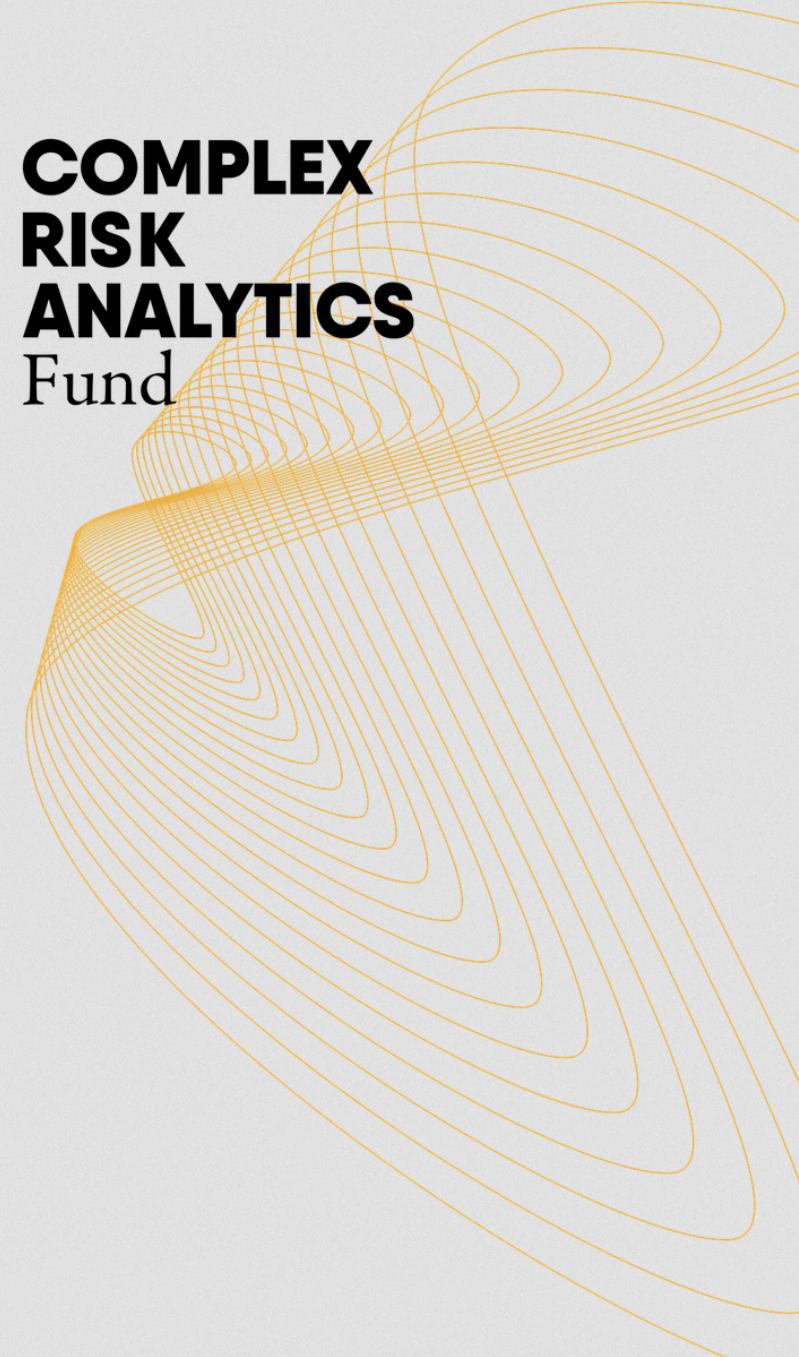


Partnership with Complex Risk Analytics Fund (CRAF'd)

As a key partner of **CRAF'd**, we contribute to a UN-led multilateral ecosystem that leverages interconnected data to save lives.

CRAF'd prevents duplication of efforts by **fostering collaboration and maximizing the value of technological advancements**.

**COMPLEX
RISK
ANALYTICS**
Fund



Achievements Since 2018

70+ conflict prediction datasets and **100+** papers/reports advancing conflict forecasting.

Hosted **2 global prediction challenges**, engaging research teams worldwide.

Published a **multilateral flagship report with UNHCR**, demonstrating the transformative potential of leveraging early warning for early action in the Sahel.

Written hundreds of thousands of (mostly well-documented) **open-source lines of code**.



The Future of VIEWS: *Scaling* Our Impact

Expanding Geographic Coverage: Expand forecasts beyond Africa and the Middle East to cover more conflict-prone regions worldwide, increasing the system's global applicability.

Leveraging Newswire Text: Better integration of newswire data to detect early signals of conflict and provide more timely forecasts of dynamic developments.

Integrating GIS and Satellite Imagery: Incorporate GIS data and satellite imagery to enhance geographic precision and track timely changes in conflict zones.



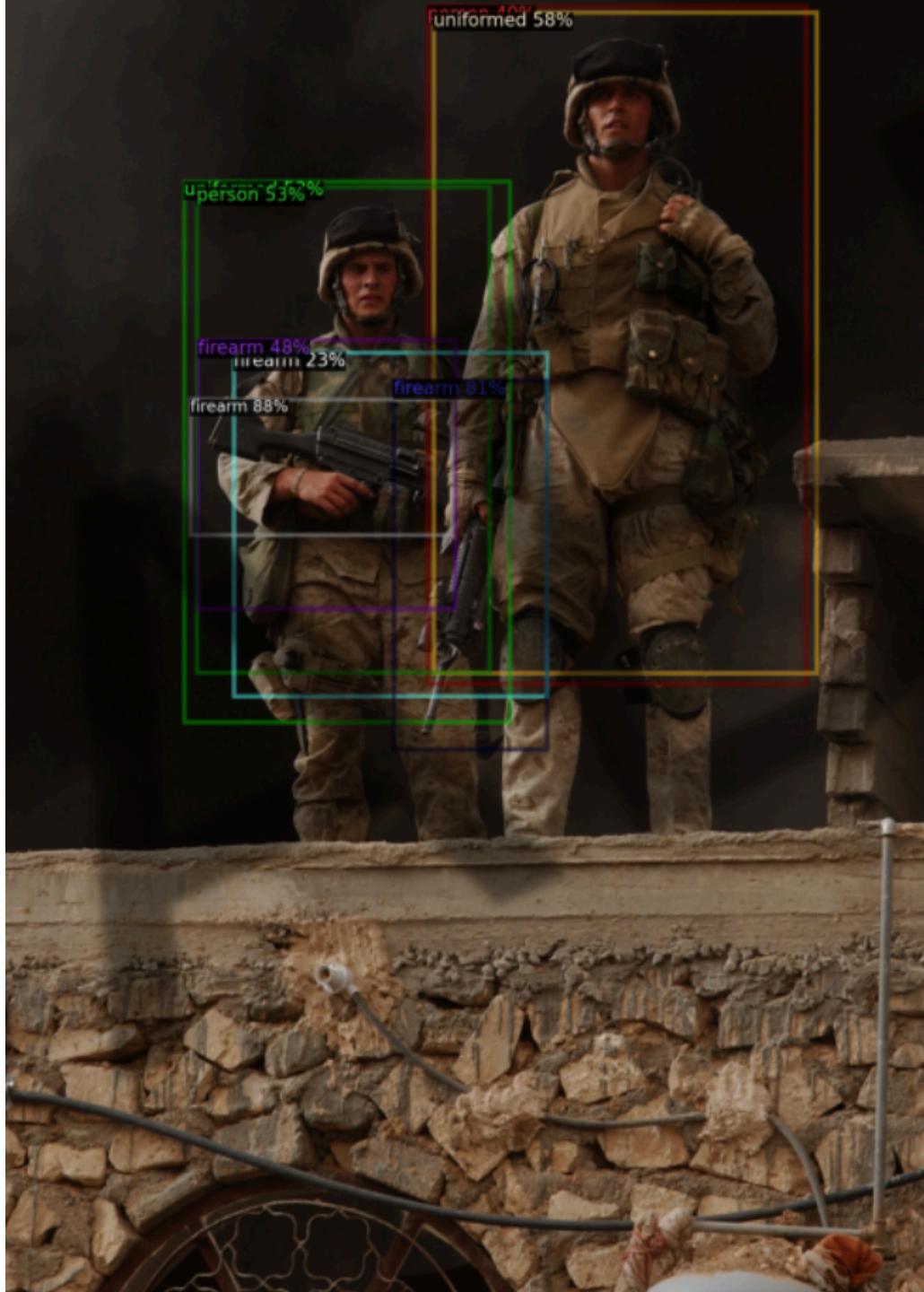
Actor-Based Forecasts: Introduce actor-specific forecasts to capture how different groups interact and contribute to conflict escalation.

Dynamic Escalation and De-Escalation

Patterns: Enhance the system's ability to track how conflicts escalate and de-escalate over time, providing more nuanced insights into conflict dynamics.

Forecasting Broader Impacts: Expand forecasting to include related humanitarian crises, such as food insecurity, migration, and public health risks.

Original image: Johan Spanner

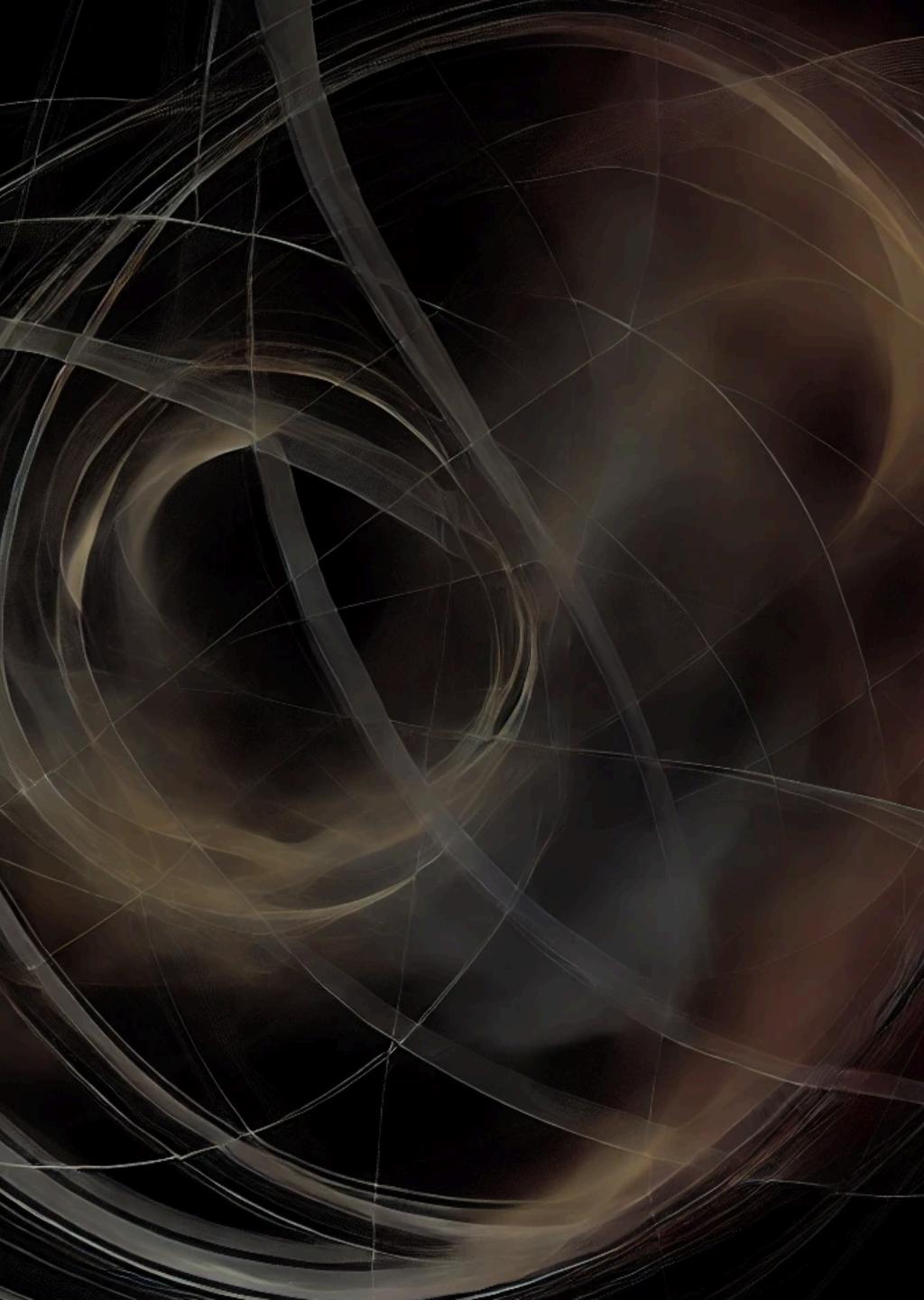


Explicit Modeling of Uncertainty: Improve the explicit modeling of uncertainty for both input data and forecasts, ensuring more reliable, actionable, and transparent predictions.

New Decision-Support Algorithms: Develop algorithms to help organizations allocate resources more effectively, based on evolving conflict risk assessments.

Developing Scenario-Based Planning

Tools: Offer tools that allow stakeholders to simulate different conflict scenarios and plan responses, improving preparedness.







Reach out!

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- 🌐 <https://viewsforecasting.org/>