CLARITY: Responsible AI for Climate-Linked Neuro-Health and Economic Risk in Vulnerable Workers

A governance-aware and human-centered AI framework developed through the interdisciplinary collaboration of Climate Risk Women Global.

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ABSTRACT

CLARITY is an interdisciplinary Responsible AI framework exploring how climate-health AI systems can support vulnerable worker populations during periods of elevated heat exposure within real-world institutional settings. The framework combines climate and environmental signals with neuro-health and labor-economic indicators to generate interpretable institutional risk insights that support preventive adaptation measures rather than individual surveillance or diagnosis.

The proposed pilot focuses on heat-related neurocognitive stress as a recurrent and actionable climate hazard, while incorporating air quality as a modifying factor where relevant. Intended outputs include a Neuro-Health Risk Index (NHRI), an Economic Risk Index (ERI), and lightweight decision-support interfaces such as dashboards and alert-based communication tools.

A central contribution of CLARITY is the integration of Responsible AI principles directly within deployment design through fairness-aware modeling, uncertainty communication, explainability, privacy-preserving governance, and human-in-the-loop oversight. Rather than prioritizing predictive complexity, the framework emphasizes interpretability, institutional usability, and worker protection.

The project contributes a governance-aware conceptual model for trustworthy climate-health AI deployment and highlights the role of interdisciplinary collaboration in building human-centered AI systems under climate stress conditions.

MOTIVATION

Climate-related heat exposure is increasingly associated with cognitive fatigue, productivity reduction, healthcare burden, and economic instability among vulnerable worker populations.

Existing approaches rarely integrate climate exposure, neuro-health vulnerability, labor-economic burden, and Responsible AI governance within a unified operational framework.

CLARITY proposes a biologically grounded and governance-aware Responsible AI framework capable of translating multimodal climate-health-economic signals into actionable institutional insight.

FRAMEWORK OVERVIEW

The CLARITY framework combines:

- Climate and environmental signals (temperature, humidity, heat index, air quality)
- Neuro-health indicators related to cognitive fatigue, heat-related neurocognitive stress, and functional burden
- Labor and economic indicators including productivity proxies and sickness absence

These multimodal signals are synthesized into interpretable institutional risk estimates supporting preventive adaptation and institutional decision-making.

SYSTEM ARCHITECTURE

Climate & Environmental Signals
↓
Neuro-Health & Economic Indicators
↓
Responsible AI Risk Layer
↓
Institutional Decision Support

RESPONSIBLE AI BY DESIGN

Responsible AI principles are embedded within the framework through:

- Interpretable and explainable modeling approaches
- Fairness assessment across worker subgroups
- Transparent uncertainty communication
- Privacy-preserving governance

- Human-in-the-loop oversight
- Explicit safeguards against worker surveillance or punitive use

INTERDISCIPLINARY NETWORK & TRANSLATIONAL ECOSYSTEM

CLARITY is developed through Climate Risk Women Global, an interdisciplinary international initiative connecting researchers working at the intersection of climate risk, neuroscience, economics, governance, and Responsible AI deployment.

KEYWORDS

Responsible AI, Climate AI, Neuro-health, Explainable AI, Human-Centered AI, Climate Risk, Decision Support Systems

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