Climate & Health

AI-Powered Localized Risk Forecasting Systems for Climate Change and Human Health

Climate change-related extreme weather events are increasing globally. In India, these occurrences severely impact public health, where locally relevant forecasts that factor in the effect of weather and climate conditions on health are not available.

Starting with extreme heat, ARTPARK is developing a deep-learning-based hyperlocal (locally relevant) risk forecasting system to assist decision-makers and heat-sensitive populations by integrating health data and evidence-based insights on heat-related impacts. The forecasting is aimed at enhancing the capacity to anticipate and prevent heat-related health threats, providing forecasts at sub-district levels with up to 10 days of lead time.

Jump to:

Recognition

- **Support from regional and national meteorology bodies including India Meteorological Department (IMD),** Indian Institute of Tropical Meteorology (IITM) Pune, Karnataka State Natural Disaster Monitoring Centre (KSNDMC) and Department of Health and Family Welfare, Government of Karnataka.
- **Commitment for grant support through Grand Challenges India** under the Department of Biotechnology - Biotechnology Industry Research Assistance Council (DBT-BIRAC) as well as support from ARTPARK funders for initiatives aimed at addressing climate-related health challenges.
- **Partnerships with leading health and community-focussed institutions** to establish sentinel sites across geographies, enabling us to generate comprehensive evidence that will enhance our initiatives.

Understanding the Problem

India is expected to experience high exposure to climate change-induced extreme heat events in the near future, which may contribute to heightened risks of heat-related health impacts and economic burdens. While existing forecasting systems provide valuable insights, they are limited to a 1-week horizon and operate at near-district levels.

In addition, the current definition of a heat wave is limited to temperature thresholds, and other meteorological parameters such as humidity, wind speed, unusual temperatures, and night temperature must also be considered to better understand heat-related discomfort. Other factors, such as acclimatization, social and demographic factors, and, importantly, health, are also overlooked.

The lack of integration of these diverse elements, which provide additional information and lead time, results in a gap in actionable risk guidance for decision-makers and heat-sensitive populations.

Designing the Solution

We are developing a deep-learning based heat-health warning system that will advance forecasting capabilities up to sub-district levels and extend the forecast period up to 10 days. In addition to incorporating other meteorological parameters, this risk forecasting will introduce health and socio-demographic parameters into the heat index that inform health systems, disaster management bodies and communities at large.

This pioneering initiative aims not only to integrate risk forecasting into existing communication channels but also to utilise innovative conversational AI tools in vernacular languages.

Eventually, we intend to enable building epidemiological models to predict heat-related health risks in diverse communities and occupations.

As part of our translational research efforts, this solution is designed to benefit the weather service agencies such as India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), Karnataka State Natural Disaster Monitoring Centre (KSNDMC), as well as research communities engaged in weather and climate-related initiatives, and public health initiatives, including epidemiological modelling.

Key Features

1. AI-driven localised, context-specific threshold-based forecasts and extended lead-times
2. Re-assess and adapt the heat index for the Indian context
3. Generate evidence through robust secondary and primary data collection through partners to inform models
4. Integration of health and social vulnerability data to AI-powered heat forecasts
5. Actionable, guidance-driven risk communication for decision-makers and communities

Implementation & Deployment

We plan to commence the work in the state of Karnataka by leveraging historical and weather station data from India Meteorological Department (IMD) and Karnataka State Natural Disaster Monitoring Centre (KSNDMC). Our objective is to build deep learning-based models to predict heat events at the sub-district level up to 10 days in advance. We will progressively introduce various meteorological parameters, as well as health and social factors, into these models.

With augmented scope, we intend to expand our geography to produce heat event forecasts in Karnataka and Tamil Nadu. We also plan to leverage rigorous health facility and community-based evidence from sentinel sites established in these states through our partners to inform our models and enhance risk communication.

Team

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