Project 4.3. Applying artificial intelligence methodologies to forecast climate-related complex emergencies and resulting population displacements

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Many of today's most distressing humanitarian emergencies are characterized by abrupt, large-scale displacement of populations, within or across international borders. Most of these cases are driven by natural disasters, armed conflict or ethnic cleansing campaigns, or a combination of these in so-called complex emergencies resulting from the concurrence of multiple forms of hazards. Natural disasters, armed conflict and ethnic cleansing are not random events that happen entirely out of the blue but follow some systematic patterns. Disastrous drought, for instance, results from deviations from ordinary patterns of precipitation and temperature that can be partially predicted some months in advance. Armed conflict occurs where political institutions are unable to cope with inter-group or inter-elite tensions, or where short-term economic gain provides incentives for elites to use violence to secure revenue streams. This project will use cutting-edge machine-learning methods, such as decision-tree classifiers and regressors, neural networks, or Bayesian networks (often referred to as artificial intelligence) to forecast complex emergencies and related migration flows, based on careful monitoring and modelling of the systematic drivers.

Method and material

The project will expand the machine-learning toolkit developed for the ViEWS system (http://views.pcr.uu.se) (Hegre et al. 2019) by adding two components. On the input side, it will include projections on the most destructive climate-related hazards such as drought in the form of probabilistic forecasts of potentially destabilizing weather events. On the output side, it will supplement the projections on UCDP-GED-based armed conflicts and violence against civilians (Sundberg and Melander 2013) already in ViEWS with projections on forced displacement/out-migration flows five years into the future. The project will formulate a set of models for how disasters, conflicts, cleansing and displacement/out-migration flows relate to each other, as well as how they relate to models for climate change and taking into account recent changes in the economic and institutional contexts in locations at risk. One challenge will be that currently available displacement datasets are often of excellent quality but restricted coverage. Some agencies, for instance, only cover natural disaster-driven displacements and some governments only report in-migration. Given that the sources overlap and are related, we will work to devise global/regional measurement models by various means, such as training machine-learning models on subsets with good data coverage and forecasting on others, and to work out measurement models and methods for feature learning (another branch of machine learning) in order to develop a pilot forecasting system.

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