

SATELLITE TECHNOLOGY SYSTEM TO Support Communities In High-Risk Flooding Areas



Ireland's Centre for Applied AI is using artificial intelligence and satellite technology to develop an early warning system for communities at risk of severe flooding. Researchers claim the model has the potential to provide local authorities with time to take emergency measures in limiting damage to homes and businesses, evacuate residents and protect livestock, ahead of periods of heavy rainfall.

Researchers used data collected by the European Space Agency's Sentinel-1 satellite to map historical flooding events in flood-prone areas of Ireland. The maps were then fed into an AI model designed to predict the extent of future flooding events in these areas.

The model is accurate, researchers say, up to approximately 20 metres. Areas which were studied as part of the project include Carrick-on-Shannon in Co. Leitrim, Middleton in Co. Cork, Athlone in Co. Westmeath, and Limerick City.



Dr Omid Memarian Sorkhabi, who led the development of the model, says that there's huge potential for it to be made available to local authorities and other research projects.

The flood prediction model forms part of CAMEO – the €9m project led by UCD to develop an Earth Observations (EO) services sector in Ireland and explore the potential impact of EO data in the areas of climate, agriculture, and the marine. The project is funded by the Department of Enterprise, Trade and Employment, and Enterprise Ireland under the Disruptive Technology Innovation Fund.

Many parts of Ireland have experienced significant flooding events in recent months, with flooding following Storm Ciarán, Storm Debbie, and Storm Babet badly affecting residents and businesses, in particular, in the west and south-west of the country.

CONSEQUENCES OF CLIMATE CHANGE

Flooding in Ireland is certain to worsen in the coming years due to climate change. According to environmental experts and researchers, increasing concentrations of greenhouse gas emissions in the atmosphere are now leading to more intense precipitation events during winter, worse floods in historically vulnerable areas, as well as in areas that never flooded previously.

The Irish Fiscal Advisory Council has warned that extreme flooding events resulting from climate change could cost the State around €500m each year by the

end of the decade. However, the report also estimates that a one-in-ten-year flooding event in Dublin could cost the Exchequer up to €2.9bn with more than 14,500 properties at risk.

Dr Omid Memarian Sorkhabi, the post-doctoral researcher leading the development of the model at Centre for Applied AI (CeADAR) monitored the Middleton flooding in real-time during Storm Babet (October 2023) with the Sentinel-1 satellite. It uses advanced radar technology to penetrate heavy cloud cover, measuring soil moisture and water



Dr Oisín Boydell, Director of Applied Research at CeADAR, said that the project has major implications for communities in high-risk flooding areas in Ireland.

Flood Protection System

bodies at any time of day and night.

Dr Sorkhabi says that the data will help refine the model and improve its accuracy. "Flooding events like the one that hit Middleton during Storm Babet are devastating for households and businessowners whose properties are worst affected. The silver lining is that Sentinel-1 was right over the area at the time. So, we have gathered a lot of valuable data that will help predict the extent of the next event and ensure that future damage is limited."

POTENTIAL FOR LOCAL AUTHORITIES

"We're in the process of developing, testing and validating the tool. However, there's huge potential for it to be made available to local authorities and other research projects. There is also a global scope to this. Sentinel-1 is always monitoring, so there's a lot of historical data on other parts of the world on which we could train and expand the model."

The Director of Applied Research at CeADAR said that the project has major implications for communities in areas at high risk of flooding in Ireland. "We've witnessed extensive flooding across the country in recent times and, with increasing greenhouse gas emissions certain to lead to more rapid climate change, we can expect even more intense precipitation events in the future," noted Dr Oisín Boydell.

He said that predicting when and where a flood will strike allows time to organise

mitigation measures, like preparing sandbags and evacuating people and livestock from certain areas. "Traditionally flood prediction and mapping would have been based on weather models and low-resolution elevation maps, whereas this one is very much data driven, based on events over the past decade and the current situation in a given area. This creates an accuracy level that's down to approximately 20 metres."

