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IPN to Enhance Extreme Weather Forecasting Models with Artificial Intelligence

- **The goal is to improve civil protection protocols in response to hurricanes, tornadoes, snowstorms, heavy rainfall, droughts, and extreme heat and cold, explains Leodegario Sansón Reyes, Coordinator of the Meteorological Engineering Program.**
- **AI will help reduce the processing time of weather prediction models, he adds.**

In response to the growing impact of climate change and the increasing frequency of extreme weather events, the Instituto Politécnico Nacional (IPN) will leverage Artificial Intelligence (AI) to strengthen weather forecasting models through its first generation of Meteorological Engineering students. The initiative aims to enhance civil protection protocols for hurricanes, tornadoes, blizzards, droughts, torrential rains, and extreme temperature events

Leodegario Sansón Reyes, coordinator of the Meteorological Engineering Program at the Escuela Superior de Ingeniería y Arquitectura (ESIA), Ticomán campus, emphasized that incorporating AI into the curriculum will enable future meteorologists to apply methods that significantly reduce the processing time of numerical models, allowing for faster and more accurate forecasts.

A faculty member at IPN for over 25 years, and trained at both the National Hurricane Center in Miami and the Center for Aeronautical Meteorological Analysis and Forecasting (part of Mexico's air navigation services under the Ministry of Infrastructure, Communications, and Transport), Sansón Reyes noted that IPN engineers would use AI to identify correlations between atmospheric indices and variables such as cloud formation and rainfall. This will enable the generation of localized forecasts and early warning alerts using radar and satellite technology.

As part of their hands-on coursework, students have analyzed recent weather phenomena that triggered heatwaves, heavy rainfall, and rapidly intensifying tropical cyclones in Mexico. One such event was the record rainfall on June 2 in central Mexico.

"We've also studied the structure and factors behind the rapid intensification of cyclones in the Pacific Ocean, some of which escalated from tropical storms to Category 3 hurricanes in a short time, such as Hurricane Erick, which affected the states of Oaxaca and Guerrero," he added.

A graduate of the Escuela Superior de Física y Matemáticas (ESFM), Sansón Reyes explained that the Meteorological Engineering program spans four years (eight semesters). "In the first semester, students take foundational courses in mathematics and physics, along with introductory meteorology subjects, including lab work on instrumentation and the creation of weather charts. In later semesters, the curriculum expands to include numerical modeling, programming, and AI. Before graduation, students are required to complete practical training in weather analysis and forecasting at Mexico's National Meteorological Service (SMN)," he said.

IPN is the first academic institution in Mexico to offer a degree in Meteorological Engineering. The program's first cohort consists of 20 students currently in their second semester. The curriculum is designed to meet the needs of the SMN and incorporates recommendations from the World Meteorological Organization (WMO).

Sansón Reyes concluded by underscoring the urgent need to revise the country's flood zone mapping methods to improve civil protection strategies and reduce the vulnerability of populations exposed to extreme weather events.

For more information, visit www.ipn.mx.

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