



## IPN Develops AI-Powered App to Help Prevent Forest Fires

- **Using datasets and neural networks, ESCOM students created a tool that enables authorities to identify high-risk areas and take preventive action before large-scale wildfires occur.**
- **By analyzing photographs, the application helps authorities prioritize intervention zones and implement preventive measures. The prototype has the potential to be deployed in protected natural areas across Mexico.**

Students from the School of Computing (ESCOM) at the Instituto Politécnico Nacional (IPN) have developed an Artificial Intelligence-powered web application capable of identifying and classifying areas at risk of forest fires before an emergency occurs. Designed to help protect El Tepozteco National Park in the state of Morelos, the tool aims to strengthen wildfire prevention through early risk detection.

The project was developed by Denys Monserrat Rodríguez Méndez, Mildred Valeria Lagunes Vázquez, Brisa María Lezama Tapia, and Aldo Díaz Martínez, under the supervision of José Asunción Enríquez Zárate, Ph.D.

Dr. Enríquez Zárate explained that the initiative evolved from an academic prototype into a minimum viable product with the potential to be implemented in other protected natural areas throughout the country. He noted that the application enables authorities to analyze photographs, identify priority areas requiring attention, and implement preventive actions—such as cleanup operations, vegetation management, or increased surveillance—before a wildfire breaks out.

Designed for desktop computers, the application aligns with the science and technology policies promoted by the administration of President Claudia Sheinbaum Pardo, as well as with the educational priorities established by Secretary of Public Education Mario Delgado Carrillo.

The project emerged from the need for preventive tools capable of reducing wildfire risks in El Tepozteco National Park, a protected natural area that faces severe wildfires every dry season, resulting in the loss of thousands of hectares of forest and threatening the



region's flora and fauna, including endemic species.

Unlike conventional systems that detect fires only after they have ignited, this application focuses on identifying hazardous conditions by analyzing images of the landscape before an emergency develops.

To achieve this, the research team built its Artificial Intelligence models from the ground up, including convolutional neural networks capable of processing structured visual data, as well as an autoencoder that evaluates vegetation conditions, detects anomalies, and classifies each area according to low, medium, or high wildfire risk.

The system—entitled "Prototype of a Web Application for the Early Prevention of Forest Fires Using Artificial Intelligence to Protect El Tepozteco National Park"—first verifies that uploaded photographs correspond to the protected area by analyzing their geographic metadata.

It then processes the visual information and combines it with real-time environmental variables such as temperature, humidity, and wind speed to generate a wildfire risk map that supports informed decision-making.

The platform features three user profiles: administrators, government authorities, and general users. This structure allows residents of nearby communities and park visitors to upload photographs of potentially hazardous areas, encouraging citizen participation while expanding monitoring capabilities across the park's more than 23,000 hectares.

To train the Artificial Intelligence models, the team created three original image datasets consisting of thousands of photographs collected from publicly available sources, digital repositories, and materials provided by environmental specialists in the region. Building these datasets represented one of the project's greatest technical challenges.

The project was carried out in collaboration with the municipality of Tepoztlán and environmental experts, who contributed their knowledge of the factors that increase wildfire risk, including the accumulation of combustible material, waste, dry vegetation, and human activity.

**For more information, visit [www.ipn.mx](http://www.ipn.mx)**

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