

# Wildfire Detection and Monitoring Using Satellite Remote Sensing

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## Project Description:

Fires used to be a natural phenomena that helped shape species distribution and assisted the natural evolution of ecosystems. However, in many regions of the world today, these are a result of increasing human pressure on the environment (in Europe, only 5% of forest fires are of natural cause). Human-made fires cause irreversible damage to fragile natural ecosystems and human assets. These are also a source of emissions into the atmosphere, and cause the loss of extensive carbon sinks in forests. Naturally, fires present a threat to populated regions or areas of high environmental value. Another type of fire that affects **public health** is the wildland fire. These are a complex combustion source with several categories of fuels and are defined by fire behavior that changes over time with the fuel and weather conditions. The smoke from wildfires is composed of hundreds of chemicals in gaseous, liquid, and solid forms that affect visibility. Some of the main concerns for land owners are the production of particulate matter from wildfires.

Satellite **remote sensing** is an efficient and economical way of monitoring fires and smoke plume over large areas on a routinely basis. Satellite observations can provide timely information on fire development and smoke plume trajectory. Remote sensing can help authorities make decisions regarding fire-fighting. Satellite remote sensing and **Geographic Information Systems (GISs)** provide distinct monitoring capabilities for different fire characteristics: areas that are dry and susceptible to wildfire outbreak, actively flaming and smoldering fires, burned areas, smoke and gas emissions. Several satellite systems are currently available for fire monitoring with different capacities in terms of spatial resolution, sensitivity, spectral bands, times, and frequencies of overpasses. This is very important since fires vary widely in size, duration, temperature, and in the tropics, where it is moist and humid, fires have a strong diurnal cycle. Lastly, the large extent of the area affected by the fire, the very dynamic nature of the process, and the low accessibility of many key fire regions, make satellite remote sensing an indispensable research and monitoring tool.

The student will make use of both satellite remote sensing and GIS software to study and track recent (over the last decade) wildfires in the United States and, if possible, quantify the damages (on public health and otherwise) associated with them. The satellites (and their respective instruments) that the student might use to monitor these wildfires include, but are not limited to: NOAA GOES (Imager), NOAA POES (AVHRR), Aqua (MODIS), and Terra (MODIS).