

# **Title: Super-Resolution: Can we extract Fine Features from a Low-Resolution image?**

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## **Abstract:**

The timely identification and accurate tracing of wildfires are crucial for the formulation and execution of effective management and mitigation of wildfires. However, acquiring high-resolution images in areas prone to disasters poses significant difficulties. The extreme heat conditions in these areas often impede the utilization of drones to capture close images of wildfire. Alternatively, securing high-resolution satellite images is notably obstructed by bandwidth constraints that severely hinder data transmission. This innovative study introduces an approach that combines advanced super-resolution technology with fire science research to enhance wildfire detection and analysis through improved environmental imaging. Initially developed for medical imaging, our project uses the Swin-FSR model, which employs Swin Transformers alongside spatial and depth-wise attention mechanisms. Swin-FSR's effectiveness is demonstrated through its impressive performance on three public Ophthalmological datasets (iChallenge-AMD, iChallenge-PM, and G1020) and a private dataset provided by NASA for SANS, achieving peak signal-to-noise ratios (PSNR) that surpass those of existing architectures. This showcases not only the technical prowess of the Swin-FSR model but also its potential to revolutionize how retinal diseases are diagnosed in challenging environments by ensuring that high-quality imaging data can be efficiently transmitted and analyzed, thus broadening the scope of early differential diagnosis and timely medical intervention. Hence, it can markedly improve the resolution of aerial and satellite images, essential for early and accurate detection, detailed mapping, and swift actions. Our Swin-FSR model has consistently demonstrated its ability to produce finely detailed images, which is crucial for fire research and analysis. The importance of this advancement is profound, driving the field of environmental science forward by showcasing the seamless integration of breakthrough AI with remote sensing tech for environmental surveillance.