Project TetreNet: Augmenting Wildfire Mitigation With Rapid-Scale Deployment of Low-Cost Nanosatellite Networks Driven By Computer Vision Analysis

Bichal, Abhinav (School: Lebanon Trail High School)
Chimalapati, Rohan (School: Lebanon Trail High School)
Sathish, Sarvesh (School: Texas Academy of Mathematics and Science)

As climate change transforms the world, it is essential to identify and counter global threats to the environment and its people - especially in the case of wildfires. On the rise over the past several decades, wildfires are becoming increasingly widespread and rampant. From the annual headlines over the California wildfire season to the millions of acres lost to the ongoing Amazon wildfires, society is in imminent need of solutions to control the propagation of deadly wildfires, yet many regions struggle to detect wildfires and often respond too late. Projections, real-time data, and instant communication are key factors for the mitigation of wildfires prevention and catastrophic damage. In response, the focus of Project TetraNet is to apply the statistical modeling of wildfire patterns into a novel, low-cost solution engineering example to monitor wildfires in real-time. Project TetraNet is enabled by a suborbital constellation of low-cost high altitude networks which apply semantic segmentation neural networks to track the spread and projections of wildfire patterns. The neural network is trained on NASA's MODIS satellite imagery in conjunction with self-generated data, atmospheric patterns, and heat flux indices to result in an 86% accuracy to predict wildfire patterns. The proposed system, therefore, proves to offer an advantage over geostationary satellite analysis with higher resolution data and accuracy, while also remaining highly applicable to developing regions that lack aerial and telecom infrastructure. In the fight against the global wildfire crisis, Project TetraNet offers a highly scalable and reliable solution to control premature and deadly wildfires to protect vulnerable populations and the environment.