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Crophealth Monitoring; Nutrient Monitoring

My group's research advances smart and sustainable indoor farming by developing automated, non-invasive monitoring systems and intelligent nutrient management solutions for hydroponic production. We created a hyperspectral-vision-based approach for the early detection of plant stresses—such as nutrient, water, and light deficiencies—enabling timely interventions and improving the efficiency of indoor vertical farms. We also developed a real-time, on-site nutrient monitoring system using laser-induced breakdown spectroscopy (LIBS) to precisely quantify key hydroponic nutrients, overcoming the limitations of conventional pH- and conductivity-based methods. Together, these innovations support autonomous hydroponic farming that improves yield quality, reduces resource waste, and enhances the sustainability and scalability of future food production systems.
