ANALYTICAL SEMINAR

Daniel Rumley

Graduate Student
L. Liu Group
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"Atomic-sized magnetic field sensors based on Nitrogen Vacancy centers in Diamond"

The nitrogen vacancy centers (NV center) is a defect in the diamond lattice with unique electronic properties. The NV center can be used as an atomic-sized sensor to detect various physical parameters such as magnetic fields with high spatial resolution and sensitivity. Sensors based on NV centers can operate under ambient conditions, making them well suited for many practical applications. One such application that will be discussed is the detection of magnetic fields produced by the electric activity of the heart.

ANALYTICAL SEMINAR

Abigail Smith

Graduate Student
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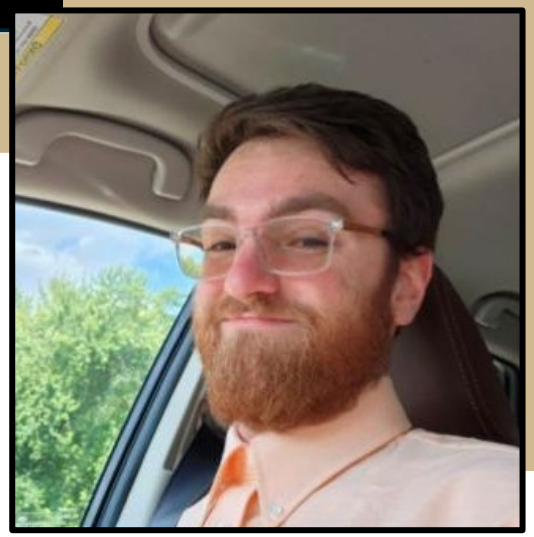
"Hyperspectral Imaging for the Conservation of Cultural Heritage"

Cultural heritage is the legacy of a group that is inherited from the past, encompassing both intangible and tangible aspects. Tangible artifacts, such as books, paintings, and monuments, are important for study and conservation, as they help pass on traditions and history. Yet issues such as armed conflict, environmental degradation, and deliberate destruction threaten their preservation. Cultural heritage science research has expanded in recent years due to advancements in non-invasive spectroscopic analytical techniques, such as XRF and XRD, for elemental and crystalline analysis. However, these techniques can be time-consuming when assessing chemical distributions over large areas. Hyperspectral imaging combines spectroscopy for chemical discrimination and imaging for spatial determination, allowing for the rapid mapping of molecular distributions. When using this technique in the IR spectral range, pigments and degradation products can be identified and localized on cultural heritage artifacts, supporting restoration and conservation efforts.

ANALYTICAL SEMINAR



Dominick Dotson

Graduate Student
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"Sniffing Out The Truth: Recent Advances in Electronic Nose-Based Chemical Sensing"

Electronic noses (e-noses) utilize sensor arrays and multivariate data analysis to detect and classify complex mixtures of volatile organic compounds. While e-noses offer advantages in speed and portability compared to separation-based techniques, they do come with drawbacks such as poor selectivity, sensor drift, and difficulty resolving complex or transient odor signals. Recent work has begun to address these limitations through advances in sensor design and data acquisition, including the development of a miniaturized, high-speed electronic nose capable of resolving transient odor signals and a biomimetic olfactory chip that dramatically increases sensor count and diversity through large-scale on-chip integration.