

Adaptive Hyper Inference for Enhanced Long-Range UAS Detection

Need/Problem

- Long-range detection accuracy impacts decision-making in airspace surveillance.
- Conventional models lose accuracy over distance, and waste computation on clear scenes. Detecting small, distant objects in low-visibility or complex weather, background clutter, remains challenging (low data diversity).
- Early identification of small objects significantly increases the available response window (Counter-UAS decision chain).

Concept

- **Adaptive hyper-inference** performs multiple adaptive inference operations
- Guided by image content and context.
- Balances detection accuracy with computational efficiency.

Data/Facility

- Building a diverse dataset combining real and synthetic imagery (small distanced UASs).
- Synthetic datasets includes low-visibility conditions (fog, haze, snow, and night scenes).



Objective

- Accurately detect **small objects from long distances** using camera imagery under variable visibility.
- Detect UAS at long ranges at operationally relevant times
- Recognize small objects using camera (e.g. UAS vs Birds)

Advancement

- Collecting datasets to expand coverage of challenging environments and small distanced UASs.

End Users

- Transportation safety and Airspace monitoring agencies.
- Autonomous and assisted vehicle systems.
- Defense stakeholders