

## S&T Campaign: Information Sciences System Intelligence and Intelligent Systems

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### Research Objective

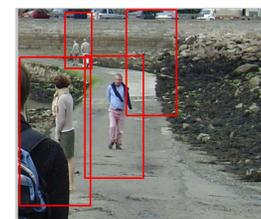
- Achieve robust human detection with minimal training.
- Benefits:
  - Navigation of intelligent systems in the presence of humans. Facilitating human-robot teaming efforts.
  - Preprocessing for further exploitation (activity recognition).



### ARL Facilities and Capabilities Available to Support Collaborative Research

- A variety of sensors available for data collection including visible, LWIR, and hyperspectral VNIR/SWIR cameras.
- Various custom-built computing platforms and software packages to support experimentation.
- Publication – P. Gurram, S. Hu, C. Reale, and A. Chan, "Unsupervised Pedestrian Detection using Support Vector Data Description," Proc. SPIE Defense, Security and Sensing (DSS) Symposium, Baltimore, April 2013.

#### Initial Results



### Challenges

- Current pedestrian detectors are all supervised methods
  - Require large and diverse training datasets.
  - Require long training time.
- Operational environments are diverse and complex
  - Extensive training data may not be available (especially for military scenarios).
  - Detrimental to the robustness of supervised techniques.
- Perform unsupervised pedestrian detection
  - Detect humans in an image as anomalies, while modeling the rest of the image as normalcy class using Support Vector Data Description (SVDD) method.
- Reduce the number of false alarms by evaluating and improving the features used in the algorithm.
- Extend the algorithm for pose-independent human detection and early action assessment.

### Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Internships and Post-doctoral positions available for candidates with expertise in computer vision (CV):
  - Development of classification and detection algorithms.
  - Extraction of relevant features to improve detection performance and reduce false alarm rate.
  - Optimization and fast implementation of CV algorithms.
- New datasets collected in scenarios exhibiting large variations to test the human detection algorithm.

#### Block Diagram

