IARPA SINTRA Lightning Talk
Kitware, Inc.

Website: https://kitware.com/expertise

Dr. Scott McCloskey
Assistant Director of Computer Vision
scott.mccloskey@kitware.com
Kitware Company Overview

- **Open-source software R&D**: algorithms & applications, image & data analysis, training data, integration, & testing
- **202 employees**: ½ PhD, ¼ masters
- **Offices**: Albany, NY; Chapel Hill, NC; Santa Fe, NM; Arlington, VA, Minneapolis, MN; Lyon, France
- **Secure facility**: Albany, NY; 44+ cleared personnel, SCI clearances

Commercial and Government Business Models

- **Commercial: 10% of Revenue**
  - Efficient commercial contract process
  - Commercial business models to suit commercial business needs
- **Government: 90% of Revenue**
  - Efficient government contract process
  - All government-funded software is provided with unlimited rights to the government
  - Software released as open source when permitted

100% Employee Owned
Relevant Experience

Established leader in computer vision and ML R&D for IC and military applications, including 3D vision

- **Extensive CV and ML expertise**
  - 30+ PhDs, 14 years
  - $70M+ in CV/ML R&D contracts from DOD and IC

- **Program Experience**
  - Prime on IARPA SMART, BRIAR, DIVA, CORE3D; DARPA URSA, SemaFor, MediFor, SAIL-ON
  - Multiple SBIRs and programs using event-based sensing: IARPA, AFRL, MDA

- **Data Focus**
  - Satellite imagery, UAV video, and surveillance video
  - Collection, curation, and annotation of large datasets

- **Open IP Business Model**
  - Kitware delivers all program-developed software and algorithms to the government with unlimited rights.
Detecting Subtle Motion Signatures

- Spatio-temporal deep learning approach, applicable to many sensor modalities
- Temporal gradients (3D convolutions) are critical for detecting movers that are not evident in a single frame
- 3D Sliding Window: each window predicts probability the center pixel is a mover
- Successfully applied to sub-pixel movers in OPIR, improving PD by 10X at same FAR vs. traditional approaches
Event Cameras for High-speed Imaging with Low Data Rates and Power Consumption

What does a meteor look like to a(n)...?

Low-speed Framing Camera

- Low-contrast smear on a dark background, with ambiguities:
  - Direction of travel
  - Infinite combinations of velocity and brightness that result in the same image.
  - Lots of temporal aliasing

High-speed Framing Camera

- Captures phenomenological details, but at high cost in terms of power and data storage.
- Downstream analytics struggle with:
  - Low SNR
  - High data volume
  - Low spatial resolution

Event Camera

- Captured in sparse, small event stream.
- High temporal resolution resolves ambiguities around direction and brightness/speed.
- Fast temporal response captures phenomenology.
Teaming Pursuits

<Tentative - subject to BAA details>

Looking to subcontract on a team with:

- a platform and integration experience for space applications and
- complementary sensing approaches.