• Name of Organization: Kitware, Inc.
• Lead Investigator: Dr. Anthony Hoogs, Senior Director of Computer Vision
• Current Team Members:
  – Computer scientists and engineers from the Kitware Computer Vision group
  – In discussion with various universities
  – Looking for industry partners
Research Areas

- Detecting new construction and classifying into one of the target classes (7 in BAA)
  - With few exemplars
- Detecting the phase of construction
  - Temporal process modeling with intermittent, multi-modal observations
- Efficiently operating at global scales

*Intra-class variation*

Confusers

- Midland, TX
- Bakersfield, CA
- Scranton, PA
- Cave Creek, AZ
- Cantua Creek, CA
- Saluda, SC
- Residential clearing
- Tower on mountain side
- Construction site
AFRL/NGA VIGILANT program
- Object-level change detection
- Semantic map change detection
- Optimized, small network for satellite imagery analytics
- Training on few exemplars by augmenting with DIRSIG simulated imagery
- Running on a cubesat with a TX2
- Installed at NGA-R for 2+ years

Image Enhancement for improved detection
- Input Planet
- Super Resolved Planet

SOCOM Urban 3D Challenge
Ranked 10th; top in USA

Patch-based Search with Interactive Query Refinement

Cyan: detected instance
Red: missed instance
Magenta: false positive

Unique Qualifications and Capabilities

Helicopter Change Detection

<table>
<thead>
<tr>
<th>Model</th>
<th>mAP</th>
<th>Billion</th>
<th>Million</th>
<th>Parameters</th>
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<tr>
<td>VGG</td>
<td>25.7%</td>
<td>149.6</td>
<td>138.5</td>
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<tr>
<td>Inception V2</td>
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<td>MobileNet</td>
<td>19.8%</td>
<td>30.5</td>
<td>6.1</td>
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Teaming

• Kitware may prime a proposal, or join a team(s) as sub
• As a prime, Kitware would look for universities and companies with specific expertise
  – Atmospheric correction and radiometry
  – Cloud detection
  – New construction domain expertise
• As a sub, Kitware offers:
  – Advanced, state-of-the-art change detection algorithms
  – Deep learning expertise in network design, anomaly detection, learning with few labels, interactive learning
  – Multi-modal image registration
• Kitware has substantial prior experience with IARPA and DARPA
  – Prime on IARPA CORE3D, ALADDIN
  – T&E support contractor on IARPA DIVA
  – Prime on DARPA Medifor, Squad-X Core Technologies, PerSEAS, VIRAT; major roles on Explainable AI, Urban Reconnaissance through Supervised Autonomy, Learning with Less Labels, PPAML, Memex, XDATA
Contact Information

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