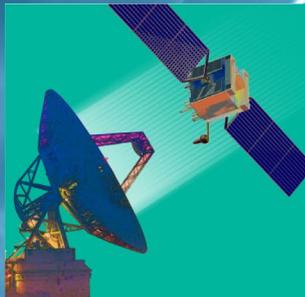


Working Group Session 11E Outbrief



Ground System Architectures Workshop Opportunities in Data Exploitation

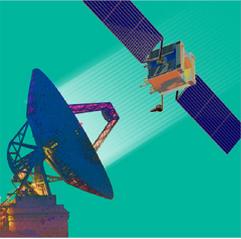
March 2–5, 2020 | Renaissance Los Angeles Airport Hotel

Intelligent Systems / Machine Learning for Space Ground Systems

*Leads:
Jon Neff and Dan Balderston,
The Aerospace Corporation*

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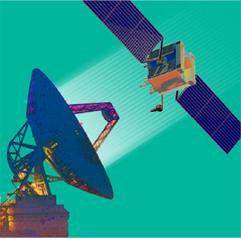


Ground System Architectures Workshop

Session Goals

- The “Intelligent Systems / Machine Learning for Space Ground Systems” working group seeks to identify and demystify where intelligent systems and machine learning currently exist in space ground systems, discover what emerging capabilities are being developed in the community, and to capture real-world impediments for adoption, and how intelligent systems/machine learning has advanced space systems resilience. It will explore deeper the questions of:
- Where do intelligent systems and machine learning currently exist in space ground systems?
 - *What elements of space ground systems are suited to intelligent systems and machine learning*
 - *What emerging capabilities and technologies are being developed in the community*
 - *What are real-world impediments for adoption*
 - *What capability and technology gaps exist and might seed further research and investment*
- The Working Group will explore 4 domains:
 1. *Space Operations*
 2. *Mission Tasking and Resource Management*
 3. *Mission Data Processing*
 4. *Space Enterprise Management*

Working Group Session 11E

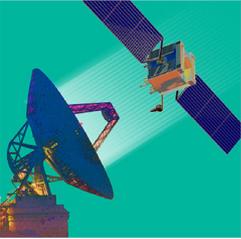


Ground System Architectures Workshop

Presenters/Panelists

- “Recap of GSAW 2019 IS/ML WG” - *Dan Balderston (The Aerospace Corporation)*
- “Automated Data Accountability for Mars Science Lab” - *Brian Kahovec (JPL)*
- “Detection and Reporting Preparation to Support JPSS-2” - *Jon Neff (The Aerospace Corporation)*
- “ASRC Federal” - *John Donohue (ASRC Federal)*
- “HSI Data Analytics- False Positive Mitigation” - *Andrew Brethorst (The Aerospace Corporation)*
- “Smart Systems for Space Operations” - *Garrett Brown (Raytheon)*
- “BrainBlocks” - *Jacob Everist (The Aerospace Corporation)*
- Panel Discussion
 - *Jon Neff, John Donohue, Garrett Brown, Jacob Everist, Phil Feldman*

Working Group Session 11E

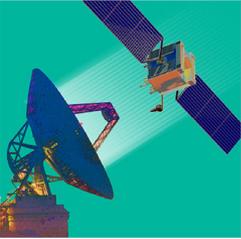


Ground System Architectures Workshop

Key Points

- Data access, annotation, cleansing are large drivers
 - *8 of 10 projects stalled by data problems*
 - *Training sets, reduce false positives*
- Data pipeline architectures emerging as essential element
- It's more a TB problem than a GB, PB problem
- Neural Nets are prevalent approach
 - *Also clustering, intelligent agents, HTM, statistical methods*
- Explosion in data volumes, availability (HSI sensors, JPSS)
- Increasingly complex systems require increasingly simple User Experience (UX)
- Impediments: Data, trust, cost, risk, lack of understanding, less cultural
- Biological neural model successes (HTM)

Working Group Session 11E



Ground System Architectures Workshop

Conclusions

- Anomaly detection and diagnosis are group's near-term prize
- Ground evolution to incorporate IS/ML is practical, feasible, precedented
- Awareness, acceptance growing rapidly
 - *Cultural resistance is vanishing*
- Value must be clear, understandable for advocacy

- IS/ML for Ground Systems is inevitable
 - *Not “Big Hammer” for all problems, but soon ubiquitous like iPhones*