



Multimedia Forensics Authentication for Analysts

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NATIONAL GEOSPATIAL **NGA** INTELLIGENCE AGENCY

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Multimedia Forensics Authentication

- **Multimedia**
 - Images – both aerial and hand held
 - Video –news and other sources
- **Forensics**
 - Establishing the facts or genuineness
 - Semantic Forensics – looking for the differences...
- **Authentication**
 - Confirmation of the result
- **Who: The Authentication Steering Committee**
 - Drawn from all members of the IC – NGA, NSA, DIA, CIA, NGIC, etc.
 - Collaborative effort to understand all forms of media manipulation
- **Issues discussed (not all, but some)**
 - Image manipulation
 - Sources of images
 - Manipulation
 - Steganography (hidden messages in image files)
 - Video surveillance use of AI to predict behavior
 - Other topics (imagery related, of course)

Multimedia Forensics Authentication

- Definition of Semantic Forensics:

The Semantic Forensics (SemaFor) program will develop technologies to automatically detect, attribute, and characterize falsified, multi-modal media assets (e.g., text, audio, image, video) to defend against large-scale, automated disinformation attacks. Statistical detection techniques have been successful, but media generation and manipulation technology are advancing rapidly. Purely statistical detection methods are quickly becoming insufficient for detecting falsified media assets. Detection techniques that rely on statistical fingerprints can often be fooled with limited additional resources (algorithm development, data, or compute). However, existing automated media generation and manipulation algorithms are heavily reliant on purely data driven approaches and are prone to making semantic errors. For example, GAN-generated faces may have semantic inconsistencies such as mismatched earrings. These semantic failures provide an opportunity for defenders to gain an asymmetric advantage. A comprehensive suite of semantic inconsistency detectors would dramatically increase the burden on media falsifiers, requiring the creators of falsified media to get every semantic detail correct, while defenders only need to find one, or a very few, inconsistencies.

– – DARPA SemaFor BAA - HR001119S0085.

What ATS would use MFA for

- Authentication of images prior to processing(e.g. taking measurements)
- A Famous manipulated image:



- Perform simple rectifications:
Go from this:



To this:



- But watch out! The manipulated image may no longer be measured accurately due to the destruction of the perspective projection.

SemaFor (Semantic Forensics Program)

(as shown in GitLab)

The screenshot displays the SemaFor GitLab group page. The left sidebar contains navigation links: Group overview, Details, Activity, Issues (189), Merge Requests (37), Packages & Registries, and Members. The main content area shows the SemaFor group details, including the group ID (7) and a 'Request Access' button. Below this, a preview of a Confluence page titled 'Resources (Platform and API)' is shown. The Confluence page lists various resources and code examples.

SemaFor Semantic Forensics

Projects ▾ Groups ▾ More ▾

Search or jump to...

SemaFor Details

Group ID: 7 | [Request Access](#)

Global semafor group

Subgroups and Spaces

- Pages
- Blog
- SPACE SHORTCUTS
 - Meeting notes
 - File lists
- PAGE TREE
 - Program Information
 - Meetings
 - Working Groups
 - Resources (Platform and API)**
 - Data/Eval
 - EvidenceGraph OpenAPI Specification
 - Internet Access During Analysis
 - Latest Versions
 - SemaFor News Sources
 - Resources (Data)
 - Performer Teams
- Space tools

Resources (Platform and API)

Created by Tom Damiano (LMCO), last modified on Nov 19, 2020

- Data/Eval
- EvidenceGraph OpenAPI Specification
- Internet Access During Analysis
- Latest Versions
- SemaFor News Sources

Code Examples

- Abstract class for containerized component.
- Analytic Input: Artifact Graph (AG) and Messages
- Analytic Output: Evidence Graph (EG)
- Test-harness for analytic development environment

Analytic API

- Analytics API - This is the API that containerized analytics will serve via the Service Library
- Guide: Developing a SemaFor Component
- Evidence Graph OpenAPI Specification (for review)
- Artifact Graph OpenAPI Specification (for review)

Ontology

Also see [Ontology WG page](#)

- Ontology Scope Screenshot (for review)

Analytic Components

The group containing all of the published analytic components

SemaFor

- Semantic Forensics
 - Grew out of the MediFor program (Media Forensics)
 - MediFor at the end of it's contractual life
 - Will produce a usable code for determining media manipulation of images
 - SemaFor expansion
 - Looking for manipulated images and videos
 - More universities and people involved
 - Possibly more apps or code for use by the IC

Q & A

