

# In Video Veritas – Verification of Social Media Video Content for the News Industry



IEEE Workshop on Information Forensics and Security  
**#WIFS2017**

**A state of the art in journalism about fake image and  
video detection**

Denis Teyssou, Agence France-Presse



@InVID\_EU @dteyssou

Rennes, December 5th 2017

[www.invid-project.eu](http://www.invid-project.eu)

# Despite this old definition of journalism



Journalism - a profession whose business it is to explain to others what it personally does not understand.

— *Alfred Harmsworth* —

AZ QUOTES

[https://en.wikipedia.org/wiki/Alfred\\_Harmsworth,\\_1st\\_Viscount\\_Northcliffe](https://en.wikipedia.org/wiki/Alfred_Harmsworth,_1st_Viscount_Northcliffe)

$$\hat{f}(\xi) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \xi} dx,$$

for any real number  $\xi$ .



Joseph Fourier

# Dilemma: digital forensic or in depth post-mortem analysis?



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The New York Times

TIMES INSIDER

## The Times Uses Forensic Mapping to Verify a Syrian Chemical Attack

By MALACHY BROWNE MAY 1, 2017

**CONFLICT IN SYRIA** | By MALACHY BROWNE, NATALIE RENEAU and MARK SCHEFFLER | 7:08  
How Syria and Russia Spun a Chemical Strike

A New York Times investigation shows how Syria and its main partner, Russia, have distorted the facts surrounding the chemical weapons attack on Khan Sheikhoun. By MALACHY BROWNE, NATALIE RENEAU and MARK SCHEFFLER on April 26, 2017.  
[Watch in Times Video »](#)

[f](#) [t](#) [Embed](#)

<https://www.nytimes.com/2017/05/01/insider/the-times-uses-forensic-mapping-to-verify-a-syrian-chemical-attack.html>

[HOME](#) [SEARCH](#)

The New York Times

TIMES INSIDER

## Reporting on Las Vegas, Pixel by Pixel

By MALACHY BROWNE OCT. 23, 2017

10:00 P.M. | 10 Minutes. 12 Gunfire Bursts. 30 Videos. Mapping the Las Vegas Massacre.  
By MALACHY BROWNE, DREW JORDAN, NICOLE FINEMAN and CHRIS CIRILLO

FIRING LOCATIONS  
STAGE  
CROWD

1:31 11:00 CC HD

[f](#) [t](#) [Embed](#)

The shots began at 10:05. Twelve bursts of gunfire later, the police broke down Stephen Paddock's door at the Mandalay Bay. The Times mapped 30 videos to draw perhaps the most complete picture to date of what happened. By MALACHY BROWNE, DREW JORDAN, NICOLE FINEMAN and CHRIS CIRILLO on October 21, 2017. [Watch in Times Video »](#)

<https://www.nytimes.com/2017/10/23/insider/reporting-on-las-vegas-pixel-by-pixel.html>

M

Sign in

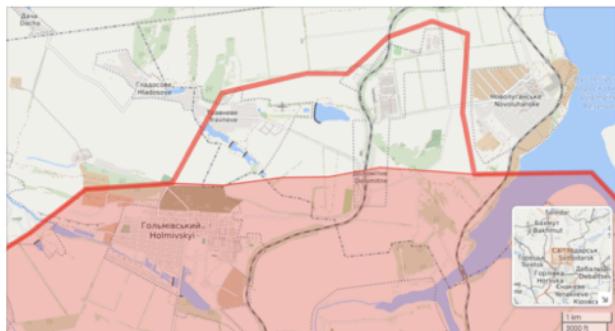
Get started



Digital Forensic Research Lab  
@AtlanticCouncil's DFLab

DEMOCRACY TECHNOLOGY SECURITY #DIGITALSHERLOCKS EDITORIAL | ABOUT

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## Changes in the Line of Contact in the Donbas

Territorial changes in the war in eastern Ukraine

@DFRLab  
Dec 4



### #PutinAtWar: New Russian Anti-Ballistic Missile

A brief look into Russia's newly introduced PRS-1M interceptor missile

@DFRLab  
Dec 1



### #PutinAtWar: Civilian Casualties in Ash Sha'Fah

A closer look into official Russia's military claims about bombings in eastern Syria

@DFRLab  
Dec 1



### Military Engagement at the Petrivske Disengagement Area

Military positions in and around civilian areas in eastern Ukraine

@DFRLab  
Nov 30

<https://medium.com/dfrlab>

bellingcat

the home of online investigations

MENA Russia Syria

## The Russian Ministry of Defence Publishes Screenshots of Computer Games as Evidence of US Collusion with ISIS

November 14, 2017 By Eliot Higgins

Translations: Русский

On the morning of November 14th 2017 the Russian Ministry of Defence published multiple posts in Russian, Arabic, and English on their [Twitter](#) and [Facebook](#) accounts, claiming to show “irrefutable evidence” of collusion between the US and ISIS combat units:



Минобороны России  @mod\_russia

Follow

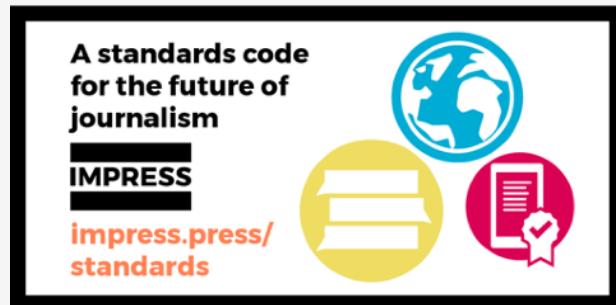
#Russian\_Mod shows irrefutable evidence that #US are actually covering ISIS combat units to recover their combat capabilities, redeploy, and use them to promote American interests in Middle East  
[s.mil.ru/2mqaz3S](http://s.mil.ru/2mqaz3S)

ISIS automobile convoy leaves Abu Kamal for Syrian-Iraqi border (November 9, 2017)

ISIS automobile convoy leaves Abu Kamal for Syrian-Iraqi border (November 9, 2017)



Eliot Higgins is the founder of Bellingcat and the Brown Moses Blog. Eliot focuses on the weapons used in the conflict in Syria, and open source investigation tools and techniques.



A standards code for the future of journalism

IMPRESS

impress.press/standards

bellingcat

the home

UK & Europe MH17 Russia Ukraine

## MH17 – Forensic Analysis of Satellite Images Released by the Russian Ministry of Defence

May 31, 2015 By Bellingcat Investigation Team

In [this new report](#) Bellingcat examines satellite images released by the Russian Ministry of Defence as part of the July 21st 2014 press conference on the downing of Flight MH17.

The Russian MoD stated at the press conference that the satellite photos show the activities of Ukraine's air defences on the day that Flight MH17 was shot down. In particular, the position of two Ukrainian Buk missile launchers south of the village Zaroschinskoie were shown to be within firing range of MH17. The Bellingcat investigation has found the following –

- Satellite images presented by the Russian Ministry of Defence claiming to show Ukrainian Buks linked to the downing of MH17 on July 14th and 17th are in fact older images from June 2014.
- The discrepancies visible in the Russian MoD satellite map imagery which shows they are incorrectly dated are visible in publicly available imagery on Google Earth.

<https://www.bellingcat.com/>

# Bellingcat's digital forensics tools guide



Bellingcat's Digital Forensics Tools

Fichier Édition Affichage Insertion Format Outils Tableau Modules complémentaires Aide

100% Normal Arial 9 B I U A

## Bellingcat's Digital Forensics Tools

### A List of Open Source Verification and Investigation Tools and Methods

Hello, welcome to [Bellingcat's](#) openly and freely available digital list of tools and methods we use during our open source investigations. You can follow our work on our [website](#), [Twitter](#) and [Facebook](#). **Feel free to suggest tools not yet listed here!** This is version 2.5 (December 1, 2017).

The list includes satellite and mapping services, tools for verifying photos and videos, websites to archive hyperlinks, and much more. The list is long, and may seem daunting. There are guides at the end of the document, highlighting the methods and use of these tools in further detail. We also provide tailored digital forensics workshops.

Currently, I'm trying to find a better way to thematically structure this list and I'm working on a more extensive guide with simple case-studies to the tools we use most. This will be an openly available and digital guide in English and hopefully Arabic too. I will share a link here once it is published. Feel free to contact me with questions or suggestions via e-mail ([christiaantriebert@bellingcat.com](mailto:christiaantriebert@bellingcat.com)) or Twitter (@[trptc](#)).

Maps, Satellites & Streetview				
Name	Description	Pros	Cons	Link
Bing Maps	Microsoft satellite and mapping service.	More recent and higher resolution imagery than Google, e.g. in Iraq.	Difficult to check the date of the imagery ( <a href="#">this tool</a> doesn't work anymore)	<a href="http://bing.com/maps">bing.com/maps</a>
converting coordinates	Convert geographic coordinates between different notation			<a href="http://synnatschke.de/geo-tools/coordinate-converter.php">sennatschke.de/geo-tools/coordinate-converter.php</a>

<https://goo.gl/tJMTdi>

# Bellingcat's digital forensics tools guide



Bellingcat's Digital Forensics Tools

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Images, Videos and Metadata

Name	Description	Pros	Cons	Link	Guides
<b>Amnesty YouTube Dataviewer</b>	Reverse image (video still) search and exact uploading time.		Searches for a number of still, not each frame is included (thus results may be left out).	<a href="http://amnestyusa.org/sites/default/custom-scripts/citizenvideoncne">amnestyusa.org/sites/default/custom-scripts/citizenvideoncne</a>	<a href="#">Advanced Guide on Verifying Video Content</a>
<b>Exiftool</b>	Read and manipulate metadata for a vast number of file types. Note: no GUI	Floss, Cross platform and very easy to integrate in scripts.	Yet to encounter any (Have only used on GNU/Linux).	<a href="https://www.sno.phy.queensu.ca/~phil/exiftool/">https://www.sno.phy.queensu.ca/~phil/exiftool/</a>	See forum and FAQ on linked page
<b>Foca</b>	Extract metadata.	Windows based, open sourced 2017.	No native linux support.	<a href="http://elevenpaths.com/labstools/foca/index.html">elevenpaths.com/labstools/foca/index.html</a>	<a href="#">NullByte</a>
<b>FotoForensics</b>	Image forensics tool.	Simple, web based.	Public access, information not private.	<a href="http://fotoforensics.com">fotoforensics.com</a>	
<b>GooFile</b>	Extract metadata.	Simple to use.	Doesn't work well outside Kali	<a href="http://tools.kali.org/information-gathering/gofile">tools.kali.org/information-gathering/gofile</a>	<a href="#">Ascii cinema</a>
<b>Image Forensics</b>	Web based image forensics tool.	Can easily identify fake or doctored images	Public access, information not private.	<a href="http://29a.ch/photo-forensics/#level-sweep">29a.ch/photo-forensics/#level-sweep</a>	
<b>InVID</b>	Verification plugin to help journalists verify images and videos <a href="#">Contextual</a>			<a href="http://invid-project.eu/plugins_for_Chrome_Firefox_(Windows_Mac).">invid-project.eu (plugins for Chrome, Firefox (Windows Mac))</a>	<a href="https://www.youtube.com/watch?v=nmgBFODPIBY">https://www.youtube.com/watch?v=nmgBFODPIBY</a>

## First Draft launches its online verification training course



by: First Draft

Date: October 11, 2017

4 mins



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Tags: About First Draft, training, verification

Our new course teaches students how to verify photos or videos online so they don't fall for hoaxes, rumors and misinformation in their reporting



First Draft is dedicated to improving skills and standards in the reporting and sharing of information that emerges online

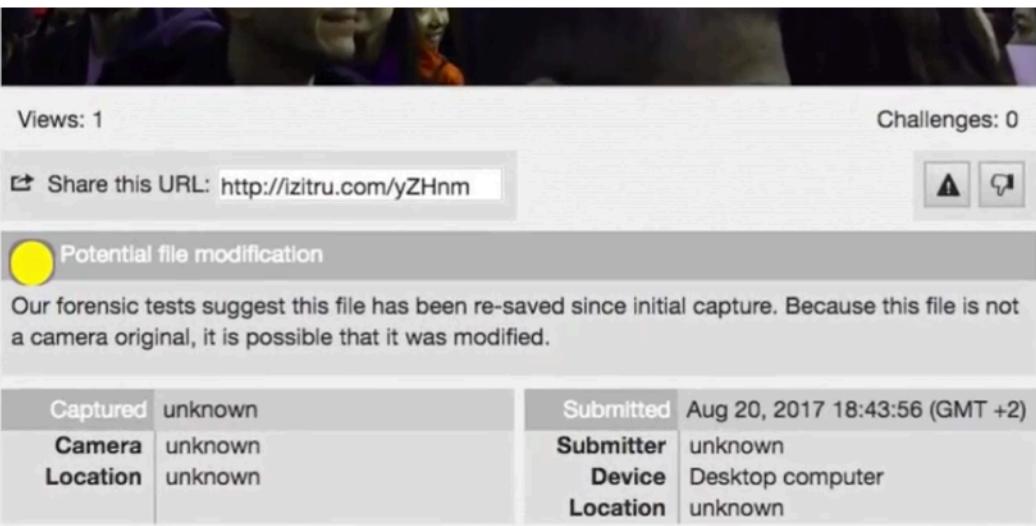


<https://firstdraftnews.com/>

# An example with an Izitru tutorial



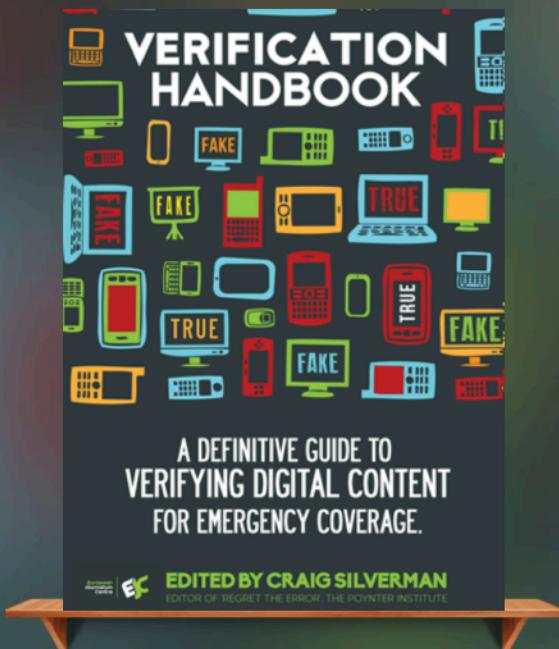
## FIRST DRAFT

[HOME](#)[PROJECTS](#)[RESOURCES](#)[ABOUT](#)[TOPICS](#)[Resource Catalog >](#)

A screenshot of an Izitru resource catalog card. At the top is a thumbnail image of a group of people. Below it are two status indicators: "Views: 1" and "Challenges: 0". A "Share this URL" button with the link <http://izitru.com/yZHnm> is present. A yellow circular icon indicates a "Potential file modification". A note states: "Our forensic tests suggest this file has been re-saved since initial capture. Because this file is not a camera original, it is possible that it was modified." Below this are two tables of metadata:

Captured	unknown	Submitted	Aug 20, 2017 18:43:56 (GMT +2)
Camera Location	unknown unknown	Submitter Device Location	unknown Desktop computer unknown

## VERIFICATION HANDBOOK



NEW

VERIFICATION HANDBOOK  
FOR INVESTIGATIVE REPORTING

[Click here to download the PDF version](#)

Also available in **Arabic** (العربية), **Macedonian**, **Russian** and **Turkish**.

## A definitive guide to verifying digital content for emergency coverage

Authored by leading journalists from the BBC, Storyful, ABC, Digital First Media and other verification experts, the Verification Handbook is a groundbreaking new resource for journalists and aid providers. It provides the tools, techniques and step-by-step guidelines for how to deal with user-generated content (UGC) during emergencies.

[Read the book](#) [Buy the book](#)

Or directly download the [PDF](#), [ePub](#) or [Kindle](#) version.

Available in **Greek!** ([PDF](#), [ePub](#) or [Kindle](#))

Available in **French!** ([PDF](#), [ePub](#) or [Kindle](#))

Available in **Portuguese** ([PDF](#), [ePub](#) or [Kindle](#))

Available in **Spanish** ([PDF](#), [ePub](#) or [Kindle](#))

Available in **Arabic** (العربية)!

Тепер також і на українській мові! ([PDF](#), [ePub](#) or [Kindle](#))

Now also available in **Turkish** ([PDF](#), [ePub](#) or [Kindle](#))

Now also available in **Croatian** ([PDF](#), [ePub](#) or [Kindle](#))

<http://verificationhandbook.com/>

# Journalists sharing their list of tools

 startme Julia / Verification Toolset

Search Google



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GET STAR... >

**Monitoring**

-  Trendsmap - Real-time local Twitter trends
-  Banjo (Mobile)
-  BuzzSumo
-  Google Trends
-  Nuzzel
-  Trends24

**Twitter**

-  Twitter Advanced Search
-  TweetDeck
-  Twitter List Copy
-  Twitter lists via Google
-  Twxplorer
-  First Tweet
-  Locate tweets
-  Twitter Videos download
-  TweetBeaver (Source)
-  Foller.me (Source)
-  Snap Bird (Source)
-  Followerwonk (Source)
-  Mentionmapp
-  Epoch Converter
-  Tweetreach
-  One million tweetmap

**Facebook**

-  Facebook Graph

**Location - Maps**

-  Google Maps
-  Dual Maps
-  Wikimapia
-  Baidu Map
-  Yandex Maps
-  Bing Map
-  Google Earth
-  iTouchmap
-  GeoNames
-  OpenStreetMap
-  HERE WeGo - Satellite
-  MapChecking
-  Interactive live map of conflict news
-  Directory of Cities and Towns in World
-  Convert Latitude/Longitude to Decimal
-  OpenRailwayMap
-  Power Grid
-  EarthExplorer
-  OpenStreetCam
-  Intelligence Techniques

**Tutorials / Toollists**

-  Truly Media - collaborative verification platform
-  How to find breaking news on Twitter
-  Newsgathering Twitter
-  Twitter Location
-  Twitter lists

**Original / Context**

-  Google Images
-  TinEye
-  Google Advanced Search

**Source**

-  Pipl
-  PeekYou
-  IntelTechniques
-  Whois
-  Denic
-  Whitepages

**General Tools**

-  Flightradar
-  FlightAware
-  Radarbox
-  MarineTraffic
-  Maritime
-  VesselFinder
-  Train Germany
-  Wayback Machine
-  OSINT Framework

**Rumours**

-  Snopes
-  Fake News Watch

**Date&Time**

-  WolframAlpha
-  SunCalc
-  World time
-  Wetter Germany
-  Sonnenverlauf

**Metadata**

-  FotoForensics
-  EXIF Data Viewer
-  Image Metadata
-  IrfanView
-  izitru
-  Exif viewer
-  Forensic Analyzer
-  Forensically

**Chrome extensions**

-  Fake video news debunker by InVID
-  Treeverse - Visualize Twitter Conversations
-  RevEye Image Search
-  Wayback Machine
-  FirstDraftNewsCheck
-  Google Translate
-  Keep for Chrome
-  Truly Media
-  360social
-  CrowdTangle Link Checker

@bayer\_julia (DW Social Media)

# Not a new problem



The New York Times

## Week in Review

MORE SLIDE SHOWS ▾

### A Brief History of Photo Fakery

1 of 13 ◀ ▶



Old debates about the authenticity of the war photographer Robert Capa's iconic photo — commonly known as "Falling Soldier" — have been re-ignited by research that challenges the location of the image.

Photo: Robert Capa/Magnum Photos

RELATED

- Article: Faked Photographs: Look, and Then Look Again

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[http://www.nytimes.com/slideshow/2009/08/23/weekinreview/20090823\\_FAKE\\_SS\\_index.html](http://www.nytimes.com/slideshow/2009/08/23/weekinreview/20090823_FAKE_SS_index.html)

# But spreading as never before on SN



## Photo Tampering throughout History

The screenshot shows a web page with a title bar at the top. The title bar includes a "View All" button, a dropdown arrow, and a close button. Below the title bar is a horizontal row of nine historical photographs. Underneath this row is a text block with a left arrow, a right arrow, and a "more..." link. The main content area features a large black background with the text "PHOTO TAMPERING THROUGHOUT HISTORY" in white and orange. Surrounding this central text are nine circular frames, each containing a different historical or modern photograph that has been tampered with.

Though photo manipulation has become more common in the age of digital cameras and image editing software, it actually dates back almost as far as the invention of photography. The pages that follow contain an

more...

PHOTO  
TAMPERING  
THROUGHOUT  
HISTORY

<http://pth.izitru.com/>

# A recent fake picture from Catalonia



- Ouvrir l'image dans un nouvel onglet
- Enregistrer l'image sous...
- Copier l'image
- Copier l'adresse de l'image
- Rechercher une image avec Google

[Fake video news debunker by InVID](#)

[Fake video news debunker by InVID](#)

[Scrape similar...](#)

[Inspector](#)

[Image Magnifier](#)

[Image Reverse Search - Google](#)

[Image Reverse Search - Baidu](#)

[Image Reverse Search - Yandex](#)

# A reverse search on Google images



Google catalonia police brutality

All **Images** Maps Shopping More Settings Tools

About 22,600,000 results (1.55 seconds)

 Image size:  
346 × 259  
[Find other sizes of this image:](#)  
[All sizes](#) - [Medium](#) - [Large](#)

Best guess for this image: **catalonia police brutality**

**Catalonia responds to police violence: 'people are angry, very angry ...**  
<https://www.theguardian.com> › World › Catalonia ▾  
Oct 3, 2017 - Like much of Catalonia, the Hotel Vila in Calella was shuttered on Tuesday morning, its rooms empty, its doors locked and a sign reading Hotel ...

**Catalonia: Did voters face worst police violence ever seen in the EU ...**  
[www.bbc.com/news/world-europe-41677911](http://www.bbc.com/news/world-europe-41677911) ▾  
Oct 27, 2017 - Which side is correct in the claims and counter-claims of violence at the Catalan referendum?

**Visually similar images**



# Original picture without flag



**Without Warning: Police Brutalize Peac...**

The Leveller - 1200 × 900 - Search by image

Spanish military police storm Catalonian polling stations Credit: Xavier Solé Gasset / Twitter

[Visit](#)

[View Image](#)

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Related images:



Images may be subject to copyright. - Get help - Send feedback



FotoForensics

Analysis:

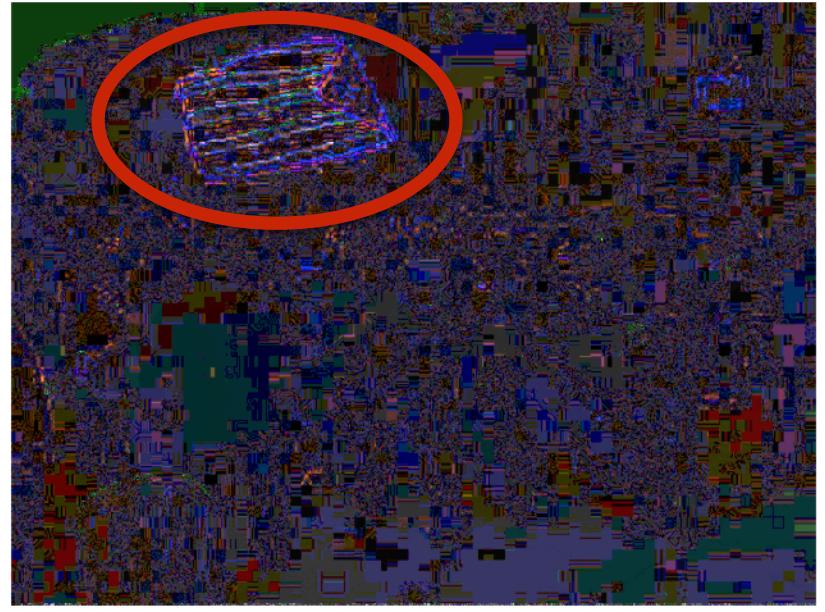
- Digest
- ELA**
- JPEG %
- Metadata
- Original

○ □ ↻ 🔍 A 🔎



Forensically Beta

Open File Help   



Magnifier

Clone Detection

Error Level Analysis

JPEG Quality  85

Error Scale  50

Magnifier Enhancement  
Auto Contrast 

Opacity  0.95

Noise Analysis

Level Sweep

<https://29a.ch/photo-forensics/#error-level-analysis>

# EU FP7 REVEAL Image verification assistant



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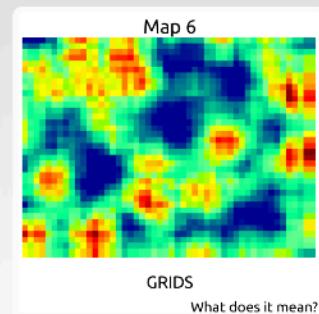
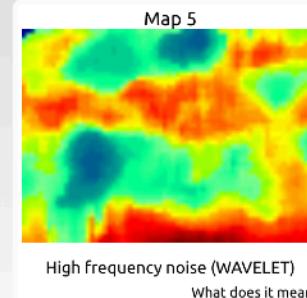
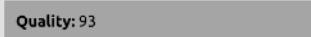
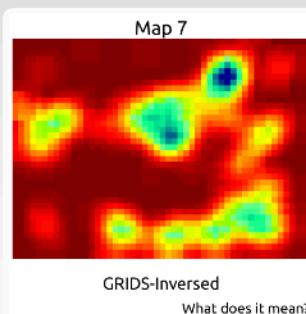
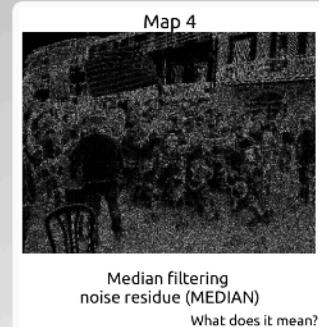
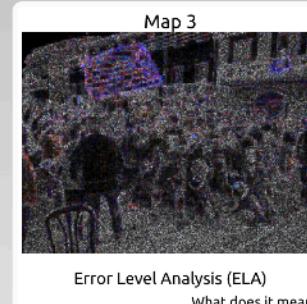
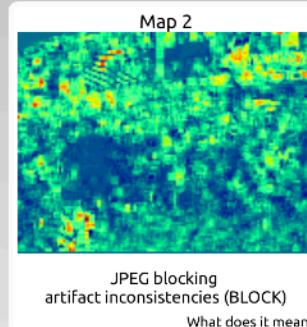
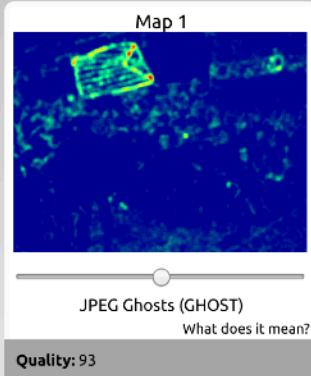


send this image to [Google reverse image search](#)

## Metadata summary

*i* →  
more metadata fields

Significant Data		JPEG		JFIF	
description	value	description	value	description	value
<b>Exif IFD0</b>					
Date/Time	Not found	Compression Type	Progressive, Huffman	Version	1.1
Gain Control	Not found	Data Precision	8 bits	Resolution Units	none
Image Description	Not found	Image Height	900 pixels	X Resolution	1 dot
Image Height	Not found	Image Width	1200 pixels	Y Resolution	1 dot
		Number of Components	3	Thumbnail Width	
				Pixels	0
				Thumbnail Height	



Save your analysis as PDF

# EU FP7 REVEAL Image verification assistant



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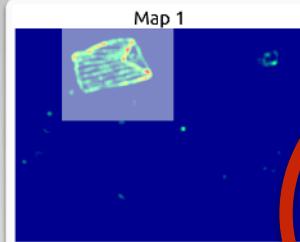
## Metadata summary

*i* →  
more metadata fields

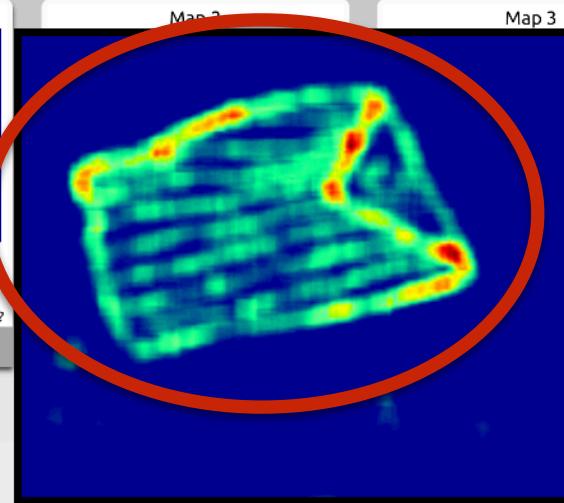
Significant Data		JPEG		JFIF	
description	value	description	value	description	value
Exif IFDO					
Date/Time	Not found	Compression Type	Progressive, Huffman	Version	1.1
Gain Control	Not found	Data Precision	8 bits	Resolution Units	none
Image Description	Not found	Image Height	900 pixels	X Resolution	1 dot
Image Height	Not found	Image Width	1200 pixels	Y Resolution	1 dot
		Number of Components	3	Thumbnail Width	0
				Pixels	
				Thumbnail Height	



Double JPEG quantization inconsistencies (DQ)  
What does it mean?



JPEG Ghosts (GHOST)  
What does it mean?

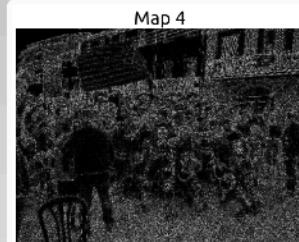


Map 2

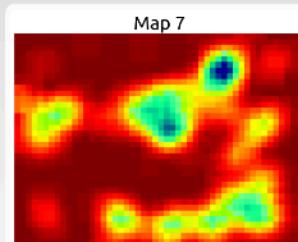
Quality: 100



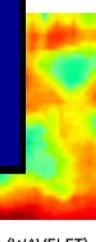
(ELA)  
What does it mean?



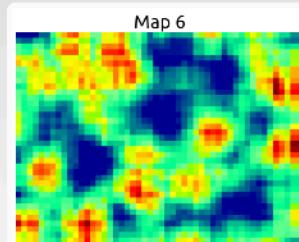
Median filtering noise residue (MEDIAN)  
What does it mean?



GRIDS-Inversed  
What does it mean?



High frequency noise (WAVELET)  
What does it mean?



GRIDS  
What does it mean?

Save your analysis as PDF

mmedia.itil.gr:8080/images/22974705bd47d63536ea448bb4866cdd/GhostOutput00.png

# Putin tsar of ... the World in G20



# Instead of an empty chair



# Debunked on Twitter



Matthew Champion

@matthewchampion

Following

lots of photos of Trump's awkward body language around Putin at G20, but not this one. original unedited AP photo on the right



Has Avrat

@hasevrat

Follow

A Renaissance painting of our age.



12:33 PM - 8 Jul 2017

4,206 Retweets 6,310 Likes



254 4.2K 6.3K



11:04 AM - 9 Jul 2017

581 Retweets 527 Likes



24

581

527



We're sorry we were unable to assign our highest trust rating to your image. [Here are some tips](#) for improving your results.

Potential  
file modification

Display settings for your photo:   

Details below

Sign in to maintain access to these options.



Views: 1

Challenges: 0

Share this URL: <http://izitru.com/9840w>

Potential file modification

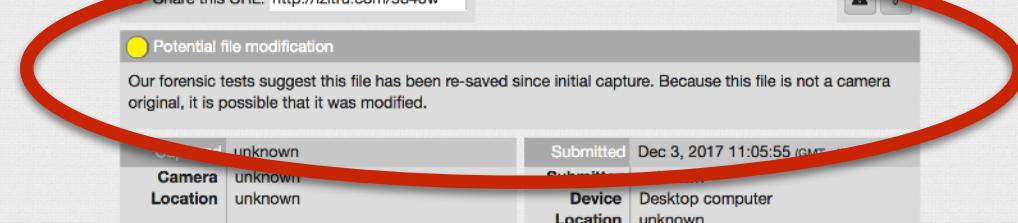
Our forensic tests suggest this file has been re-saved since initial capture. Because this file is not a camera original, it is possible that it was modified.

Camera Location

unknown  
unknown

Submitted Dec 3, 2017 11:05:55 (GMT)  
by InVID  
Device Location

Desktop computer  
unknown



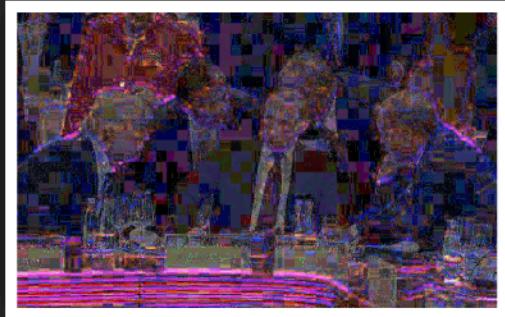


Analysis:

Digest  
**ELA**  
JPEG %  
Metadata  
Original



Forensically Beta Open File Help Like 1.2K Share G+



Magnifier

Clone Detection

Error Level Analysis

JPEG Quality  90

Error Scale  50

Magnifier Enhancement

Opacity  0.71

Noise Analysis

Level Sweep



### Metadata summary

**i** → more metadata fields

#### Significant Data

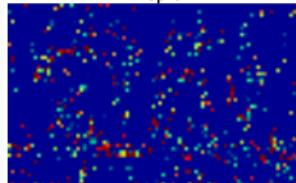
description		value
		<b>Exif IFDO</b>
Date/Time		Not found
Gain Control		Not found

#### JPEG

description		value
Compression Type		Progressive, Huffman
Data Precision		8 bits
Image Height		443 pixels
Image Width		720 pixels

send this image to [Google reverse image search](#)

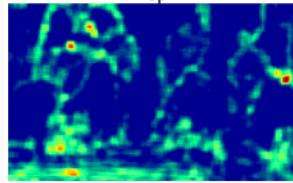
Map 0



Double JPEG quantization  
inconsistencies (DQ)

What does it mean?

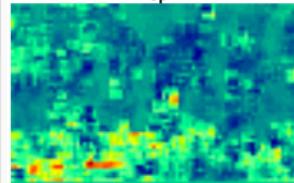
Map 1



JPEG Ghosts (GHOST)

What does it mean?

Map 2



JPEG blocking  
artifact inconsistencies (BLOCK)

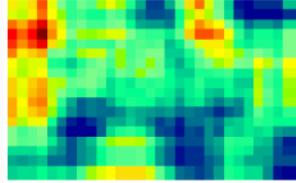
What does it mean?

Map 3



Error Level Analysis (ELA)  
What does it mean?

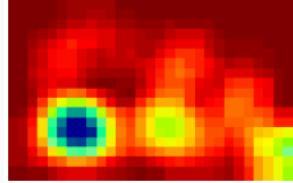
Map 6



GRIDS

What does it mean?

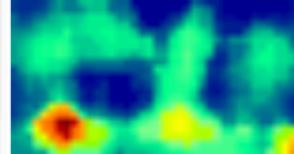
Map 7



GRIDS-Inversed

What does it mean?

Map 5



High frequency noise (WAVELET)

What does it mean?

Map 4



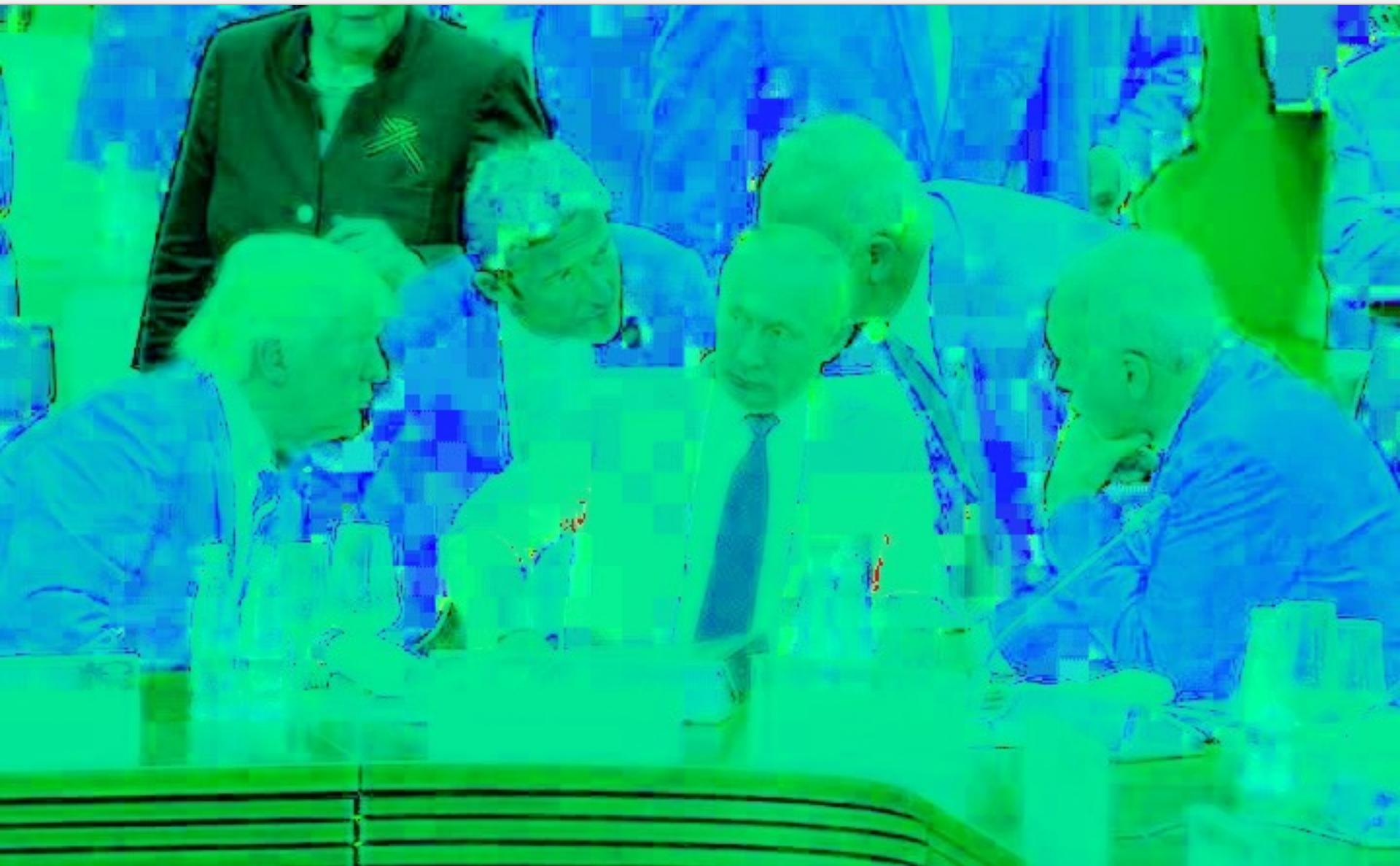
Median filtering  
noise residue (MEDIAN)

What does it mean?

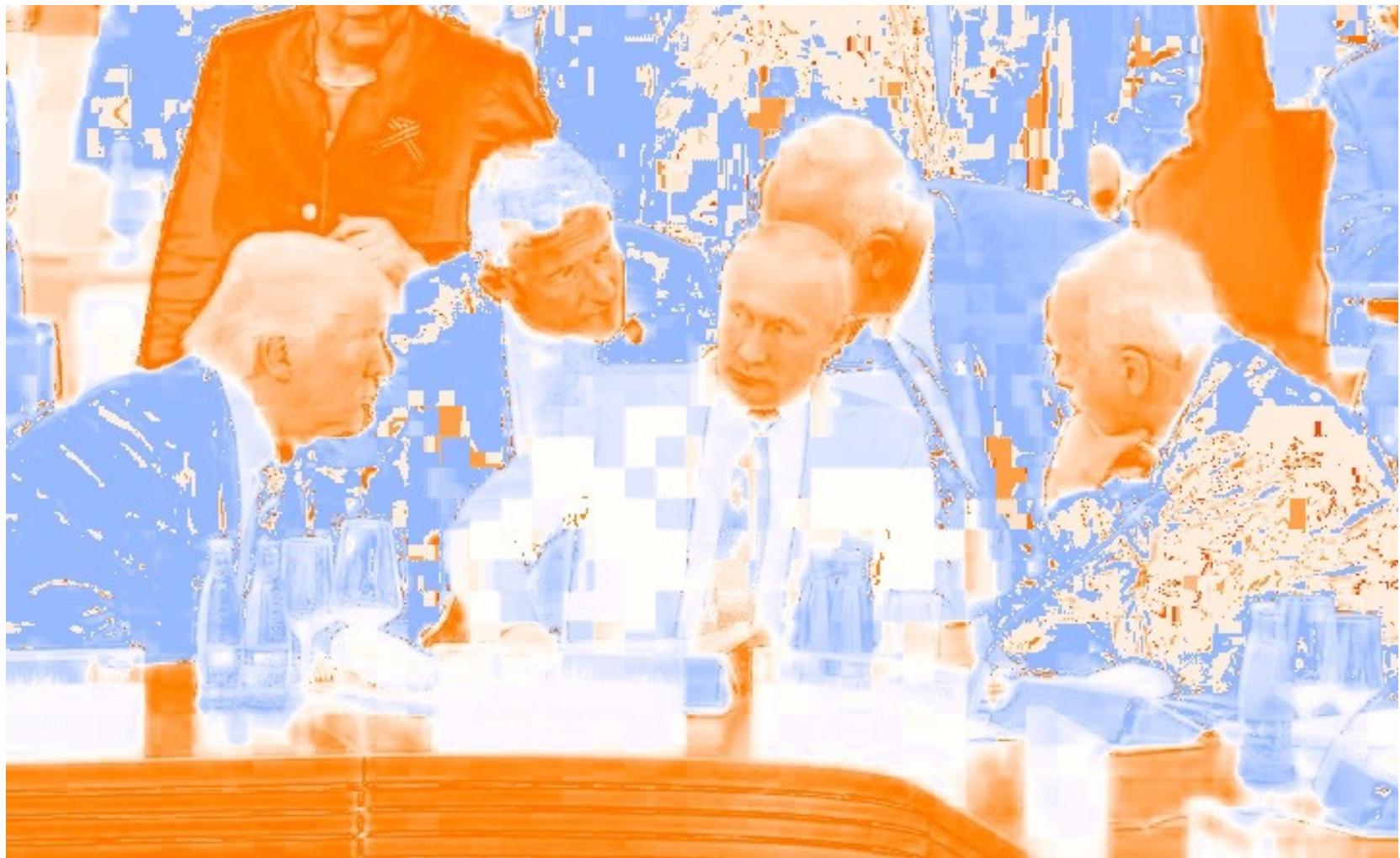
# Tungstene by ExoMakina



# Tungstene by ExoMakina



# Tungstene by ExoMakina



# A variation of a widely retouched picture



# North Korean pictures



© KCNA

# Through a forensic exam

InVID  
IN VIDEO VERITAS

ANALYSIS KEYFRAMES THUMBNAILS TW. SEARCH MAGNIFIER METADATA FORENSIC ? SURVEY NEW

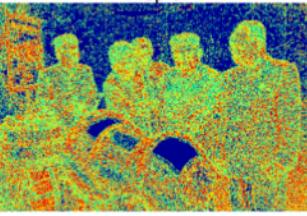
Home | Tutorial | About | Github

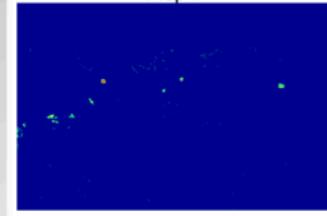


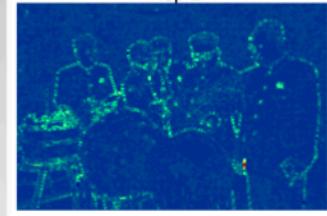
**Metadata summary**

Significant Data		JPEG	
description	value	description	value
<b>Exif IFD0</b>		Compression Type	Baseline
Date/Time	Not found	Data Precision	8 bits
Gain Control	Not found	Image Height	2210 pixels
		Image Width	3314 pixels
		Number of	-

send this image to [Google reverse image search](#)

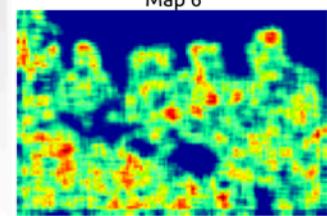
**Map 0**  
  
Double JPEG quantization inconsistencies (DQ)  
What does it mean?

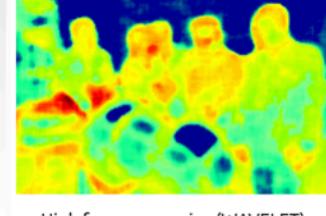
**Map 1**  
  
JPEG Ghosts (GHOST)  
What does it mean?  
Quality: 96

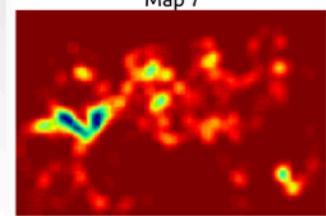
**Map 2**  
  
JPEG blocking artifact inconsistencies (BLOCK)  
What does it mean?

**Map 3**  
  
Error Level Analysis (ELA)  
What does it mean?

**Map 4**  
  
Median filtering noise residue (MEDIAN)  
What does it mean?

**Map 5**  


**Map 6**  


**Map 7**  


**Feedback** new

# Hidden traces within the picture



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



METADATA



FORENSIC



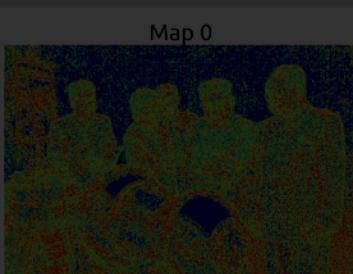
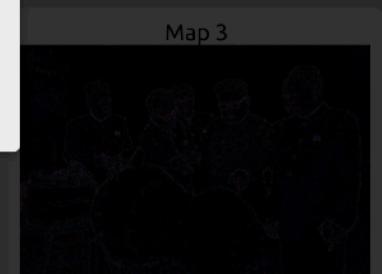
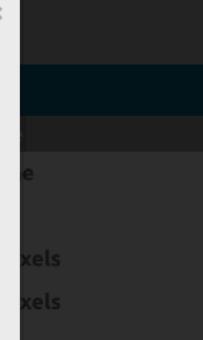
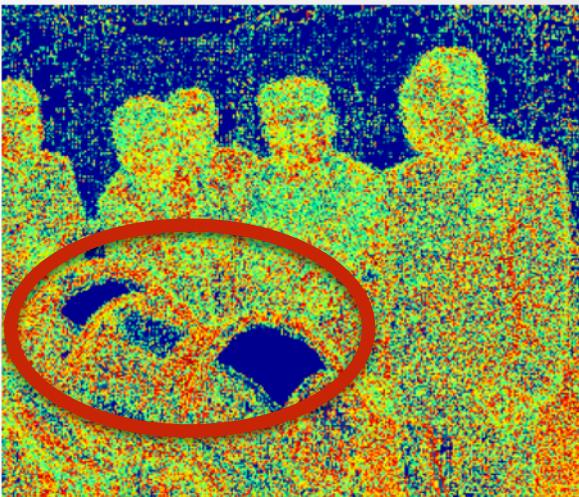
ABOUT

SURVEY  
NEW

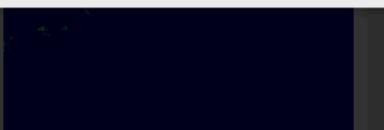
Home | Tutorial



send this image to Google reverse image search

Double JPEG quantization  
inconsistencies (DQ)

What does it mean?



What does it mean?



What does it mean?



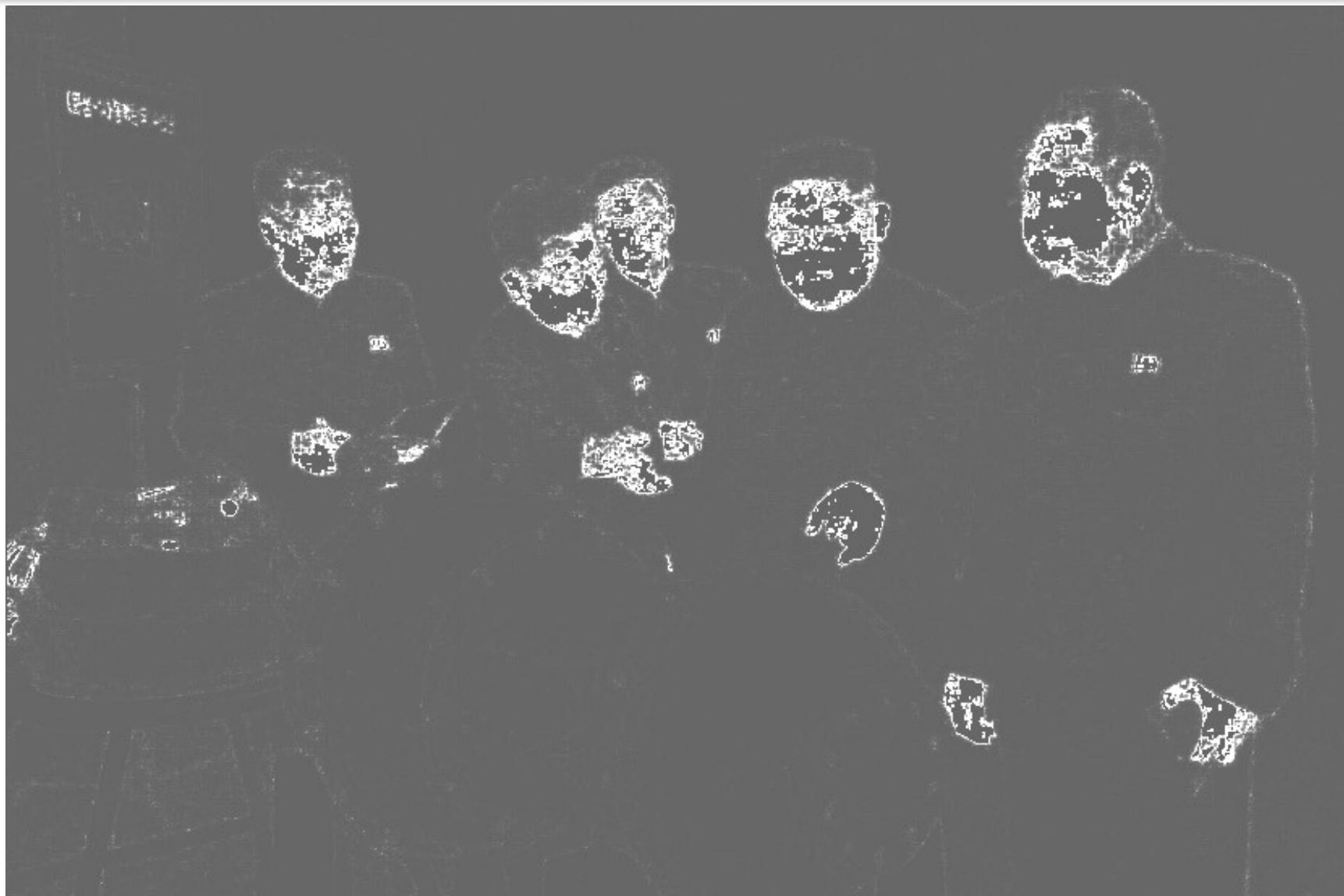
What does it mean?

Feedback new

# North Korea in possession of ... Photoshop (or GIMP)



# Traces of digital make-up ...



# InVID: a Horizon 2020 European project



*InVID is funded by the EU Horizon 2020 Programme under the project number ICT-2015-687786*

A three-years innovation action (2016-2018)  
about video verification on social networks for the news industry

# A well know fake picture out of a movie



Well known fake which circulated after Ben Laden's death in 2012

# Testing a use case approach to duplicate search



The movie used for making the fake: Ridley Scott's Black Hawk Down

# Testing a use case approach to duplicate search



These outcomes indicate that the DCNN method is by far the most efficient one in indicating the "Ben Laden" image as a near-duplicate of one of the given video keyframes.

keyframes	DCNN	DCT	Matching of local descriptors
BlackHawkDown-tt0265086-123.jpg	0.8905	0.1483	0.1199
BlackHawkDown-tt0265086-124.jpg	0.8929	0.0860	0.0935
BlackHawkDown-tt0265086-125.jpg	0.8877	0.0436	0.1031
BlackHawkDown-tt0265086-126.jpg	0.8885	0.0260	0.0959
BlackHawkDown-tt0265086-127.jpg	0.8888	0.0333	0.0935

# Testing a use case approach to duplicate search



the most similar keyframe from the movie

# Enough to swindle Google predictive algorithm



Screenshot of a Google search results page for the query "osama bin laden dead". The search bar shows the query, and the "Images" tab is selected. The results page displays a thumbnail of a video frame showing a person lying down, identified as Osama bin Laden. The image is labeled as being 399 x 225 pixels. Below the image, the text "Best guess for this image: **osama bin laden dead**" is shown.

**Death of Osama bin Laden - Wikipedia**  
[https://en.wikipedia.org/wiki/Death\\_of\\_Osama\\_bin\\_Laden](https://en.wikipedia.org/wiki/Death_of_Osama_bin_Laden) ▾  
Osama bin Laden, the founder and head of the Islamist group Al-Qaeda, was killed in Pakistan on May 2, 2011 shortly after 1:00 am PKT (20:00 UTC, May 1) by United States Navy SEALs of the U.S. Naval Special Warfare Development Group (also known as DEVGRU or SEAL Team Six). The operation, code-named ...

**Visually similar images**

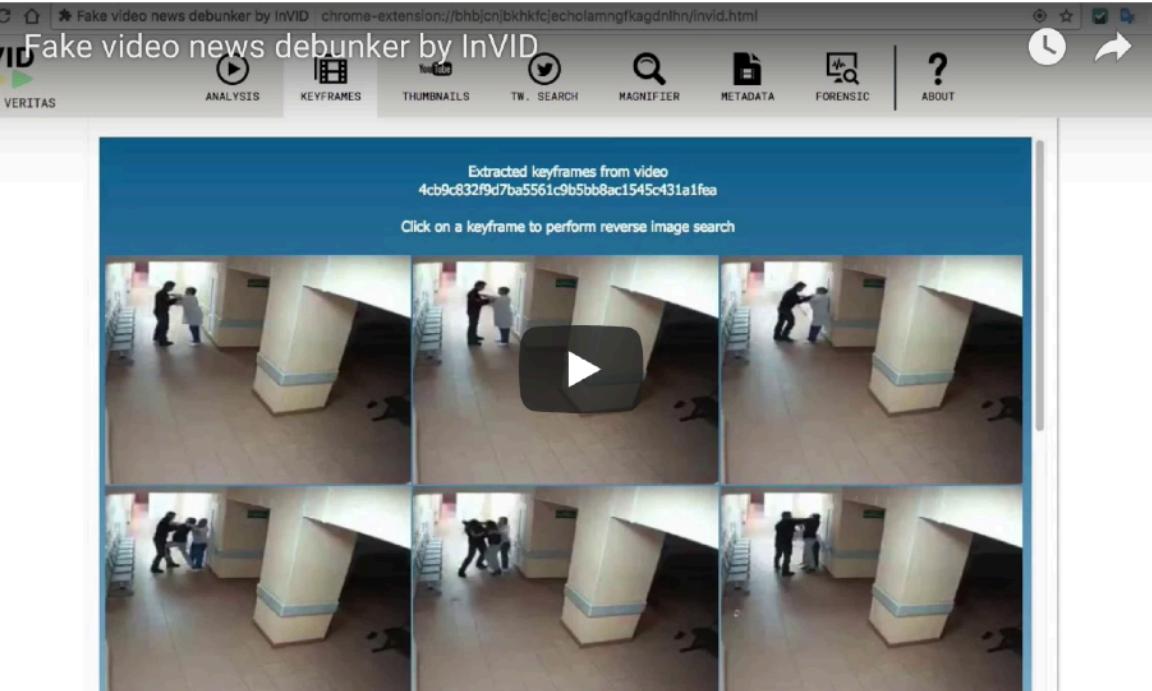
# A free verification browser plugin



**Fake video news debunker by InVID**  
offered by invid.project.eu

★★★★★ (2) | News & Weather | 1,186 users

OVERVIEW REVIEWS SUPPORT RELATED G+



The screenshot shows the InVID extension interface. At the top, there's a toolbar with icons for ANALYSIS, KEYFRAMES, THUMBNAILS, TW. SEARCH, MAGNIFIER, METADATA, FORENSIC, and ABOUT. Below the toolbar, a message says "Extracted keyframes from video 4cb9c832f9d7ba5561c9b5bb8ac1545c431a1fea". It instructs users to "Click on a keyframe to perform reverse image search". There are six keyframe thumbnails displayed in a grid. To the right of the interface, there's a sidebar with the following sections:

- Compatible with your device**
- InVID extension**

This plugin has been designed as a verification "Swiss army knife" helping journalists to save time and be more efficient in their fact-checking and debunking tasks on social networks especially when verifying videos and images. This is a beta version and we will update it regularly thanks to your feedback.
- Report Abuse**
- Additional Information**

Version: 0.58  
Updated: November 20, 2017  
Size: 398KiB  
Language: English



## Youtube DataViewer

Enter YouTube URL

Go

Clear

© 2017 Amnesty International USA | 5 Penn Plaza, New York, NY 10001 | 212.807.8400

# How to verify a video ?



## Sinai Mosque attack on Nov 24th?



A blurry video thumbnail showing several people from behind, wearing white robes, in what appears to be a mosque during a Friday prayer service. The video player interface shows a play button, a progress bar at 0:48, and other standard controls.

**IMAS Egypt**  
November 24 at 1:37pm · 

Like Page \*\*\*

عاجل  
فيديو أثناء تججير مسجد الروضة بالعربيش  
اثناء صلاة الجمعة  
وخاري نقل القتلى والصابرين للمستشفيات  
الفيديو الثاني بعد قليل  
#عاجل اول فيديو لحظة انفجار مسجد الروضة في العريش اثناء صلاة الجمعة  
#العربيش #مسجد\_الروضة #الجمعة #صلاة

Urgent  
Video during the bombing of rod mosque  
During Friday prayers  
And they're moving dead and injured to hospitals.  
Second video in a bit.  
#Urgent first video the moment the explosion mosque exploded in arish during Friday prayers

# Extracting keyframes from the video



Information Technologies Institute  
Multimedia Knowledge and Social Media Analytics Laboratory



VIDEO4ALL  
ANALYSIS

On-line service for video fragmentation and reverse image search

Copy and paste a YouTube, DailyMotion, Facebook, Twitter or Dropbox URL

23597408\_375457866236948\_727064764085174272\_n.mp4

Enter your email to get a 48-hours-active link to the analysis results (optional)

Open a new tab to submit another request

75% uploaded... please wait while your video is been uploaded

Uploaded 1146880 bytes of 1539206

© CERTH-ITI, MKLab [About this tool](#) This demo is supported by the InVID project. InVID has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 687786.

# Reverse image search on video keyframes



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



METADATA



FORENSIC



ABOUT

SURVEY  
NEWTUTORIAL  
NEW

The submitted video '23597408\_375457866236948\_727064764085174272\_n.mp4' has been already analysed.  
Note that your video's id is c822dd3a072ac508c9426d9c10c905074e004af7.mp4

Ouvrir l'image dans un nouvel onglet  
Enregistrer l'image sous...  
Copier l'image  
Copier l'adresse de l'image  
Rechercher une image avec Google

InVID Fake video news debunker by InVID

Image Magnifier  
Image Reverse Search - Google  
Image Reverse Search - Baidu  
Image Reverse Search - Yandex

new  
Feedback

# Reverse image search on video keyframes



Yandex



Uploaded image X

Search

WEB IMAGES VIDEO MAPS TRANSLATE MORE



960x720

Exclusive footage of Saudi mosque blast that killed 4 people - Watch Video Online

<https://keepvidu.com/video/x2rytut/exclusive-footage-of-s...>

Exclusive footage of Saudi mosque blast that killed 4 people - Watch Video Online - keepvidu.com



640x480

Shiite Mosque in Saudi Arabia's al-Ahsa under attack, 3 kill Wednesday 26th April 2017 05:10:30 AM

<http://www.dailivides.com/watch-video/x5jpl2z/Shiite-Mosq...>

Exclusive footage of Saudi mosque blast that killed 4 people span class.



640x360

Vatan Video

<http://videogaleri.gazetevatan.com/VatanTvSearch/intihar ...>

148 görüntüleme.



640x360

Suudi Arabistan'da cami bombalandı - Video İzle

<http://videogaleri.gazetevatan.com/video-izle/Suudi-Arabi...>

Suudi Arabistan'ın doğusundaki Demmam kentinde bir camiyi hedef alan intihar saldırısında 4 kişinin öldü.



640x360

Bikinili kız az kalsın boğuluyordu! - Video İzle

<http://videogaleri.gazetevatan.com/video-izle/Bikinili-ki...>

Tarih: 30.05.2015. video.

# Retrieves images of another attack ... in 2015



A statement from Saudi Arabia's Interior Ministry, however, said that the state's security services had been responsible for "foiling" the mosque attack.

Footage posted online reportedly recorded the moment of the explosion, as heard from inside the mosque.



mohammad boland  
@mohadboland

لحظة التفجير الإرهابي الذي استهدف مسجد العنود في الدمام ..#تفجير\_العنود

10:58 AM - May 29, 2015

221 1,377 391

Middle East Eye interviewed a local resident about the bombing. Close house is 1 kilometre

<http://www.bbc.com/news/world-middle-east-42115748>

The screenshot shows the Arab News website. At the top right is a search bar and the date "Wednesday, 29 November 2017 Welcome to Arab News". The main navigation menu includes SAUDI ARABIA, MIDDLE EAST, WORLD, BUSINESS, SPORTS, LIFESTYLE, OPINION, MEDIA, and JOBS. Below the menu, a sub-navigation bar shows "Latest News" under "Business & Economy" with the headline "Opec must make deeper cuts to oil inventories". The main content area features a large image of people in a mosque, with a play button overlaid. The caption reads "Alert security averts catastrophe" and is dated "ARAB NEWS | Published — Saturday 30 May 2015". Below the image are social sharing icons for Facebook, Twitter, Google+, WhatsApp, and Email. To the right of the main article, there is a sidebar titled "Latest News" with several smaller news items and their thumbnails. At the bottom right, there is an "Opinion" section with a single visible article by Robert Lacey.

# Tweet verification



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



METADATA



FORENSIC



ABOUT

SURVEY  
NEWTUTORIAL  
NEW

## Twitter advanced search

Keyword or #  
**@mohadboland**

Filter (e.g. safe, media, retweets, native\_video, periscope, vine, images, twimg or links)

Language (e.g. en, fr, de, es, ru, ja, zh...)

Geocode (e.g. -22.912214,-43.230182,1km or -22.912214,-43.230182,1mi)

Near (city name)      Within (e.g. 15mi or 15km)

**05/28/2015 00:00**

05/29/2015 23:59

Local time  GMT

**Submit**

# Search by time interval on Twitter



[Home](#) [Notifications](#) [Messages](#)



from:@mohadboland since:1432764000 until:1433109540



Tweet

from:@mohadboland since:1432764000 until:1433109540

Top [Latest](#) [People](#) [Photos](#) [Videos](#) [News](#) [Broadcasts](#)

⋮



221 1.4K 391



# Another example with a video ... from Paris?



il Giornale.it  
Video

Home Politica Mondo Cronache Blog Economia Sport Cultura Milano LifeStyle Speciali Motori Video Cerca

[Twitter](#) [Mi piace 11](#) [Partager](#)

Parigi, il panico a Notre Dame

Twitter Mar, 06/06/2017 - 18:31

Panico a Notre Dame: dopo la sparatoria, la folla fugge dal sagrato della cattedrale

0:10 0:15 | ▶ | ↻

MikeC ◆  
@mikethecraigy

Follow

@MarkCollyerReal I am at Brussels Central Station its terrible pray for me

0:08 / 0:16 ▶ ↻

9:35 PM - 20 Jun 2017 from Brussele, Belgium

Kevin W.  
@kwilli1046

Follow

Something bad happening outside my #NotreDame villa window pray for us. #Paris

MikeC ◆

0:03 / 0:16 ▶ ✖ ↻

5:01 PM - 6 Jun 2017

454 Retweets 398 Likes



# Again a segmentation in keyframes



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



METADATA



FORENSIC



ABOUT

SURVEY  
NEWTUTORIAL  
NEW[Show more keyframes](#)

© CERTH-ITI, MKLab [About this tool](#) This demo is supported by the InVID project. InVID has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 687786.

# A look at the keyframe through a Magnifier lens



# And a reverse image search ... on Google

Google  JPG X scared people running from godzilla   

All **Images** Maps Shopping More Settings Tools

About 25,270,000,000 results (0.83 seconds)

 Image size:  
346 × 259  
No other sizes of this image found.

Best guess for this image: **scared people running from godzilla**

**RUUN!! IT'S GODZILLA!!! - YouTube**  
<https://www.youtube.com/watch?v=OX2VaVtFYfs> ▾  
 Jan 9, 2008 - 0:12 Nothin to see here, Just charmander running around ... I could never expect Austin Powers, Godzilla, Pikachu, Chamander and Hiro ...

**[FULL] Japanese Dinosaur Prank - YouTube**  
<https://www.youtube.com/watch?v=gmxQSwwTRqu> ▾  
 Aug 29, 2013 - I don't need a weird costume to scare people like that. .... there is a whole group of cameramen running right next to the dinosaur. 2. GODZILLA!

Visually similar images



Report images

Pages that include matching images

**World War Z - people running away - YouTube**  
 <https://www.youtube.com/watch?v=W2IA9UwmHCA> ▾  
 1280 × 720 - Sep 9, 2012 - Scene from World War Z being filmed.

# World War Z making of !



YouTube FR

Search



World War Z - people running away

# More « real life » use cases



First a video used on Twitter and Facebook in a xenophobic campaign during the French Presidential election and claiming that a migrant « seeking free healthcare » assaulted a hospital staff member ... in France.



Napoléon  
@tpricedelamour

Follow

A l'**#hopital** public une **#infirmière** tabassée par un **#migrant** venu chercher la **#gratuité** des soins.  
Barbare.  
Stop la **#CMU** pour les étrangers!

Translate from French



# Extracting keyframes from the video



Ouvrir l'image dans un nouvel onglet  
Enregistrer l'image sous...  
Copier l'image  
Copier l'adresse de l'image  
Rechercher une image avec Google

Fake video news debunker by InVID

Scrape similar...

Inspector

Image Magnifier  
Image Reverse Search - Google  
Image Reverse Search - Baidu  
Image Reverse Search - Yandex

new  
Feedback

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# Reverse image search on video keyframes



Yandex

Uploaded image  Search

WEB IMAGES VIDEO MAPS TRANSLATE MORE

< Back

# Reverse image search on video keyframes



NASTROENIE.TV ТЕЛЕКАНАЛ НОВОСТИ ПРОГРАММА

ТЕМЫ Сирийский конфликт Санкционная война Украинский кризис

16:15, 25 ФЕВРАЛЯ 2017

## Суд арестовал избившего медиков новгородца

Пьяный пациент избил медсестру и санитарку в Новгороде

Фото: ТВ Центр

How a fake war photojournalist  
totally fooled media  
organisations around the world



War photographer who survived  
leukaemia exposed as a fake

Eduardo Martins passed off photos of British surfer as himself and some of his  
war zone pictures were stolen



941 curtidas

edu\_martinsps Work in the city of Aleppo in Syria.



Curtido por ...  
edu\_martinsps Work in the City of Mogadishu in  
África.

Ver todos os 20 comentários  
20 DE MARÇO DE 2016 - VER TRADUÇÃO

Some of the pictures from Eduardo Martins' Instagram page, which has since been deleted. Photograph:  
Eduardo Martin/Instagram

Mashable



Brazil 'surfing war photographer' Eduardo  
Martins exposed as fake

6 September 2017 Latin America & Caribbean

f t o e Share



941 curtidas  
edu\_martinsps Work in the city of Aleppo in Syria.



Curtido por ...  
edu\_martinsps Work in the City of Mogadishu in  
Somália.

Ver todos os 20 comentários  
20 DE MARÇO DE 2016 - VER TRADUÇÃO

The fake photographer photoshopped a British surfer into images of Middle East conflict

# fooled the media ... and the search engines



Fotos publicadas como de Eduardo Martins



Fotos de autoría de Daniel C. Britt



Kirkuk, 2010

A boy runs away from a wall of smoke and fire during a protest 20 miles north of Kirkuk in Iraq's Kurdish region on Friday, August 12, 2010. Demonstrators protesting the lack of electricity in Iraq's rural areas burned tires in the road. Long-term frustrations with the new government's failure to provide basic services such as clean water, electricity and public sanitation have reached a boiling point this month. The road block is one of many that have sprung up all over the country, coinciding with the draw-down of United States forces and the Muslim observance of Ramadan.



The streets of a city in ruins, Aleppo, Syria.



Krafaanbel, Syria 3

A tank shell passed a building destroyed in an air strike in the village center in Krafaanbel, Syria on Friday October 18, 2013. As the war approaches its third year, bombs continue to fall on the rebel-controlled town several times a week.

# Search engines often fail to retrieve inverted images



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



METADATA



FORENSIC



ABOUT

SURVEY  
new

## Image Magnifier

blob:chrome-extension://mhccpoafgdgbhnjfhkcmgknndkeenfhe/2bfcfc41-686d-4202-a7e9-a48575e4a45f



Local file

Submit

More filters

+

Lens zoom / Inner zoom



The fake Gaza  
picture of the fake  
war photographer  
Eduardo Martins

# Flip function to retrieve inverted images



More filters -

None  Sharp  Flip  Bicubic

Apply

Undo Redo

Lens zoom / Inner zoom



Download Copy URL

We invert the image and press the copy url button to send it to Google images

# Then Google retrieves the original image



Google Kirkuk Camera Microphone Search

All **Images** Maps Shopping More Settings Tools

About 3 results (0.60 seconds)

Image size: 600 x 403  
No other sizes of this image found.

Best guess for this image: [Kirkuk](#)

**Kirkuk - Wikipedia**  
<https://en.wikipedia.org/wiki/Kirkuk> ▾  
Kirkuk is a city in the Kirkuk Governorate of Iraq, 180 kilometres (112 miles) north of Baghdad. It is also the capital of Kirkuk Governorate. Kirkuk lies in a wide ...

**The Kurdish Independence Referendum Could Rip Kirkuk Apart | Time ...**  
[time.com/4954584/kurdish-referendum-vote-kirkuk-unrest/](http://time.com/4954584/kurdish-referendum-vote-kirkuk-unrest/) ▾  
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**The Transition In Iraq - danielbrittphoto.com**  
 [www.danielbrittphoto.com/War/Iraq-in-Transition/](http://www.danielbrittphoto.com/War/Iraq-in-Transition/) ▾  
800 x 536 - Kirkuk, 2010. A boy runs away from a wall of smoke and fire during a protest 20 miles north of Kirkuk in Iraq's Kurdish region on Friday, August 13, 2010.

## Kirkuk

City in Iraq Share

Kirkuk is a city in the Kirkuk Governorate of Iraq, 180 kilometres north of Baghdad. It is also the capital of Kirkuk Governorate. Kirkuk lies in a wide zone with an enormously diverse population and has been multilingual for centuries. [Wikipedia](#)

**Weather:** 84°F (29°C), Wind W at 12 mph (19 km/h), 21% Humidity  
**Local time:** Wednesday 4:32 PM  
**Number of airports:** 1  
**University:** University of Kirkuk  
**Neighborhoods:** Kurdistan, Domiz, Al-Hurriya, Shoraw, Runaki, MORE ▾  
**Clubs and Teams:** Kirkuk FC, Ghaz Al-Shamal

**Points of interest**

Kirkuk Citadel Qishla of Kirkuk Kirkuk Amusement Park Sarchnar Park Baba Gurgur Park

**People also search for** View 10+ more

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Feedback

# Google retrieves the original image



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Summer Camps

Girls, Feigned Death, Ohio, Etc.

» > WAR

## The Transition In Iraq

Photographs from the political transition in Iraq as the United States military pulled out between 2009-2010.

< 1 2 >

Kirkuk, 2010

A boy uses smoke from a shell of smoke and fire during a protest 20 miles north of Kirkuk.

BUY

# A real life debunk



InVID  
IN VIDEO VERITAS

ANALYSIS KEYFRAMES THUMBNAILS SEARCH MAGNIFIER METADATA FORENSIC ? ABOUT

Youtube thumbnails reverse search

<https://www.youtube.com/watch?v=hDZWj6MjYbk>

Submit

The screenshot shows the InVID web application's user interface. At the top, there's a navigation bar with links for ANALYSIS, KEYFRAMES, THUMBNAILS, SEARCH, MAGNIFIER, METADATA, FORENSIC, and ABOUT. The THUMBNAILS link is highlighted. Below the navigation is a section titled "Youtube thumbnails reverse search". A URL input field contains the link "https://www.youtube.com/watch?v=hDZWj6MjYbk". A blue "Submit" button is positioned below the input field. The main content area displays a video frame showing a hallway or entrance to a establishment with people standing around. Below this main frame are three smaller, vertically stacked thumbnail images, each showing a different frame from the same video, demonstrating the search results.

A casino robbery in Philippines (in fact in Surinam several years before)

# Check it out !



ANALYSIS

KEYFRAMES

YouTube  
THUMBNAILS

TW. SEARCH

MAGNIFIER

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SURVEY  
NEW

## Video contextual verification

Copy and paste a Youtube or Facebook url

Submit

[www.invid-project.eu/verify](http://www.invid-project.eu/verify)

new  
Feedback

# Very positive feedback so far ...



ANALYSIS



KEYFRAMES



THUMBNAILS



TW. SEARCH



MAGNIFIER



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ABOUT



SURVEY

NEW

## Video contextual verification

Copy and paste a Youtube or Facebook url

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## Some comments on Twitter

Must-download

REALLY USEFUL  
invaluable

A must have for any journalist

<https://twitter.com/i/moments/888495915610275840>

- better content enhancement: the often low resolution of the content is an obstacle to detect alterations. Super resolution imaging could be a possible solution.
- better storytelling regarding forensics with more accessible jargon, more user centric (ex: this picture has been save > 5 times)
- social network analysis: being able not only to detect bubbles, echo chambers but also to map the content (images) propagation within social media.
- software signatures (being able to detect the last software used with the content; Photo Response Non Uniformity (PRNU) to detect the pictures taken by a single device and check the image consistency)  
Search for similar camera <= thanks AMPED Software
- anticipate the future of fake news: technology to manipulate audio tracks and people faces is already there.

# Future of fake news



<http://futureoffakenews.com/>

# Some scaring tools coming soon ...



The Fake Video

Videos from the Episode

Want more Radiolab?



## The technology of fake news



### Project Voco

Using tiny audio clips, researchers from Adobe and Princeton turn text into the words of anyone they'd like.



### Synthesizing Obama

Using a generic video of President Obama speaking, researchers at the University of Washington can match his facial movements to a totally different set of words.



### Face2Face

Researchers at Stanford have found a way to let ordinary people control the faces of presidents, in real time.



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# Thank you for your attention!



## Any questions?

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