Verifying Videos and Images

Aric Toler, Bellingcat

1) Key questions in video/image verification
   a) Where?
   b) When?
   c) Who?
   d) Why?
2) Metadata and digital forensics
3) Think like a faker

Key questions in image/video verification:

1) **Where?**

Determine through geolocation

2) **When?**

Determine (if possible) through shadows, weather, temporary details, context

3) **Who?**

Determining first -- not most popular -- source

4) **Why?**

Determine motive

Geolocation:
Where was a photograph/video shot?

Determine the location of a photograph or video by finding identifiable features in a photographic/video, then match them to the same features in another photograph/video or satellite image.

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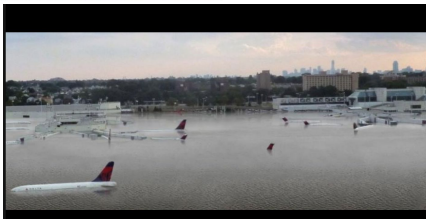**Source Material from YouTube, social media, etc...**

Houston Harvey Flood - Meyerland Neighborhood - August 27 2017 - Front Yard Time Lapse
RoismanDani
5 days ago • 130,436 views
Time lapse of the live stream I had showing the front yard. The street corner disappeared at Saturday 8/26/2017 around 8:00PM, ...
NEW

Daily Buzz Live Trending
Like This Page · August 28 · Edited · @

Harvey flooding at Houston airport 😢
SHARE for Prayers 🙏

Like   Comment   Share
😮❤️👍 78   Top Comments
123 shares   46 Comments

Carmen Brockmiller
https://watsupwiththat.com/.../quite-possibly-the.../
Like · Reply · August 28 at 9:00pm

Barry Johnston Airlines are stupid enough to leave millions of $ in planes sitting in a potential hurricane, former Hydro CEO's must run these companies
Like · Reply · August 28 at 3:50pm

Geolocation:
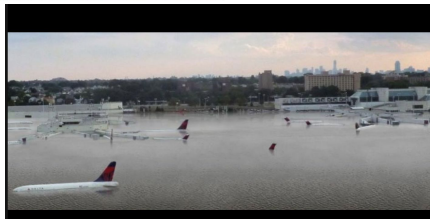# Where was a photograph/video shot?

Determine the location of a photograph or video by finding identifiable features in a photographic/video, then match them to the same features in another photograph/video or satellite image.

Source Material from YouTube, social media, etc...

Cross-reference materials for geolocation

Source material

Google Street View

Street-Level Imagery

- **Google Street View** (All over!)
- **Bing Streetside** (US, UK, France, Spain)
- **Yandex Panorama** (Russia/Former Soviet Union)
- **MapJack** (West Coast US, Sweden, Thailand...)
- Some countries and cities have specialized services

Source material
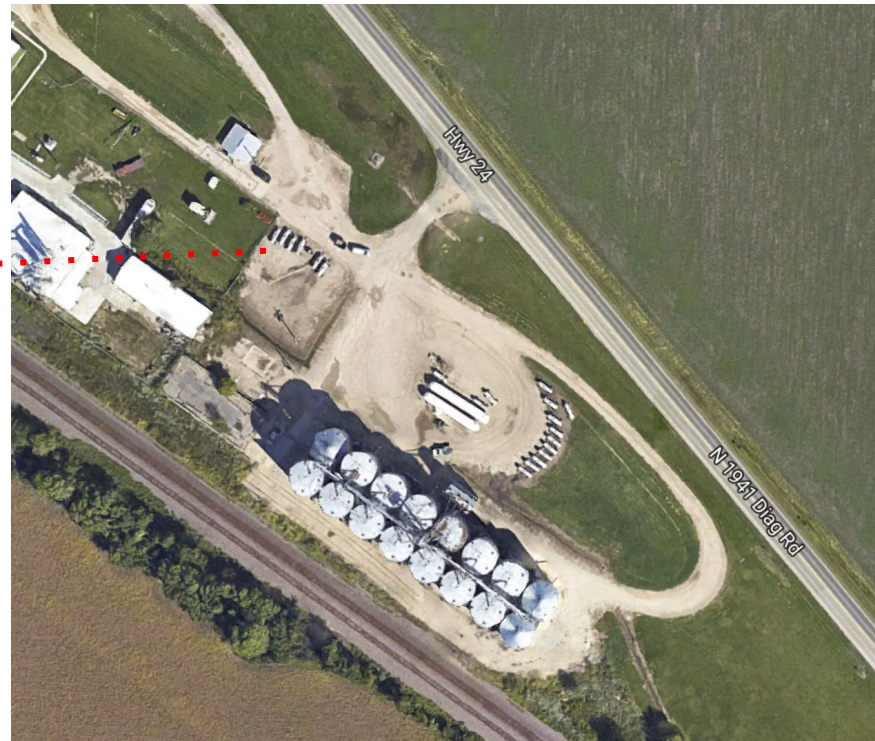

Satellite imagery

Source material

Satellite imagery

Source material

Satellite imagery

Source material

Satellite imagery

Source material

Satellite imagery

(Free) Satellite Imagery

- **Google Earth** (historical imagery available)
- **Google Maps** (no historical imagery)
- **Yandex Maps**
- **Bing Maps**
- **Wikimapia** (combines multiple services)
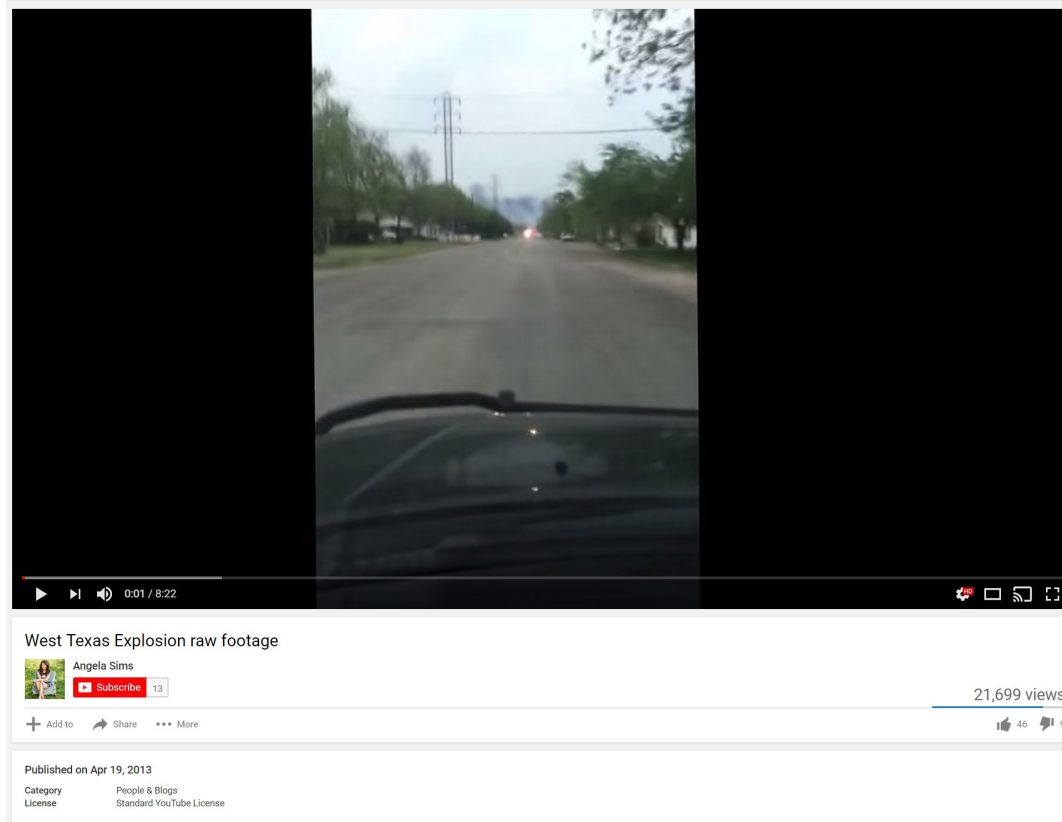- **Terraserver** (only previews are free)

Source material

Other Photo/Video

Geotagged Photos/Videos

- **Google Earth** (turn on "photos" option)
- **Panoramio** (shutting down soon, integrated into Google Earth)
- **Yandex Maps** (geotagged photos included)
- **Echosec** ($$$, shows geotagged Instagram/VK/Twitter posts)
- **YouTube** (search street names for dash cams)

5-Minute Verification

West Texas Explosion raw footage

Angela Sims

Subscribe 13

21,699 views

Add to   Share   More

46   9

Published on Apr 19, 2013

Category   People & Blogs
License   Standard YouTube License

West TX Football field

All   Images   Maps   Videos   News   More   Settings   Tools

About 7,210,000 results (1.15 seconds)

Trojan Stadium - West, Texas
www.texasbob.com/stadium/stadium.php?id=179 ▼
Jul 28, 2011 - Trojan **Stadium West** , **Texas**. TexasBob.com - The most Comprehensive list of Texas **Football** Stadiums on the Internet.

Texas Football Stadium Database - Texas Bob
www.texasbob.com/stadium/ ▼
Stadium Regions. Austin Area · Central Texas · DFW Area · East Texas · El Paso / Far **West Texas** · Gulf Coast · Houston Area · North Texas · Panhandle / High ...

Update Stadium Listing

Address Map Link: W Ronda St at Reagan St -- West, Texas 76691

Owner: West ISD   **Track:** No

County: McLennan   **Soccer:** No

Capacity: 3500   **Video Scoreboard:** No

Stadium Type: High School   **Wheelchair Access:** Fair

Year Opened: **Playing Surface:** Grass

Resource:

1:49 / 12:26   HD
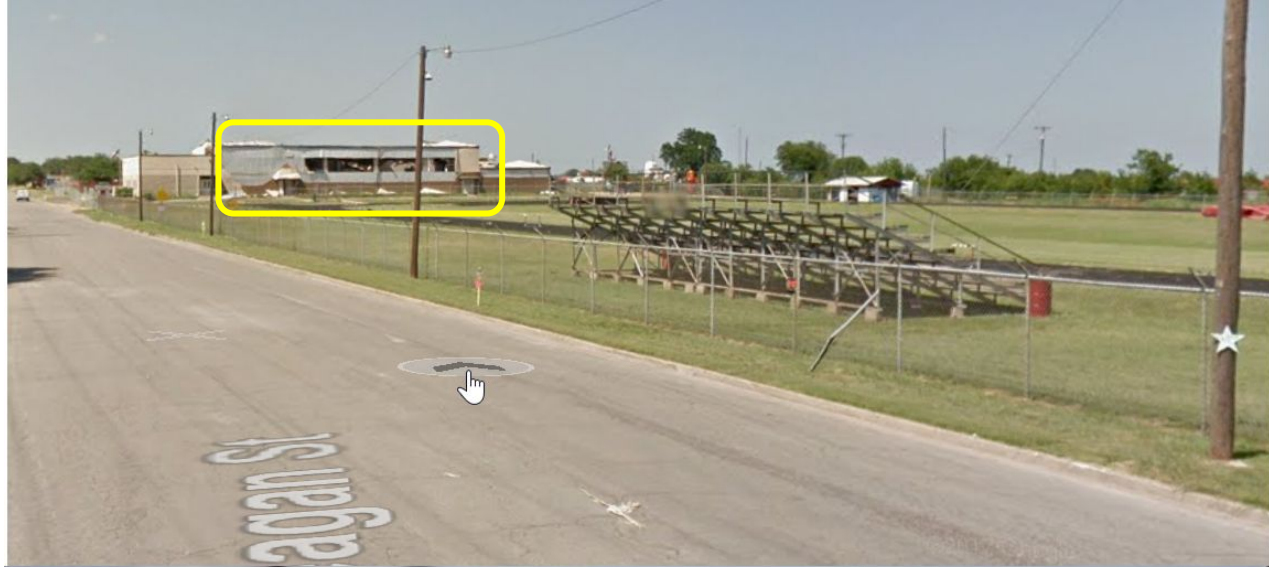
Cars Underwater In Hurricane Harvey Houston & Texas 2017

LowMileage

▶ Subscribe 108K

➕ Add to   ↪ Share   ••• More

👍 339   👎 41

Published on Sep 2, 2017
Catastrophic flooding at a historic level was the result of Hurricane Harvey.

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Reverse Image Search

No results

GOOGLE [screenshot2.jpg ✕] [describe image here] 📷 🎤 🔍

All   Images   Maps   Shopping   More   Settings   Tools

About 2 results (0.89 seconds)

Image size:
1916 × 1075

No other sizes of this image found.

Best guess for this image: *atmospheric phenomenon*

Atmospheric Phenomena | Unusual phenomena around the World
https://atoptics.wordpress.com/ ▾
Searching for Sub-Visual **Atmospheric** Structures in the Daytime Sky ... The cloud was located left from the rising sun, and the **phenomenon** lasted from two ...

Atmospheric phenomenon - definition of atmospheric phenomenon by ...
www.thefreedictionary.com/atmospheric+phenomenon ▾
atmospheric phenomenon. Also found in: Thesaurus, Wikipedia. Related to **atmospheric phenomenon**: Atmospheric phenomena. ThesaurusAntonymsRelated ...

Visually similar images

Report images

Cars Underwater In Hurricane Harvey Houston & Texas 2017

LowMileage

48,263 views

Add to　　Share　　More

👍 339　　👎 41

Published on Sep 2, 2017
Catastrophic flooding at a historic level was the result of Hurricane Harvey.

SHOW MORE

3:38 / 12:26

Pages that include matching images

Houston flooding: At least 5 dead - CNN - CNN.com
www.cnn.com/2016/04/18/us/houston-texas-flooding/index.html ▾
1600 × 900 - Apr 18, 2016 - More than a foot of rain in some places **flooded** low-lying areas across the **Houston** ... "**Houston** residents should avoid travel at all costs **today**.

Tropical storm Harvey brings deadly floods to Houston - YouTube
https://www.youtube.com/watch?v=b7qESUrBtk0 ▾
168 × 94 - Aug 27, 2017 - Tropical storm Harvey has unleashed catastrophic **flooding in Houston**, the largest city in the US state of Texas, turning streets into raging rivers ...

Houston Flooding Is Deadly as Harvey Lingers - YouTube
https://www.youtube.com/watch?v=mAL08g3Sycg ▾
168 × 94 - Aug 27, 2017 - Once a hurricane Harvey, now a tropical storm, pummeled **Houston** and the surrounding region, bringing catastrophic **flooding** and killing at ...

Watch This Annoyed Reporter Rescue A Man From A Sinking Car On ...
jalopnik.com/watch-this-annoyed-reporter-rescue-a-man-from-a-sinking-1... ▾
1870 × 1161 - Apr 18, 2016 - KTRK **Houston's** news reporter Steve Campion was live on the scene covering **flooding** going on in the area, when he saw two cars drive ...

VIDEO: Houston Reporter Jumps Into Flood Water To Save Driver
https://weather.com/.../houston-reporter-jumps-into-flood-water-to-save-driv... ▾
980 × 551 - Apr 19, 2016 - A KTRK reporter out of **Houston** Texas jumped into the **flood** waters to help pull a driver to safety before his car got submerged.

Watch This Annoyed Reporter Rescue A Man From A Sinking Car On Live TV

Michael Ballaban

4/18/16 10:56am | Filed to: FLOODS ⌄

355.5K 779 47

Why geolocate?

The International Criminal Court (ICC) issued an arrest warrant for a Libyan commander for unlawful executions and war crimes. This warrant was issued **entirely based off of evidence from social media**.

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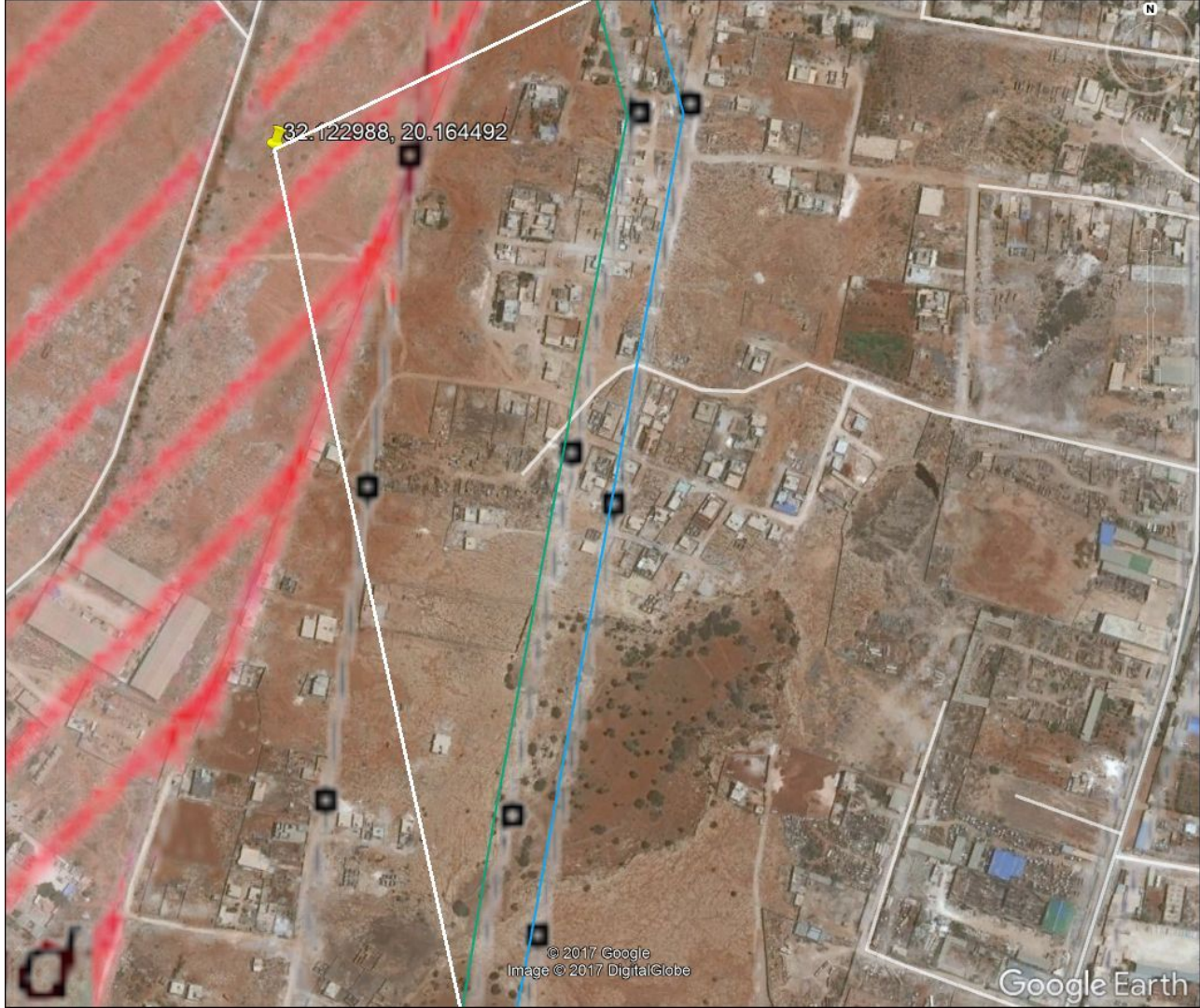
32.122988, 20.164492

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Not only does geolocating a video verify that the events really took place, it also solidifies evidence that can be used in criminal investigations. The ICC was not able to geolocate this video on their own, but a crowdsourcing campaign ran by Bellingcat provided coordinates for the video -- proving that it really did take place. **The video was filmed at a military compound controlled by this Libyan commander**, in between Benghazi and its airport.

"Temporal Location"
When was a photograph/video shot?

Determine the date/general time of a photograph or video by finding time-specific details, such as weather or temporary features (e.g. billboards), or determine a more precise time* by analyzing visible shadows.

Will likely not give you 100% verification, but will let you quickly sniff out fakes.

*Exact location and approximate date needed
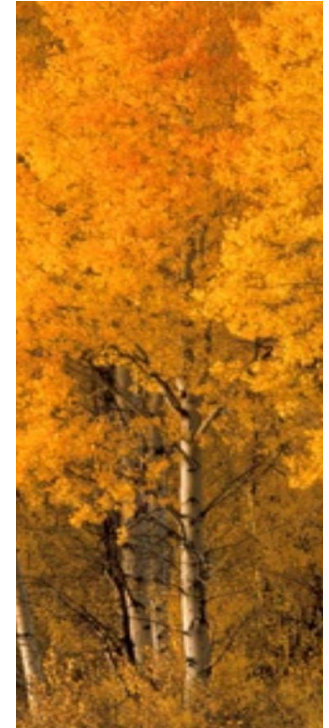
Temporary Details

Temporary Details

Temporary Details

Temporary Details

Temporary Details

Corrina Drost
@Corrina_Drost

⚙ 👤+ Follow

Ahmed Khan Rahami, bombing suspect, shot in Linden, NJ

Supposed eye witness to arrest of Manhattan / New Jersey bombing suspect -- other than geolocation, how do we verify that this image could be real?

Arrested on September 19, 2016
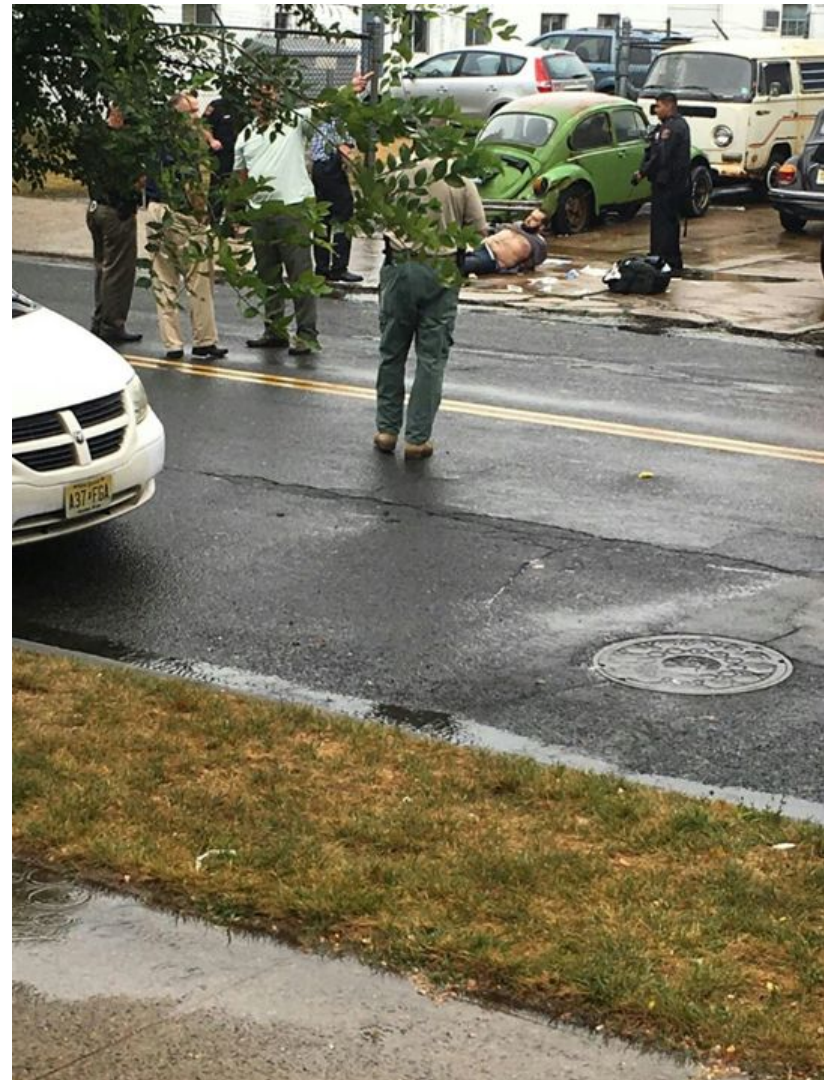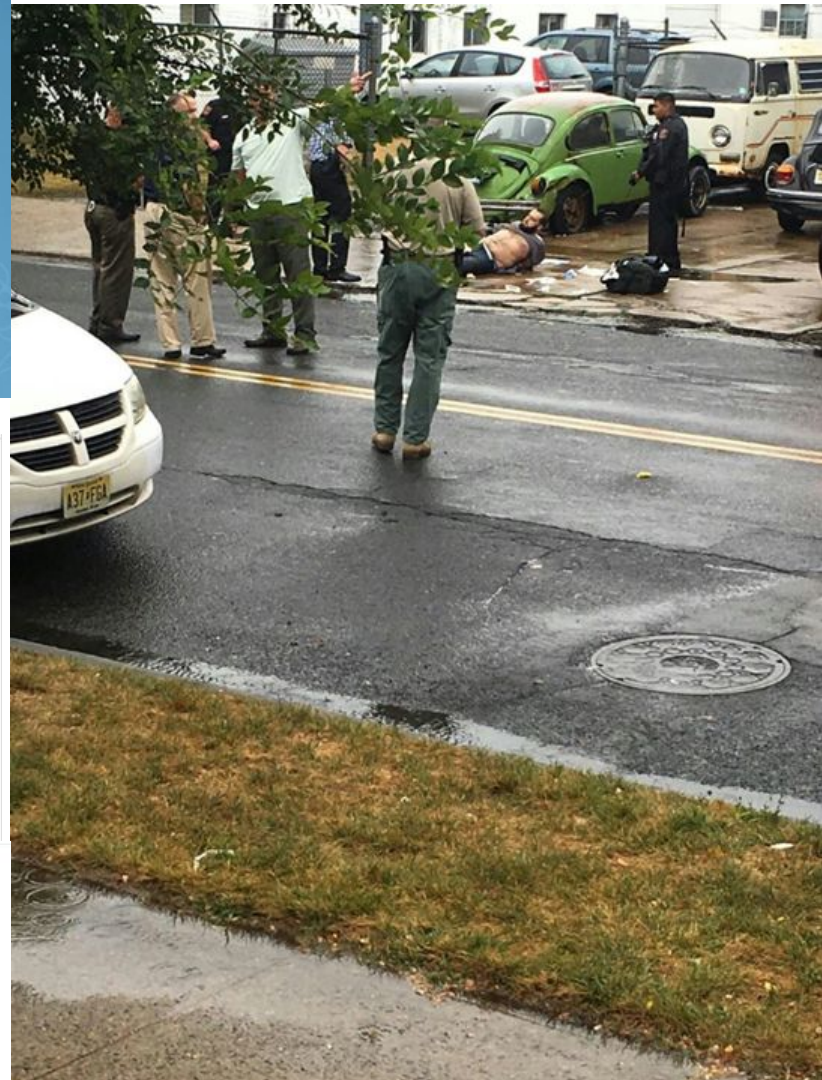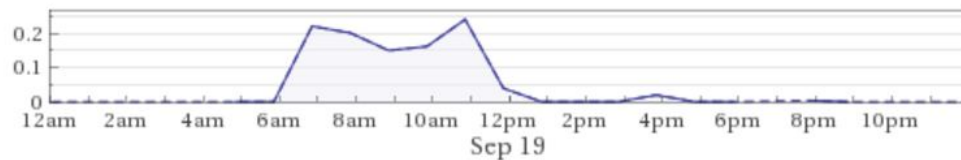
Digital Sundials
Using shadows to determine a specific time

If you know **exactly** where a photograph or video was taken, the approximate date, and there are clear shadows visible, you can often determine the approximate time of the source material.

Use Suncalc.org to place the shadow visible in photograph/video, and then adjust to match source material.

Don't forget to adjust for time zones!

Reported skirmish between Indian and Chinese soldiers at a lake.

Alleged time: August 15, 7:30am

Shadows seem to be perpendicular to the shore, visible paths
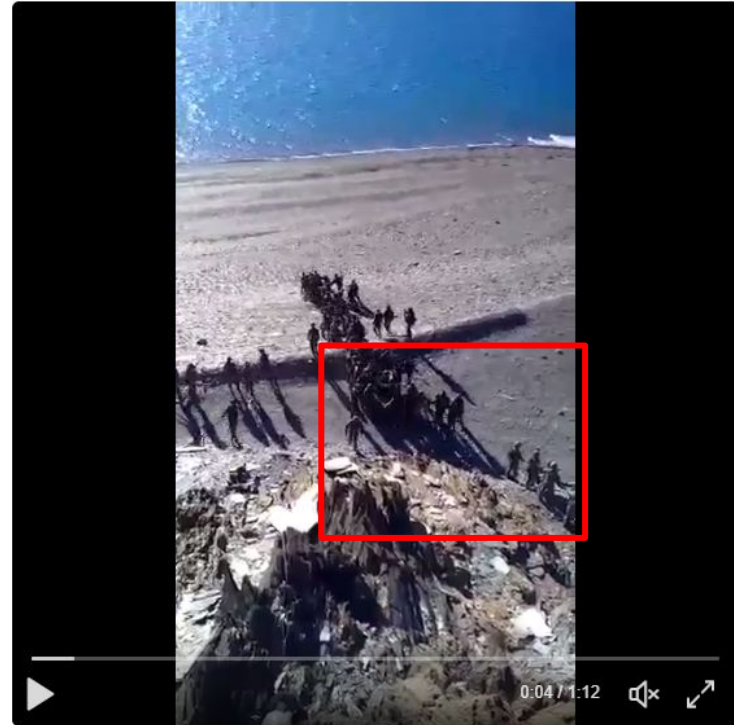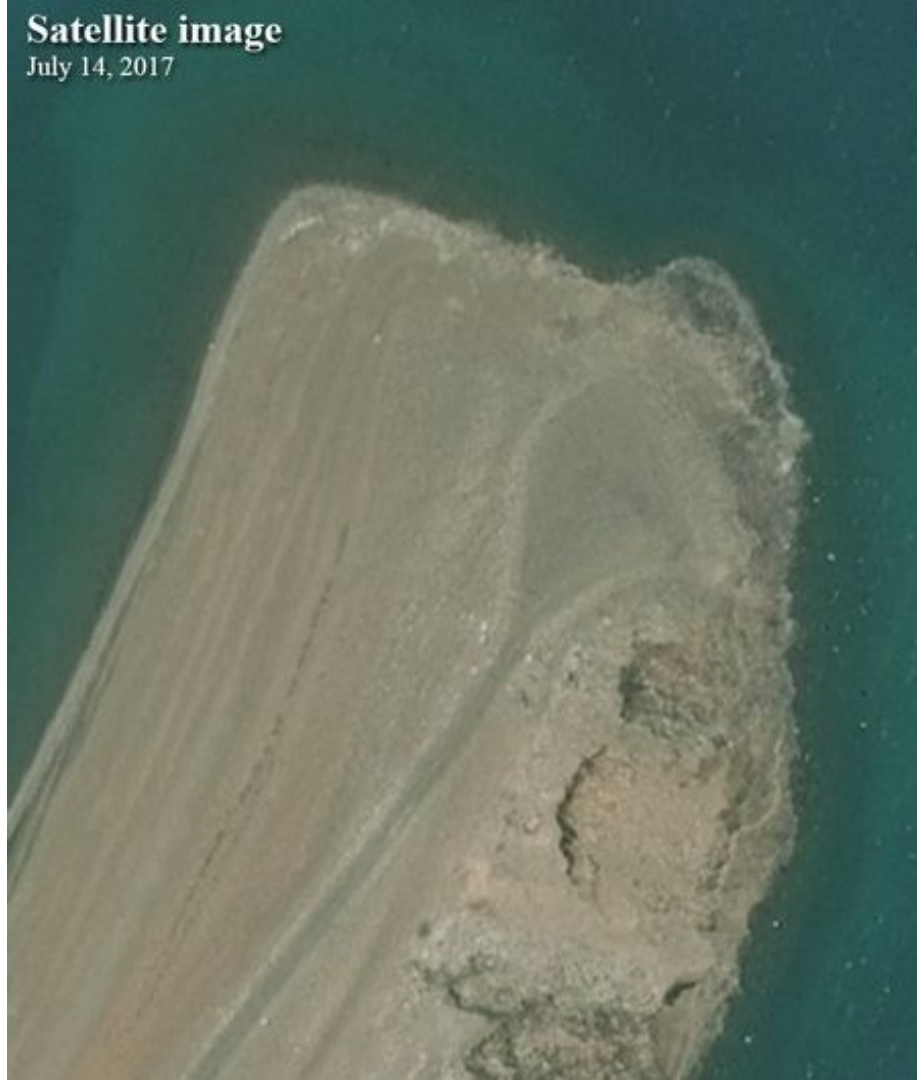
Satellite image
July 14, 2017

Satellite image
July 14, 2017
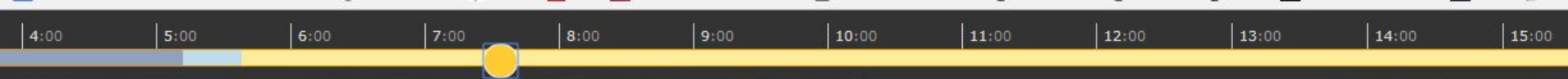
Computation path of the sun for:

Enter a location

| 15.Aug.2017 | 07:31 UTC+5.5 | >|< |

Solar data for the selected location

Dawn:	05:10:28
Sunrise:	05:36:31
Culmination:	12:19:26
Sunset:	19:01:49
Dusk:	19:27:49
Daylight duration:	13h25m18s
Distance [km]:	151.516.707
Altitude:	22.51°
Azimuth:	87.75°
Shadow length [m]:	238.83
at an object level [m]:	99

Geodata for the selected location

Height:	4248m	Set Lat/Lon
Latitude:	N 33°43'13.7"	33.72047°
Longitude:	E 78°45'49.51"	78.76375°
TZ:	Asia/Kolkata IST	
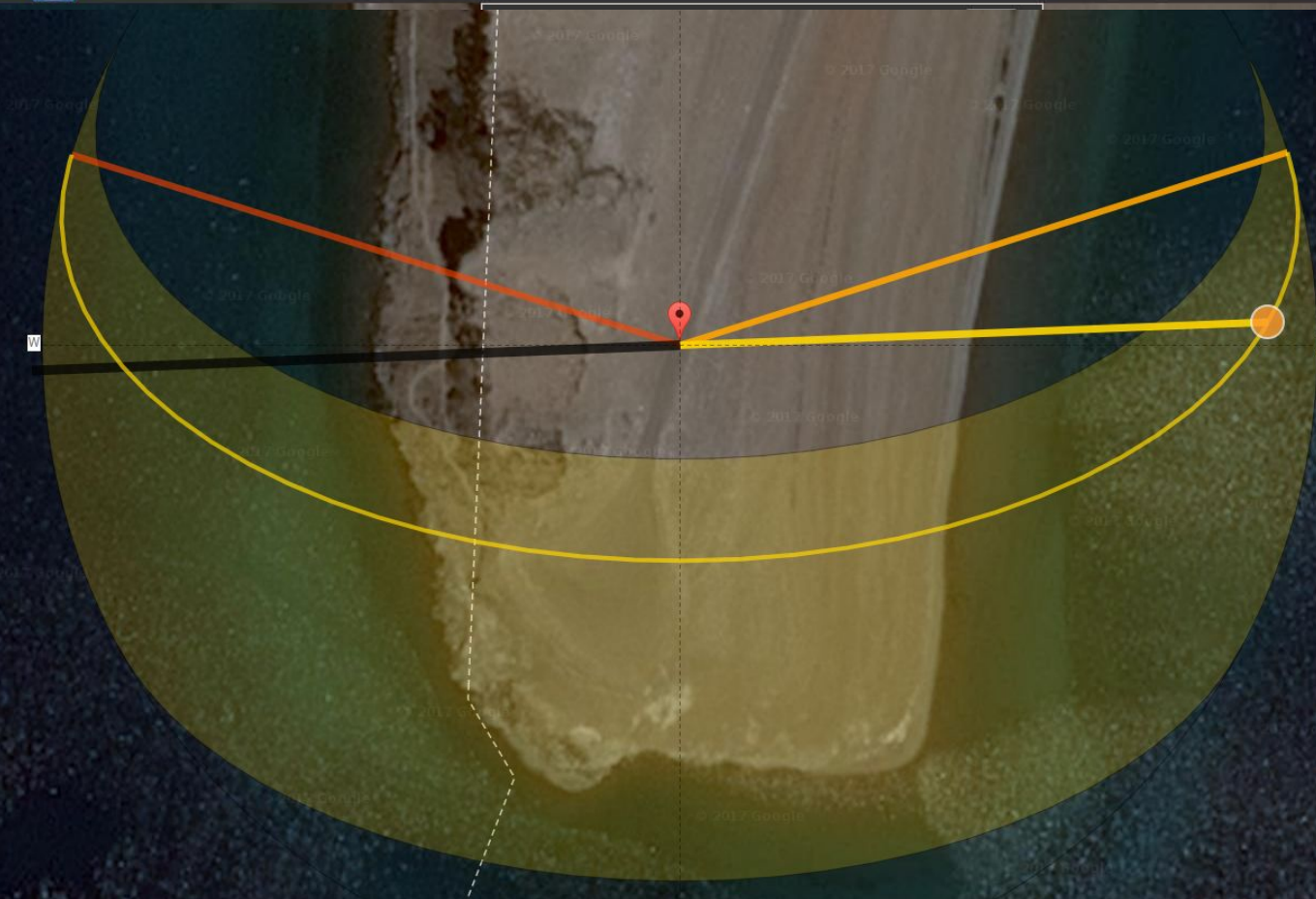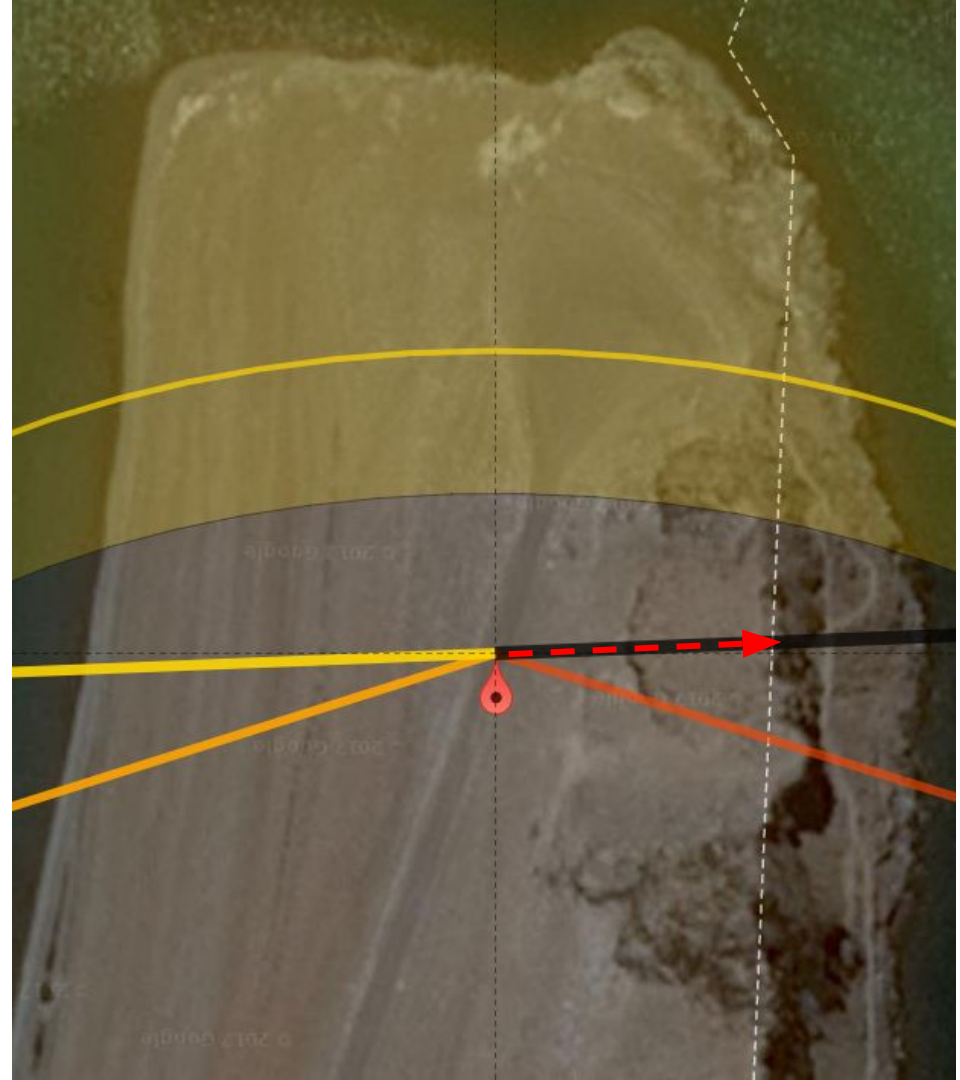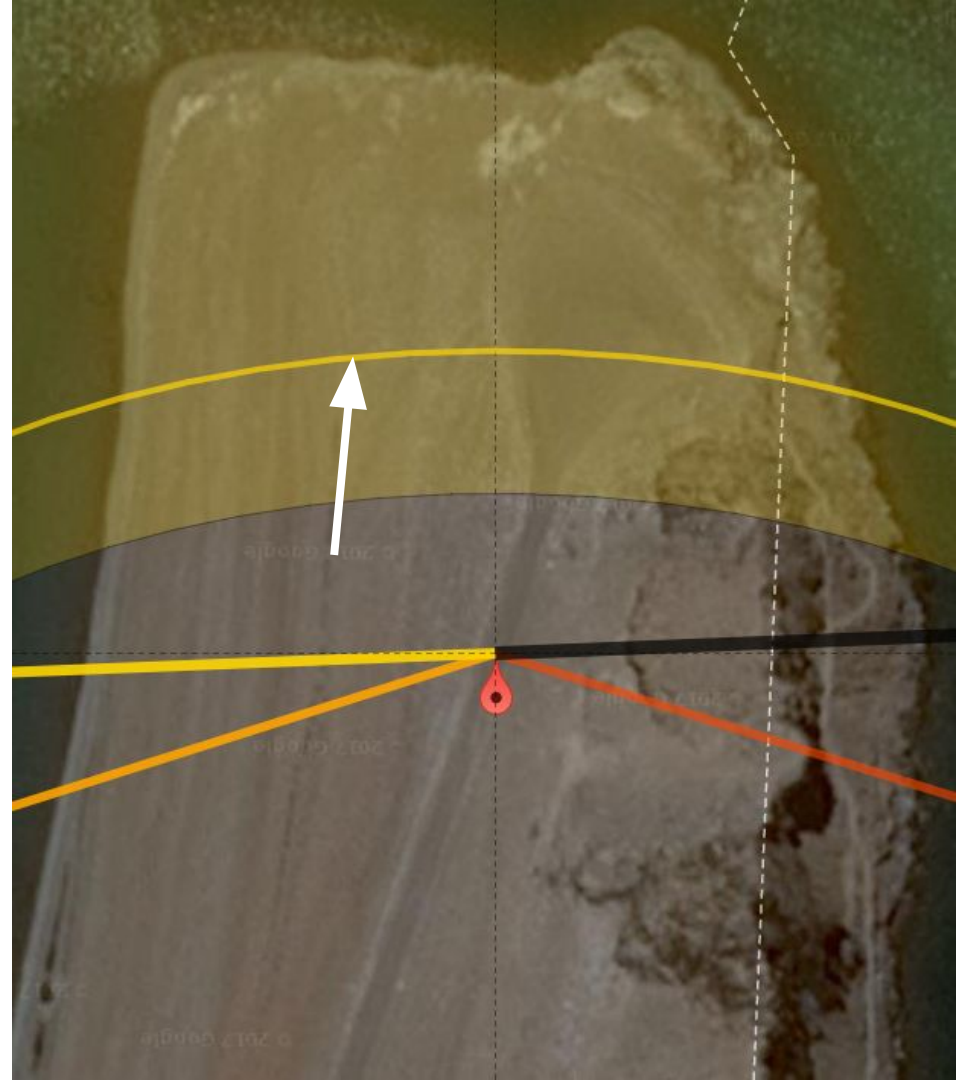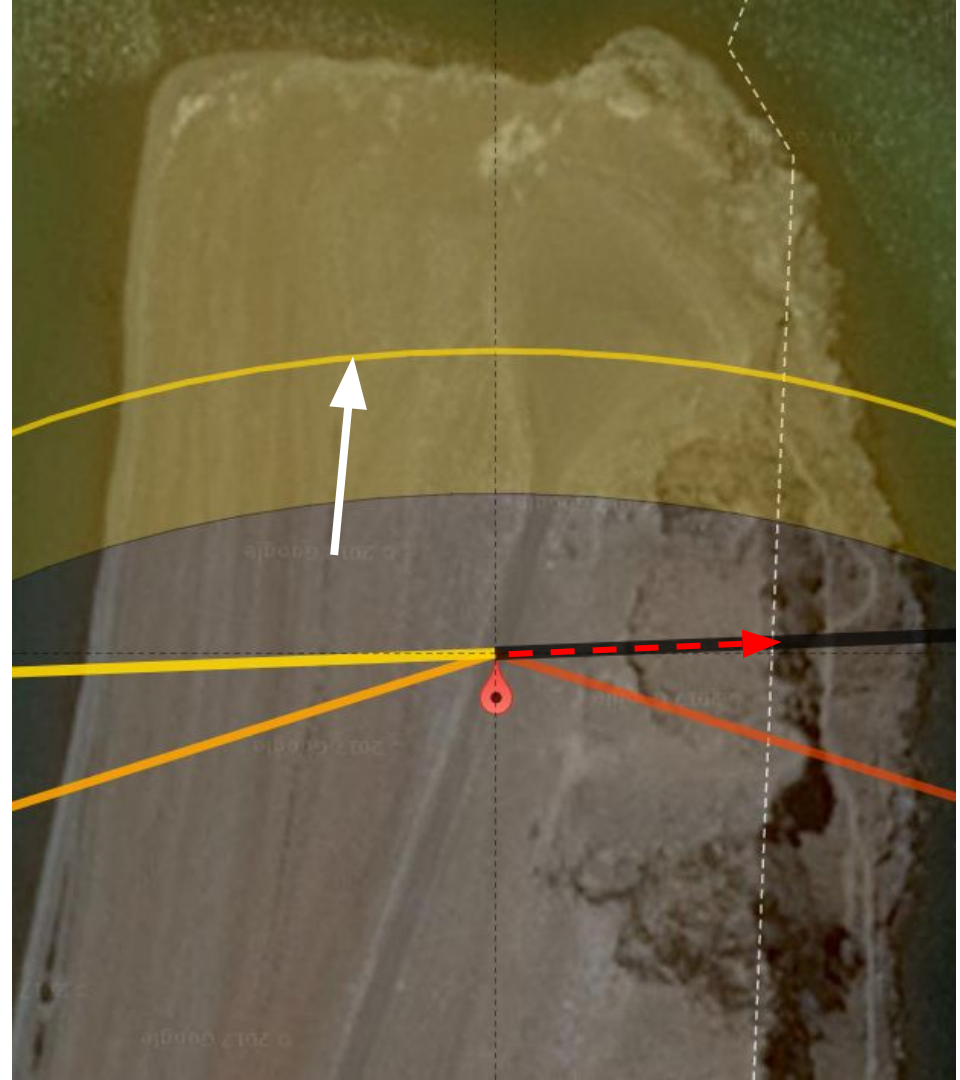
W

Who and Why?

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You can make some basic digital efforts, such as finding the social media profiles of the supposed author of a photograph/video, and then following up on potential motivations.

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While verification is important, it is also vital to figure out the **real** author of photographs or videos - especially with the rise of licensing services for viral photographs and videos from social media (Storyful, Viralhog, Jukin Media, etc.)

Metadata and Digital Forensics

Some interesting capabilities, but ultimately limited

Metadata can be useful for verifying photographs and videos straight from a device, but this metadata is lost when files are shared or sent through social networks or messaging applications.

If you want to receive a photograph and retain metadata, have it sent directly via email or MMS -- not Facebook chat, Telegram, Twitter, etc.

IMG_20170530_123127 Properties

General Security **Details** Previous Versions

Property	Value
Width	3036 pixels
Height	4048 pixels
Horizontal resolution	96 dpi
Vertical resolution	96 dpi
Bit depth	24
Compression	
Resolution unit	2
Colour representation	sRGB
Compressed bits/pixel	

Camera

Camera maker	Google
Camera model	Pixel XL
F-stop	f/2
Exposure time	1/60 sec.
ISO speed	ISO-314
Exposure bias	0 step
Focal length	5 mm
Max aperture	2
Metering mode	Centre Weighted Average
Subject distance	619 mm

Remove Properties and Personal Information

OK   Cancel   Apply

Photo sent via
Facebook (left)

vs.

Photo taken
directly from
phone (right)

21363343_10212213028619432_1296554199_o Prope... ✕

General | Security | **Details** | Previous Versions

Property	Value
Width	1536 pixels
Height	2048 pixels
Horizontal resolution	96 dpi
Vertical resolution	96 dpi
Bit depth	24
Compression	
Resolution unit	
Colour representation	
Compressed bits/pixel	
Camera	
Camera maker	
Camera model	
F-stop	
Exposure time	
ISO speed	
Exposure bias	
Focal length	
Max aperture	
Metering mode	
Subject distance	
Flash mode	

Remove Properties and Personal Information

OK   Cancel   Apply

IMG_20170530_123127 Properties ✕

General | Security | **Details** | Previous Versions

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Max aperture	2
Metering mode	Centre Weighted Average
Subject distance	619 mm

Remove Properties and Personal Information

OK   Cancel   Apply

imageedited.com

Is Your Image Edited?

Analyze File

Drag image here to test if it is edited or photoshopped.

Exif and pixel tests tell if the photo is original or modified.

Exif Viewer shows the full raw exif data for your image.

For full image analysis, contact us for pricing.

Image Edited?

Probably

2017-09-08_8-42-07.jpg

Pixels only match software editors

[Test another image](#) · [Show Exif information](#) · [Send Us Feedback](#)

>

Possible Image Sources

Based on the pixels, this image could have been created with:

software: **IMatch**

Limits of naked-eye analysis

We may think we are good at finding fake photographs, but often we come up short. Also, freely available, easy-to-use digital analysis is difficult to come by.

© Hany Farid

Think Like a Faker

Creative verification to win the fake news arms race

B.o.E Combat Airsoft Night Operations April 25th 2009

TAS801

Subscribe 12K

1,110,726 views

Add to   Share   More   👍 4,195   👎 162

Published on Apr 27, 2009

Footage of Team Black ops Elite and company performing night maneuvers in the utah desert, captured with PVS-14s. Like our facebook page "Utah Airsoft" For more information about our operations!

SHOW MORE

Бой Карабах (Karabakh fight night)

Анти Каратель

▶ Subscribe

1,514 views

+ Add to   ➤ Share   ••• More

👍 8   👎 4

Published on Apr 4, 2016

Notice   Age-restricted video (based on Community Guidelines)
Category   Gaming

SHOW MORE

▶ ⏭ 🔊 0:25 / 1:21   ⚙ ▭ ⧉ ⛶

Ночной бой в нагорном карабахе ВОТ ЛИЦО ВОЙНЫ где есть страх и боль 03 04 2016 ★★★★★

Mench A

▶ Subscribe 289

6,770 views

＋ Add to   ➤ Share   ••• More

👍 22   👎 6

Published on Apr 13, 2016

Category   People & Blogs
License   Standard YouTube License

NIGHT FIGHT KURDS VS ISIS RATS

worldtechvideos

▶ Subscribe 6

1,395 views

👍 11 👎 1

➕ Add to   ↗ Share   ••• More

This fight looks similar to a different recording near kobane in 2014 but it might not be. it could be north Iraq. So not sure if its ypg or peshmerga. Isis finding out they are not like the others who fight for 2 hours and walk away.

SHOW MORE

How to root out the fake?

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  - Zooming in on photograph/video
  - Mirroring
  - Extra logos/graphics in corners, obscuring details
  - Dubbed-in or removed audio (in order to add authenticity, or strip speech/languages)

night vision fighting

All   Images   Videos   Shopping   News   More   Settings   Tools

About 597,000 results (0.35 seconds)

Amazing Firefight Nightvision - YouTube
https://www.youtube.com/watch?v=qqgjg1rIKAk ▾
Jul 2, 2011 - Uploaded by xjkill
Holy crap.
▶ 2:41

Dramatic night footage of fighting in Fallujah - 2004 - YouTube
https://www.youtube.com/watch?v=sL4fUTGk3kg ▾
Jul 21, 2015 - Uploaded by AP Archive
Dramatic night footage of **fighting** in Fallujah - 2004 .... Intense **Nightvision**
Firefight Compilation | U.S ...
▶ 5:20

SHOCKING IRAQ WAR NIGHT VISION FOOTAGE!!! - YouTube
https://www.youtube.com/watch?v=w8UFaf8VnUI ▾
May 26, 2011 - Uploaded by bushdidit2u911
SHOCKING IRAQ WAR **NIGHT VISION** FOOTAGE!!! .... War in Syria - Insane Intense
Fighting and Firefights ...
▶ 6:39

Intense Nightvision Firefight Compilation | U.S. Military Afghanistan ...
https://www.youtube.com/watch?v=HLSEJ-hLkcc
Feb 4, 2017 - Uploaded by MilitaryCorner
A Compilation of **Nightvision** Firefights filmed by U.S. Forces! ➜ Visit RECON
COMPANY: https://www.recon ...
▶ 7:24

Heavy firefight at night in Iraq - YouTube
https://www.youtube.com/watch?v=2CjseDAuMvw ▾
May 17, 2012 - Uploaded by German Military Power
yea dude. fuck imagine we were **fighting** the russians or an actual .... Intense
Nightvision Firefight Compilation ...
▶ 2:18

0:10 / 1:09

Syria/War/ Сумасшедший ночной бой.Шквальный огонь в упор.

Sochi Ed

Subscribe 82

1,077 views

Add to   Share   More

10   5

Published on Oct 26, 2016

Category   People & Blogs
License   Standard YouTube License

Запеклі бої тривають на Світлодарській дузі

Сегодня

Subscribe 27K

10,896 views

Add to | Share | More

36 | 10

SHOW MORE

Место: Экскаваторная улица, Донецк
Добавлена 20 сентября 2014 | Мне нравится ♥ 5
Комментарии к этой фотографии скрыты настройками приватности.

Вадим Хома
Фотографии на стене
Вадима

- Photo shared on social media page of "Russian soldier" claiming to have shot down Malaysian Airlines Flight 17 (MH17)
- Profile seemed legitimate -- friends, photos, apparently from real division in Russian military
- Shared geotagged photo of missile system in Donetsk, Ukraine
- Photo did not have any results on Google Image Search, suggesting it was original (thus, not borrowed/recycled from another source)

Место: Экскаваторная улица, Донецк
Добавлена 20 сентября 2014 | Мне нравится ♥ 5

Комментарии к этой фотографии скрыты настройками приватности.

Вадим Хома
Фотографии на стене Вадима

It is not only fake "soldiers" altering images to pass them off as real. A Brazilian man named "Eduardo Martins" passed off the real photos of professional photographers as his own, after doing slight modifications to them, preventing results on reverse image searches. His photos were published on Getty, Deutsche Welle, Wall Street Journal, and other prestigious publications and photo services.

Fotos publicadas como de Eduardo Martins

Fotos de autoria 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 13, 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.

Krafanbel, Syria 3
A boy rides passed a building destroyed in an air strike in the village center in Krafanbel, 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.

Krafanbel, Syria
Men ride passed a destroyed building in Krafanbel, 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.
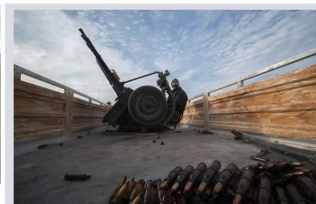
Watching the Sky
Mahmood Sheikh Hamid mans an anti-aircraft weapon in Marat al-Nouman, Syria, on Sunday, December 1, 2013. Daily government airstrikes have rebels watching the sky on 24-Hour alert.