

Challenges

Instructions

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******The Case Of The Super Moon******

- ✓ A *supermoon* is when a full moon coincides with the perigee (closest point) in the Moon's orbit around the Earth. This event can make the moon appear larger and brighter than a typical full moon.
- ✓ Unfortunately, events like this are frequently misrepresented by people who want the credit for taking an amazing photo. Digital alterations and older pictures are commonly portrayed as recent photos.
- ✓ On Twitter, a user posted an amazing photo of the supermoon. This alleges to show a supermoon over ruins in Greece.



Look at these pictures and try to answer the following questions in order to determine the credibility of the tweeted picture:

1. Are any of these pictures camera-originals?

HINT :- Look at the metadata

- None of these pictures are camera-original.
- A camera-original photo should have metadata that reflects the camera. Pictures #1 and #3 have minimal metadata that does not identify any camera information.

- Picture #2 identifies the picture as coming from a Canon EOS 5D camera. However, the metadata also identifies Adobe Photoshop CS2 for Windows and a "Derived From Document ID", indicating that this picture is based on another picture.

2. Do any of these pictures identify an unedited moon?

HINT :- try using error level analysis

- Pictures #1 and #3 have undergone multiple resaves. ELA shows a flat background, where the low quality has removed most of the noise from the picture.
- Picture #2 shows a some rainbowing and very strong high contrast edges. These are consistent with the use of an Adobe product; Adobe automatically sharpens high contrast edges when JPEGs are saved.

3. When was this picture created?

HINT :- Look at the metadata

- The metadata in picture #2 contains a timestamp: 2010-06-27 01:19:53. Although the tweet says it was taken "yesterday" (meaning 2015-06-24), it was actually taken more than five years earlier.

4. Does this picture represent a supermoon?

HINT :- There are two dates: when the picture was tweeted and when the picture was taken. Were either of these dates when a supermoon occurred?

- The picture was tweeted on 2015-06-25 and the metadata from picture #2 says it was taken on 2010-06-27 around 1:19 am. (The date could actually be 2010-06-26, depending on the timezone.)
- A full moon supermoon occurs about once every 13 months. A list of previous supermoons can be found online. The date for the 2015 supermoon is September 28, not June 25. And in 2010, it was January 30, not June 27.
- We can also identify that there was no full moon within three weeks of 2015-06-25. On 2015-06-25, only half of the moon should have been visible. In contrast, there was a full moon on 2010-06-26, so the picture is consistent with the metadata.
- While the picture does represent a full moon, it is not a supermoon. Moreover, it was not taken on the date that was claimed by @BestWorldPix on Twitter.

5. Can you identify the photographer?

HINT :- This requires using a search engine, such as Google or Bing. First identify the ruins. Then look for pictures of the ruins at night. Then see if you can identify the photographer's name.

- A search on Google for pictures of ruins in Greece identifies this location as a temple of Poseidon in Attica, Greece.

- A search for temple of Poseidon in Greece at night identifies a series of related photos captured by photographer Anthony Ayiomamitis late at night on 26-June-2010.
- The web page at TWANight.org states that the Royal Museums Greenwich featured the middle picture in a photo contest. Picture #2 comes from Ayiomamitis' Flickr stream, which is linked from the Museums web site. The Flickr picture has minor color alterations.
- It is very likely that Ayiomamitis first photographed this picture and digitally enhanced the colors for a photo contest. Years later, @BestWorldPix posted the modified picture to Twitter and misrepresented it as a recent photo of a supermoon.

*******The Case of the Wall-Eyed Girl*******

Having both eyes look inward is called "esotropia" or "cross-eyed". But what is it called when both eyes look outward? Exotropia, or having both eyes look outward, is sometimes called "cock-eyed" or "wall-eyed". Plenty of people can cross their eyes, but few people can look in opposite directions at the same time. Is this picture of a wall-eyed girl real?



1. Starting with the metadata. What type of camera took this picture?

HINT :- Look at metadata for cameras make and model.

- The make identifies this as a "Casio Computer Co., LTD" camera. The model is a EX-Z3.
- If you look up this camera, you will find that it is a small point-and-shoot camera with a 3 megapixel sensor. It first came out in 2003.

2. When was this picture taken?

HINT :- Look at the metadata for the timestamps. This includes the creation date, modified date, and date/time original.

- The creation date, modify date, and original date/time all say the same thing. The picture was photographed on 24-June-2006 at 7:51pm (2006:06:24 19:51:05).

3. This type of camera has a configuration setting that permits you to set a nearby hometown. (Selecting a city in the same time zone is easier than forcing users to select a time zone.) What is the hometown?

HINT :- Look in the metadata's MakeNotes for the city.

- The metadata "Hometown City" is "Stockholm". This picture was likely taken in the same time zone as Stockholm, Sweden.
- 4. Based strictly on the metadata, is there anything to suggest that this is anything other than a camera-original picture?**

HINT :- Look for inconsistent timestamps, metadata fields that only come from applications, or other inconsistencies. See the metadata tutorial.

- The timestamps are consistent. The metadata sections appear consistent for metadata from a camera. There is no indication of tampering or third-party applications altering this picture.
- Based only on the metadata, this appears to be a camera-original picture.

5. Using Error Level Analysis to evaluate the JPEG compression level, are there any inconsistencies, or does this picture appear unmodified?

HINT :- With ELA, look for consistencies. Do similar edges have similar intensities? Are similar surfaces at similar intensities? Are similar textures at similar intensities? Or is there something inconsistent? Inconsistencies can be used to identify tampering or modifications.

- The ELA result shows a dark vertical line down the center of the picture. Compared to the rest of the picture, this line is inconsistent across all edges, surfaces, and textures.
- This inconsistency identifies an edit that was made to the picture. The wall-eyed girl appears to be made from two photos that were spliced together. The vertical line shows where the two pictures were blended together.

6. Bonus question: (Very difficult) Can you tell what happened with this picture?

HINT :- Identifying how the picture was created is a really difficult problem. You want to find a scenario that is consistent with both the ELA and metadata findings. For this picture, first look at the metadata for anything about camera modes or specific camera settings. Then look through the camera's user manuals and technical manual for information about the modes identified in this picture's metadata. **Warning:** While this overall challenge has a difficulty of ●●●○○, this question, by itself, should be a ●●●●●.

- The metadata has a MakerNotes field called "Record Mode" and is set to "Best Shot". The metadata also says that it used Best Shot Mode #4.
- The manual for this camera says that the "Best Shot" function is used for in-camera modifications to the picture. Mode #4 is a "Coupling Shot: Uses separate areas to combine two shots." This is a splicing of two pictures.
- So how did the photographer create this image? They took two pictures. One picture has her looking left, and the other has her looking right. Then, using the in-camera splicing, the pictures were combined.
- The ELA result shows where the pictures were spliced together. And since it was all done in-camera, the metadata reflects a camera-original picture.

********The Case of the Scottish Sheep********



Sheep A



Sheep B



Sheep C

Stories and pictures go viral and spread across the Internet rapidly. This results in hundreds of photo variants. For analysis, it is always best to start with the highest quality picture. One viral story is about a farmer who dyes his sheep. It has been repeated at Imgur, Reddit, Uberhumor, and many other sites. According to the story: Freshly dyed sheep run in view of the highway near Bathgate, Scotland. The sheep farmer has been dyeing his sheep with NON-TOXIC dye since 2007 to entertain passing motorists.

1. Which photo is the highest quality?

HINT :- Look for the largest dimensions and the largest file size.

- Sheep B is the highest quality. The digest and metadata both identify that B is 736x1118, while A is 350x531 and C is 728x1105. Scaling any picture larger results in blurring. Since Sheep B has the largest dimensions and does not appear blurry, it should be the highest quality.
- Sheep B is also the largest file size. When a JPEG is resaved, it becomes a smaller file -- even if the image dimensions remain unchanged.
- According to JPEG %, Sheep A was last saved at 94% quality. Sheep B is at 95% and Sheep C is at 80%. Even if the pictures were all the same dimensions and roughly the same file size, Sheep B would still be the highest quality image.
- In this case, Sheep B has the largest dimensions, biggest file size, and highest last-save quality.

2. Is the highest quality picture digitally altered?

HINT :- Do all of the colors stay on their respective sheep, or did someone color outside the lines? You will probably need to view the largest picture at full size -- select "Original" and click on the lower picture.

- Using observation, the edge of the cyan sheep (front center) loses the cyan color next to the center red sheep. The edge between the red and purple sheep is gray and not red or purple. And the magenta sheep on the left/middle has some of her color on the purple sheep. These details are not as obvious in the lower quality images and not obvious when the picture is scaled smaller. These color boundary issues strongly suggest digital alterations.
- ELA also identifies an artificial focus along the lower third of the picture. This appears as a bright horizontal band that is independent of the picture's content.

3. Can you find a better source for the original?

HINT :- Try using an image search engine.

- Google Image Search is based on the coloring in the image. It finds many versions of the colored sheep. The various sources all give similar stories about the Scottish sheep farmer.
- The TinEye search engine is based on similar shapes. TinEye identifies the original, uncolored sheep picture.
- The photo originally came from the USDA. The caption reads, "Research flock at the U.S. Sheep Experiment Station near Dubois, Idaho." It was uploaded to the USDA web site on January 17, 2003.

4. Is this viral story associated with this picture correct and accurate?

HINT :- Re-read the viral story (it is only two sentences). Do any of the key details match the analysis results?

- Every key detail in the viral story is fictitious. The sheep are not dyed, the location is not Scotland, and the photo is not from 2007.

5. Ignoring the picture, is the story real?

HINT :- Search news sites for "dyed sheep" and "Bathgate". Ignore any results that show this picture.

- There is some truth to this story. A BBC News report from 2007 discusses dyed-red sheep as part of an art project. In 2011, the Telegraph reported on sheep dyed-purple to raise awareness for a cause. There are also reports of red sheep in 2008 and blue sheep in 2015.
- There does appear to be dyed sheep at the Pyramid Parks on M8 in Bathgate, Scotland. However, according to the news stories, the reason for coloring the sheep seems to vary by year (it is not specifically "to entertain passing motorists"), and the news does not appear to report on it every year.

********The Case of the Loch Ness Monster********



A photograph claiming to capture an image of the Loch Ness Monster in the waters of Loch Ness has emerged, generating considerable interest and speculation. The image has gained attention on social media platforms, with debates surrounding its authenticity and the potential discovery of the legendary creature. In an effort to determine the credibility of the photograph, photo forensics is employed to analyze various technical aspects, including metadata, error levels, pixel patterns, and more.

1. Was the metadata of the image consistent with the claimed location, date, and time of capture?

The metadata of the image was consistent with the claimed location, date, and time of capture.

Time: 19:51:05

Date: 2006:06:24

Location:

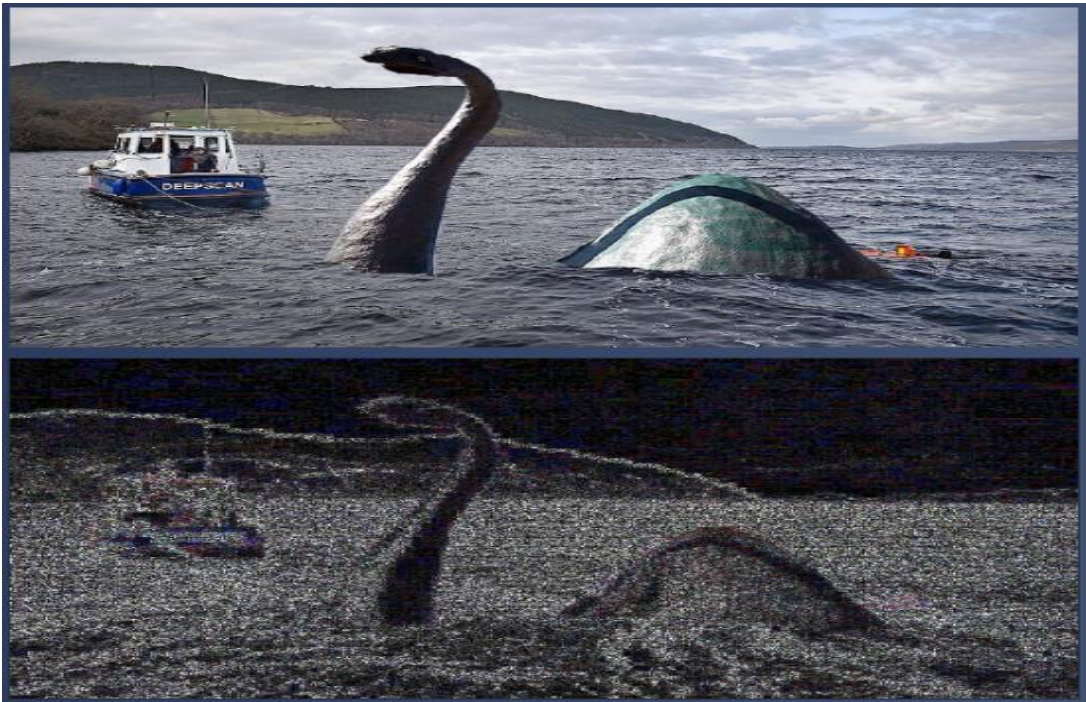
- Latitude: 47.35° N
- Longitude: 8.498° E
- These coordinates points to Switzerland

2. Were there noticeable variations in compression levels across the image, suggesting potential areas of digital manipulation?

The error level analysis helps us to show if there are any digital manipulations in the input image or not. The input image showed some white patches in the ELA analysis which informs that there are digital manipulations or the image is modified with the original. This means our input image has some modifications done prior.

3. Did the steganography analysis reveal any concealed data or hidden information within the image, providing additional context to the Loch Ness Monster sighting?

From the steganography analysis we found out that using the Adobe software was used to edit the image signifying that the image is false and contains error.



Digest

Property	Value
Filename	_98762130_lochness1.jpg
Filetime	2024-03-06 07:38:28 GMT
File Type	image/jpeg
Dimensions	976x549
Color Channels	3
Unique Colors	52857
File Size	171,816 bytes
MD5	4a049dc4dedb23499ffa8bc43d0c61ac
SHA1	80bd78ee2ea5c76791f5afc55950161f6e5b12b9
SHA256	7911a560bb1042792b2287db11a41b36414f641b1895b8bf93687f241000d2df
First Analyzed	2018-02-09 16:52:54 GMT

Meta Data

File	
File Type	JPEG
File Type Extension	jpg
MIME Type	image/jpeg
Image Width	976
Image Height	549
Encoding Process	Baseline DCT, Huffman coding
Bits Per Sample	8
Color Components	3
Y Cb Cr Sub Sampling	YCbCr4:2:0 (2 2)
JFIF	
JFIF Version	1.01
Resolution Unit	inches
X Resolution	96
Y Resolution	96
Composite	
Image Size	976x549
Megapixels	0.536

Jpeg%

Summary

JPEG last saved at 80% quality (JPEG Standard)

Quantization Tables

Quality determined from the quantization tables that encoded the JPEG:

JPEG Q0: Luminance

6	4	4	6	10	16	20	24
5	5	6	8	10	23	24	22
6	5	6	10	16	23	28	22
6	7	9	12	20	35	32	25
7	9	15	22	27	44	41	31
10	14	22	26	32	42	45	37
20	26	31	35	41	48	48	40
29	37	38	39	45	40	41	40

Applied as 8x8

JPEG Q1: Chrominance

7	7	10	19	40	40	40	40
7	8	10	26	40	40	40	40
10	10	22	40	40	40	40	40
19	26	40	40	40	40	40	40
40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40
40	40	40	40	40	40	40	40

Applied as 16x16

******The Case of the Big Foot******



A photograph claiming to capture an authentic image of Bigfoot in a remote forest has surfaced online, triggering widespread speculation and debates about its legitimacy. The image has quickly gone viral, with enthusiasts and skeptics alike weighing in on whether it could provide conclusive evidence of the existence of the elusive creature. To settle the controversy, photo forensics is employed to assess the authenticity of the image, examining various technical aspects such as metadata, error levels, pixel patterns, and more.

1. Ignoring the picture, is the story real?

The story of Bigfoot, also known as Sasquatch, is a legendary creature that has been a subject of folklore and alleged sightings primarily in North American folklore. However, despite numerous claims and alleged evidence such as footprints, photographs, and videos, there has been no definitive scientific evidence proving the existence of Bigfoot. Many researchers and scientists consider Bigfoot to be a myth or a cultural phenomenon rather than a real creature.

2. Starting with the metadata. What type of camera took this picture?

There is no specific camera details provided but it is sure that the image is taken by a low quality and old camera by looking at the picture quality. The metadata consists of various other details except camera since it could be not included in metadata at that time.

3. Using Error Level Analysis to evaluate the JPEG compression level, are there any inconsistencies, or does this picture appear unmodified?

Summary

JPEG last saved at 90% quality (JPEG Standard)

Quantization Tables

Quality determined from the quantization tables that encoded the JPEG:

JPEG Q0: Luminance

3	2	2	3	5	8	10	12
2	2	3	4	5	12	12	11
3	3	3	5	8	11	14	11
3	3	4	6	10	17	16	12
4	4	7	11	14	22	21	15
5	7	11	13	16	21	23	18
10	13	16	17	21	24	24	20
14	18	19	20	22	20	21	20

Applied as 8x8

JPEG Q1: Chrominance

3	4	5	9	20	20	20	20
4	4	5	13	20	20	20	20
5	5	11	20	20	20	20	20
9	13	20	20	20	20	20	20
20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20

Applied as 16x16



The error level analysis helps us to show if there are any digital manipulations in the input image or not. The input image showed some white patches in the ELA analysis which informs that there are digital manipulations or the image is modified with the original. This means our input image has some modifications done prior. The above image is modified since it shows white spaces at some point indicating the luminance, chrominance has been modified to look as the original image.

Metadata :-

File	
File Type	JPEG
File Type Extension	jpg
MIME Type	image/jpeg
Image Width	421
Image Height	198
Encoding Process	Baseline DCT, Huffman coding
Bits Per Sample	8
Color Components	3
Y Cb Cr Sub Sampling	YCbCr4:2:0 (2 2)
JFIF	
JFIF Version	1.01
Resolution Unit	inches
X Resolution	96
Y Resolution	96
Composite	
Image Size	421x198
Megapixels	0.083

Digest :-

Property	Value
Filename	Picture1.jpg
Filetime	2024-03-06 13:28:56 GMT
File Type	image/jpeg
Dimensions	421x198
Color Channels	3
Unique Colors	28769
File Size	28,229 bytes
MD5	20fc36746e65d791083fb8744b08af0b
SHA1	f4c1d2acf41541aadfec8a8e83fec985dfa5790e
SHA256	7ec1d153dfead4cc784e13a9000466e02fe4e20568c27087fdd5e98f94e0cd27
First Analyzed	2024-03-06 13:29:13 GMT