METADATA

CHAPTERS

What is Metadata?

"Metadata which details the who, what, where, and when of communications" -Edward Snowden
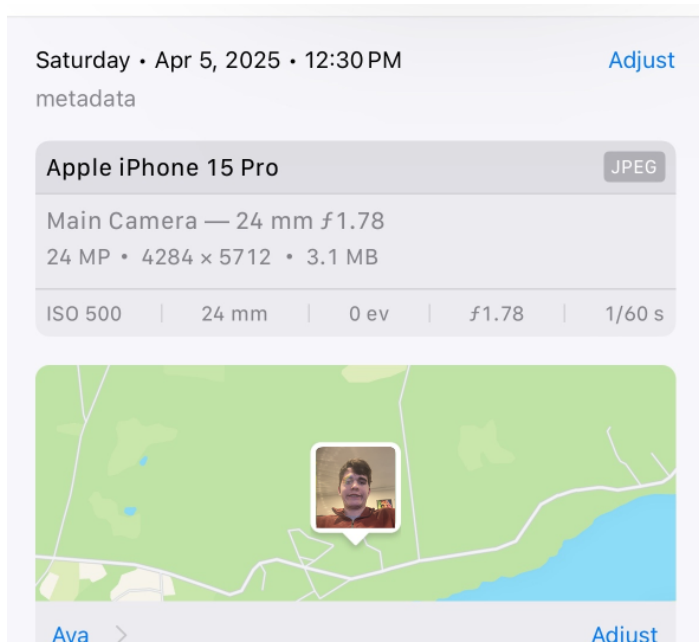
Legal & Ethical Aspect

- Altering metadata for malicious purposes can be illegal

- It can be used for both protection and deception

Why Metadata Matters

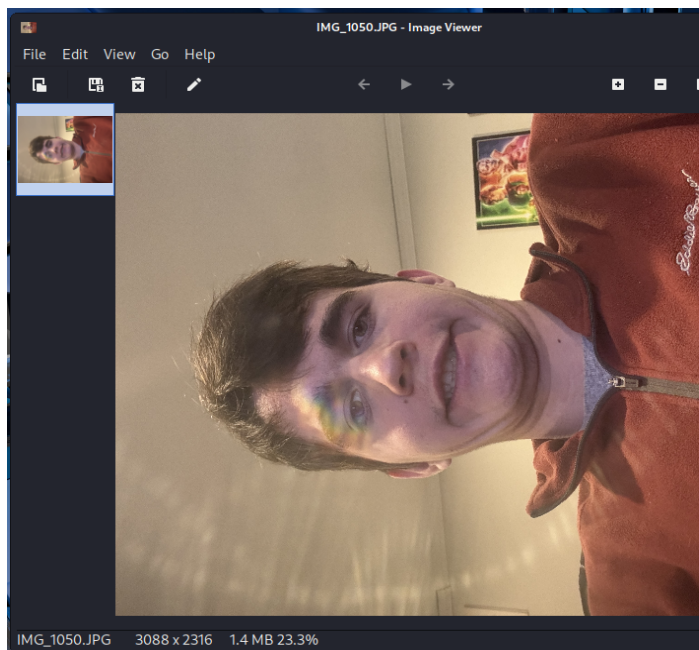Give context about the importance of metadata in:

- Digital forensics

- Privacy concerns

- Journalism and whistleblowing

- Legal evidence

Before Pictures

LOCATION WAS TAKEN AT AVA, NY

Here is the before data on my iPhone, the data says the location is Ava, NY.

CLOSER LOOK AT IMAGE

Here is the picture on the Kali.

Raw Data

```
┌──(oshagw㉿kali)-[~/Desktop]
└─$ exiftool metadata.JPG
ExifTool Version Number         : 13.10
File Name                       : metadata.JPG
Directory                       : .
File Size                       : 3.1 MB
File Modification Date/Time     : 2025:04:06 00:59:38-04:00
File Access Date/Time           : 2025:04:17 13:54:05-04:00
File Inode Change Date/Time     : 2025:04:17 13:54:05-04:00
File Permissions                : -rwxrwx———
File Type                       : JPEG
File Type Extension             : jpg
MIME Type                       : image/jpeg
JFIF Version                    : 1.01
Exif Byte Order                 : Big-endian (Motorola, MM)
Make                            : Apple
Camera Model Name               : iPhone 15 Pro
Orientation                     : Rotate 90 CW
X Resolution                    : 72
Y Resolution                    : 72
Resolution Unit                 : inches
Software                        : 17.6.1
Modify Date                     : 2025:04:05 12:30:13
Host Computer                   : iPhone 15 Pro
Y Cb Cr Positioning             : Centered
Exposure Time                   : 1/60
F Number                        : 1.8
Exposure Program                : Program AE
ISO                             : 500
Exif Version                    : 0232
Date/Time Original              : 2025:04:05 12:30:13
Create Date                     : 2025:04:05 12:30:13
Offset Time                     : -04:00
Offset Time Original            : -04:00
Offset Time Digitized           : -04:00
Components Configuration        : Y, Cb, Cr, -
Shutter Speed Value             : 1/60
Aperture Value                  : 1.8
Brightness Value                : 0.4342892653
Exposure Compensation           : 0
Metering Mode                   : Multi-segment
Flash                           : Off, Did not fire
Focal Length                    : 6.8 mm
Subject Area                    : 2849 2137 3291 1884
Maker Note Version              : 14
Run Time Flags                  : Valid
Run Time Value                  : 740612633068000
Run Time Scale                  : 1000000000
Run Time Epoch                  : 0
AE Stable                       : No
AE Target                       : 163
AE Average                      : 152
AF Stable                       : Yes
```

```
MP Image Start                   : 2814772
Dependent Image 1 Entry Number   : 0
Dependent Image 2 Entry Number   : 0
Profile CMM Type                 : Apple Computer Inc.
Profile Version                  : 4.0.0
Profile Class                    : Display Device Profile
Color Space Data                 : RGB
Profile Connection Space         : XYZ
Profile Date Time                : 2022:01:01 00:00:00
Profile File Signature           : acsp
Primary Platform                 : Apple Computer Inc.
CMM Flags                        : Not Embedded, Independent
Device Manufacturer              : Apple Computer Inc.
Device Model                     :
Device Attributes                : Reflective, Glossy, Positive, Color
Rendering Intent                 : Perceptual
Connection Space Illuminant      : 0.9642 1 0.82491
Profile Creator                  : Apple Computer Inc.
Profile ID                       : ecfda38e388547c36db4bd4f7ada182f
Profile Description              : Display P3
Profile Copyright                : Copyright Apple Inc., 2022
Media White Point                : 0.96419 1 0.82489
Red Matrix Column                : 0.51512 0.2412 -0.00105
Green Matrix Column              : 0.29198 0.69225 0.04189
Blue Matrix Column               : 0.1571 0.06657 0.78407
Red Tone Reproduction Curve      : (Binary data 32 bytes, use -b option to extract)
Chromatic Adaptation             : 1.04788 0.02292 -0.0502 0.02959 0.99048 -0.01706 -0.00923 0.01508 0.75168
Blue Tone Reproduction Curve     : (Binary data 32 bytes, use -b option to extract)
Green Tone Reproduction Curve    : (Binary data 32 bytes, use -b option to extract)
HDR Gain Curve                   : (Binary data 2021 bytes, use -b option to extract)
Image Width                      : 5712
Image Height                     : 4284
Encoding Process                 : Baseline DCT, Huffman coding
Bits Per Sample                  : 8
Color Components                 : 3
Y Cb Cr Sub Sampling             : YCbCr4:2:0 (2 2)
Run Time Since Power Up          : 8 days 13:43:33
Aperture                         : 1.8
Image Size                       : 5712×4284
Megapixels                       : 24.5
Scale Factor To 35 mm Equivalent: 3.5
Shutter Speed                    : 1/60
Create Date                      : 2025:04:05 12:30:13.273-04:00
Date/Time Original               : 2025:04:05 12:30:13.273-04:00
Modify Date                      : 2025:04:05 12:30:13-04:00
Thumbnail Image                  : (Binary data 6024 bytes, use -b option to extract)
GPS Altitude                     : 204.3 m Above Sea Level
GPS Date/Time                    : 2025:04:05 16:30:12Z
GPS Latitude                     : 43 deg 18' 11.74" N
GPS Longitude                    : 75 deg 26' 18.52" W
MP Image 2                       : (Binary data 326882 bytes, use -b option to extract)
Circle Of Confusion              : 0.008 mm
Field Of View                    : 73.7 deg
```

```
Acceleration Vector              : -0.03198229522 -1.004677653 -0.05938143288
Focus Distance Range             : 1.06 - 1.40 m
Image Capture Type               : Scene
Live Photo Video Index           : 8595185700
Photos App Feature Flags         : 0
HDR Headroom                     : 1.00999999
AF Performance                   : 35 1 45
Signal To Noise Ratio            : 35.01178361
Photo Identifier                 : A092EF68-C724-4269-B562-EA7810801E33
Color Temperature                : 7443
Camera Type                      : Back Normal
Focus Position                   : 116
HDR Gain                         : 0.0244006291
AF Measured Depth                : 34
AF Confidence                    : 68
Semantic Style                   : {_0=1,_1=0,_2=0,_3=0}
Sub Sec Time Original            : 273
Sub Sec Time Digitized           : 273
Flashpix Version                 : 0100
Color Space                      : Uncalibrated
Exif Image Width                 : 5712
Exif Image Height                : 4284
Sensing Method                   : One-chip color area
Scene Type                       : Directly photographed
Exposure Mode                    : Auto
White Balance                    : Auto
Focal Length In 35mm Format      : 24 mm
Scene Capture Type               : Standard
Lens Info                        : 2.220000029-9mm f/1.779999971-2.8
Lens Make                        : Apple
Lens Model                       : iPhone 15 Pro back triple camera 6.765mm f/1.78
Composite Image                  : General Composite Image
GPS Latitude Ref                 : North
GPS Longitude Ref                : West
GPS Altitude Ref                 : Above Sea Level
GPS Time Stamp                   : 16:30:12
GPS Speed Ref                    : km/h
GPS Speed                        : 0
GPS Img Direction Ref            : True North
GPS Img Direction                : 330.0045167
GPS Dest Bearing Ref             : True North
GPS Dest Bearing                 : 330.0045167
GPS Date Stamp                   : 2025:04:05
GPS Horizontal Positioning Error: 18.48566832 m
Compression                      : JPEG (old-style)
Thumbnail Offset                 : 2982
Thumbnail Length                 : 6024
MPF Version                      : 0100
Number Of Images                 : 2
MP Image Flags                   : (none)
MP Image Format                  : JPEG
MP Image Type                    : Undefined
MP Image Length                  : 326882
```
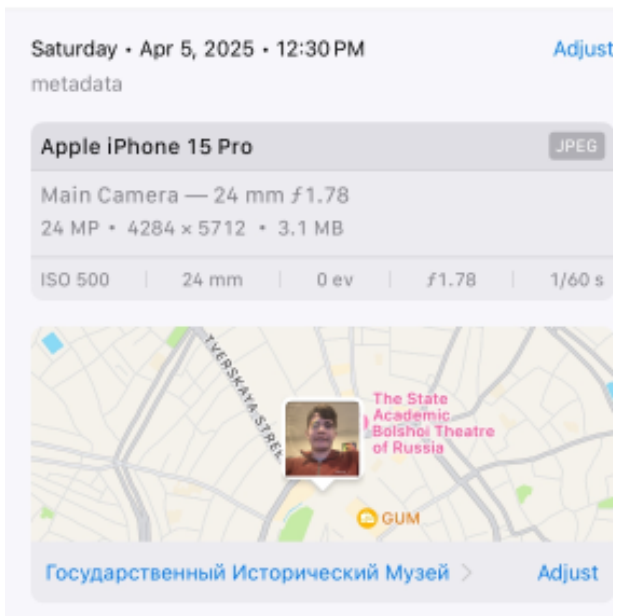
Changing Data

CHANGING THE METADATA GPS LOCATION TO MOSCOW

IMAGE METADATA CHANGED TO MOSCOW

Bash Script


```bash
#!/bin/bash

echo "WARNING: This will permanently remove all metadata from image files in the current directory:"
pwd
echo
read -p "Are you sure you want to continue? (y/N): " confirm

if [[ "$confirm" =~ ^[Yy]$ ]]; then
    echo "Starting metadata removal ... "

    find . -maxdepth 1 -type f \( -iname "*.jpg" -o -iname "*.jpeg" -o -iname "*.png" -o -iname "*.tiff" \)
        -exec exiftool -overwrite_original -all= {} \;

    echo "Metadata removal complete."
else
    echo "Operation cancelled."
    exit 1
fi
```

Here is the bash script.


```
┌──(oshagw㉿kali)-[~/Desktop/Test_Photo_Directory]
└─$ bash ~/Desktop/clean_metadata.sh
WARNING: This will permanently remove all metadata from image files in the current dire
ctory:
/home/oshagw/Desktop/Test_Photo_Directory

Are you sure you want to continue? (y/N): y
Starting metadata removal ...
Warning: ICC_Profile deleted. Image colors may be affected - ./IMG_1050.JPG
    1 image files updated
Metadata removal complete.
```

Running the script


```
┌──(oshagw㉿kali)-[~/Desktop/Test_Photo_Directory]
└─$ exiftool IMG_1050.JPG
ExifTool Version Number         : 13.10
File Name                       : IMG_1050.JPG
Directory                       : .
File Size                       : 1418 kB
File Modification Date/Time     : 2025:04:29 19:15:04-04:00
File Access Date/Time           : 2025:04:29 19:15:04-04:00
File Inode Change Date/Time     : 2025:04:29 19:15:04-04:00
File Permissions                : -rw-rw-r--
File Type                       : JPEG
File Type Extension             : jpg
MIME Type                       : image/jpeg
Image Width                     : 3088
Image Height                    : 2316
Encoding Process                : Baseline DCT, Huffman coding
Bits Per Sample                 : 8
Color Components                : 3
Y Cb Cr Sub Sampling            : YCbCr4:2:0 (2 2)
Image Size                      : 3088×2316
Megapixels                      : 7.2
```

Here is the Metadata after the scripts.