

Lab#12: Exiftool

In this lab, you will use ExifTool to extract GPS coordinates from a photo taken with your phone. You will then convert the coordinates into decimal format and use Google Maps to locate where the photo was taken. This lab simulates how forensic investigators can track locations using image metadata.

Objective

Learning Outcome

By completing this lab, students will:

- Understand how digital photos store forensic evidence.
- Learn how to extract, convert, and map GPS data.
- Be aware of privacy risks associated with photo metadata.

Step-by-Step Instructions / Summary

- Step 1 - Enable Location Services on Your Phone
- Step 2 - Transfer the Photo to Your Computer
- Step 3 - Download and Set Up ExifTool
- Step 4 - Extract Metadata from the Photo
- Step 5 - Convert GPS Coordinates to Decimal Degrees
- Step 6 - Search Location on Google Maps
- Step 7 - (Optional) Remove EXIF Metadata for Privacy Awareness

Step 1 - Enable Location Services on Your Phone

Going to settings to enable location services for the camera.

< Maps

Location

ALLOW LOCATION ACCESS

Never

Ask Next Time Or When I Share

While Using the App

While Using the App or Widgets

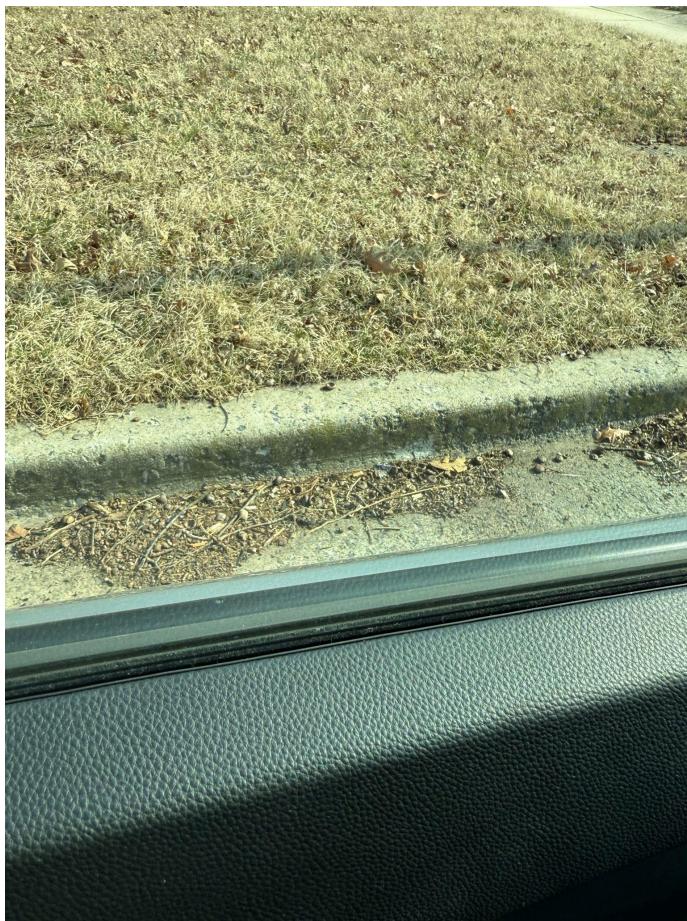
App explanation: "Your location is used to show your position on the map, get directions, estimate travel times, and improve search results."

Precise Location



After photos are taken, pictures are saved





Step 2 - Transfer the Photo to Your Computer

Received photos through email

2 images for exiftool lab [Inbox x](#)



Alexander Nguyen <alexanderhonguyen19@gmail.com>
to me ▾

2 Attachments • Scanned by Gmail ⓘ



[Reply](#)

[Forward](#)



Saved in a folder



IMG_1438.jpeg



IMG_1440.jpeg

Step 3 - Download and Set Up ExifTool

Setting up and installing from linux terminal
sudo apt-get install libimage-exiftool-perl

```
alexmayretire@AlexPC447:~/Downloads$ sudo apt-get install libimage-exiftool-perl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
libimage-exiftool-perl is already the newest version (12.76+dfsg-1).
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
```

Step 4 - Extract Metadata from the Photo

Extracting metadata for the first photo
exiftool IMG_1438.jpeg

```
alexmayretire@AlexPC447:~/Pictures$ exiftool IMG_1438.jpeg
ExifTool Version Number      : 12.76
File Name                   : IMG_1438.jpeg
Directory                   :
File Size                    : 4.8 MB
File Modification Date/Time : 2025:07:29 20:28:38-04:00
File Access Date/Time       : 2025:07:29 20:53:00-04:00
File Inode Change Date/Time : 2025:07:29 20:28:38-04:00
File Permissions            : -rw-rw-r--
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 16 Pro Max
Orientation                  : Rotate 90 CW
X Resolution                 : 72
Y Resolution                 : 72
Resolution Unit              : inches
Software                     : 18.3.1
Modify Date                  : 2025:07:29 12:16:15-04:00
```

The GPS Latitude and GPS Longitude in the output for this file

```
GPS Altitude : 149.8 m Above Sea Level
GPS Date/Time : 2025:03:13 20:15:20Z
GPS Latitude : 39 deg 11' 2.67" N
GPS Longitude : 77 deg 15' 41.47" W
```

Extracting metadata for the second photo
exiftool IMG_1440.jpeg

```
alexmayretire@AlexPC447:~/Pictures$ exiftool IMG_1440.jpeg
ExifTool Version Number : 12.76
File Name : IMG_1440.jpeg
Directory : .
File Size : 3.8 MB
File Modification Date/Time : 2025:07:29 20:28:24-04:00
File Access Date/Time : 2025:07:29 20:52:41-04:00
File Inode Change Date/Time : 2025:07:29 20:28:24-04:00
File Permissions : -rw-rw-r--
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 16 Pro Max
Orientation : Rotate 90 CW
X Resolution : 72
Y Resolution : 72
Resolution Unit : inches
```

The GPS Latitude and GPS Longitude in the output for this file

```
GPS Altitude : 149.2 m Above Sea Level
GPS Date/Time : 2025:03:13 20:17:20Z
GPS Latitude : 39 deg 10' 58.60" N
GPS Longitude : 77 deg 15' 43.67" W
```

Step 5 - Convert GPS Coordinates to Decimal Degrees

Converting the coordinates

$$\text{Decimal Degrees} = \text{Degrees} + (\text{Minutes} / 60) + (\text{Seconds} / 3600)$$

First image coordinates:

- **Latitude: 39° 11' 2.67" N**
Decimal: $39 + (11 / 60) + (2.67 / 3600) = 39 + 0.183333 + 0.0007417 \approx 39.184075^\circ \text{ N}$

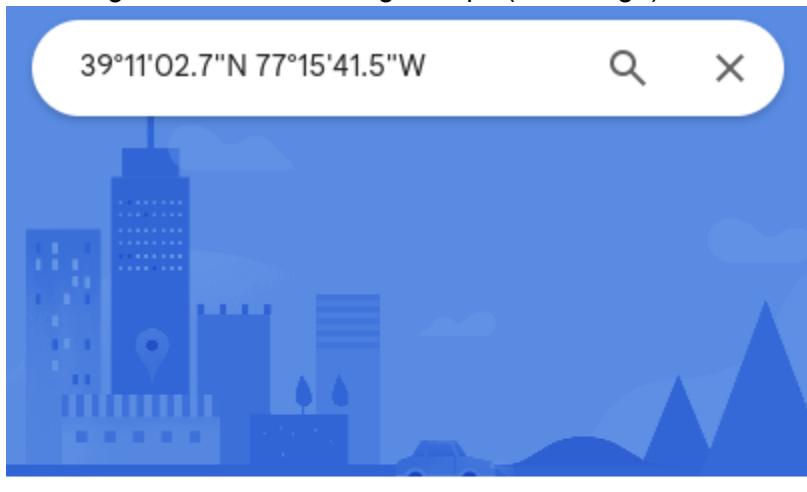
- **Longitude:** $77^{\circ} 15' 41.47'' \text{ W}$
Decimal: $77 + (15 / 60) + (41.47 / 3600) = 77 + 0.25 + 0.011519 \approx 77.261519^{\circ} \text{ W}$
(So, -77.261519°)

Second image coordinates:

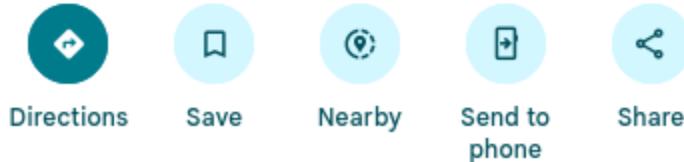
- **Latitude:** $39^{\circ} 10' 58.60'' \text{ N}$
Decimal: $39 + (10 / 60) + (58.60 / 3600) = 39 + 0.1666667 + 0.0162778 \approx 39.182944^{\circ} \text{ N}$
- **Longitude:** $77^{\circ} 15' 43.67'' \text{ W}$
Decimal: $77 + (15 / 60) + (43.67 / 3600) = 77 + 0.25 + 0.0121306 \approx 77.262131^{\circ} \text{ W}$
- **(So, -77.262131°)**

Step 6 - Search Location on Google Maps

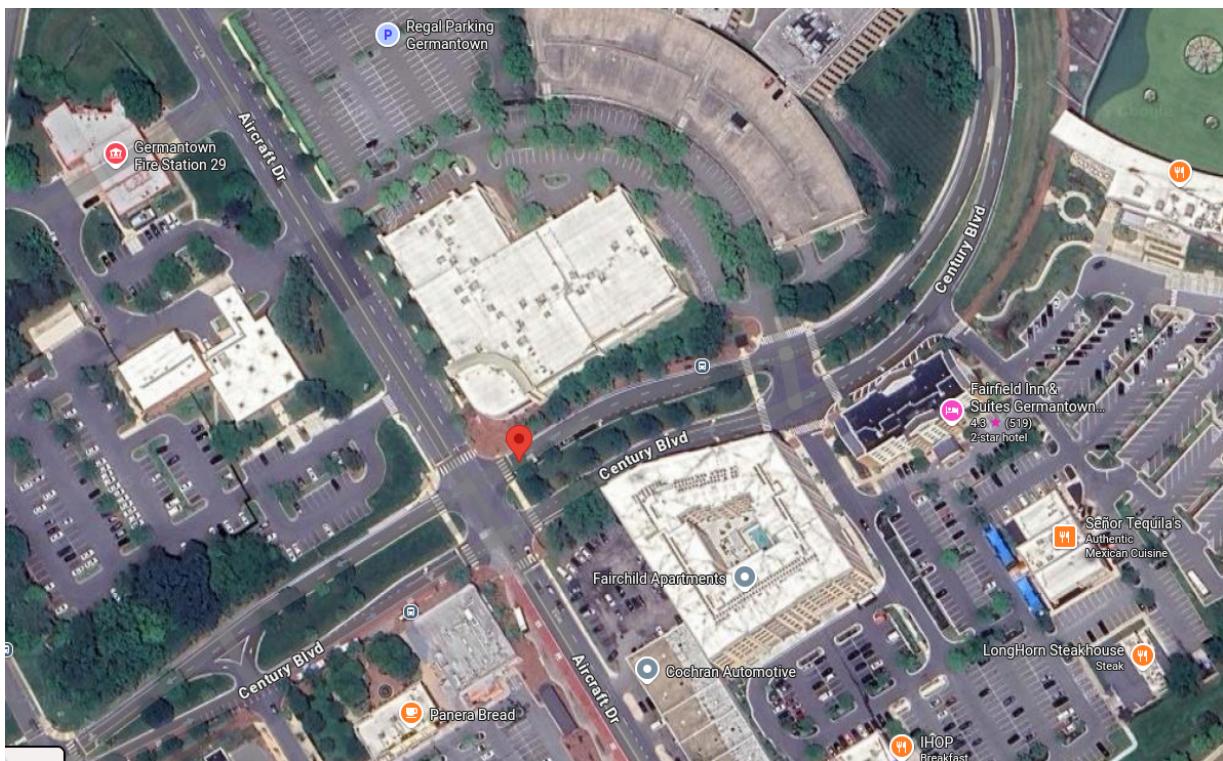
Checking coordinates in Google Maps (first image)



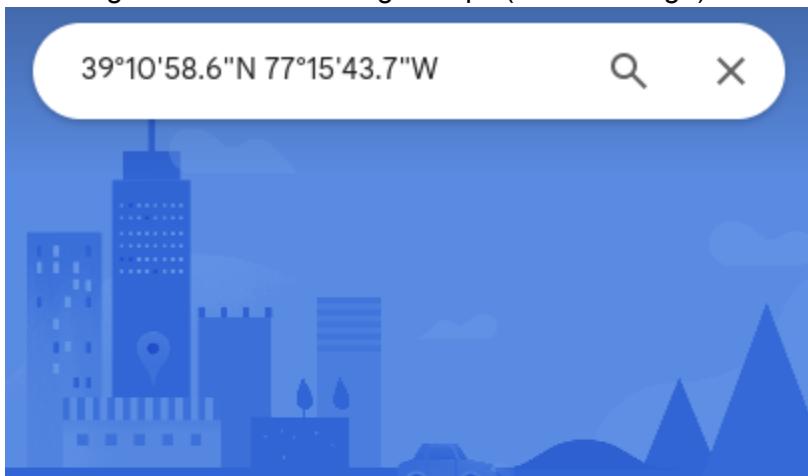
39°11'02.7"N 77°15'41.5"W



Screenshot for showing the pin where the first image is



Checking coordinates in Google Maps (second image)



39°10'58.6"N 77°15'43.7"W

39.182944, -77.262131



Directions



Save



Nearby

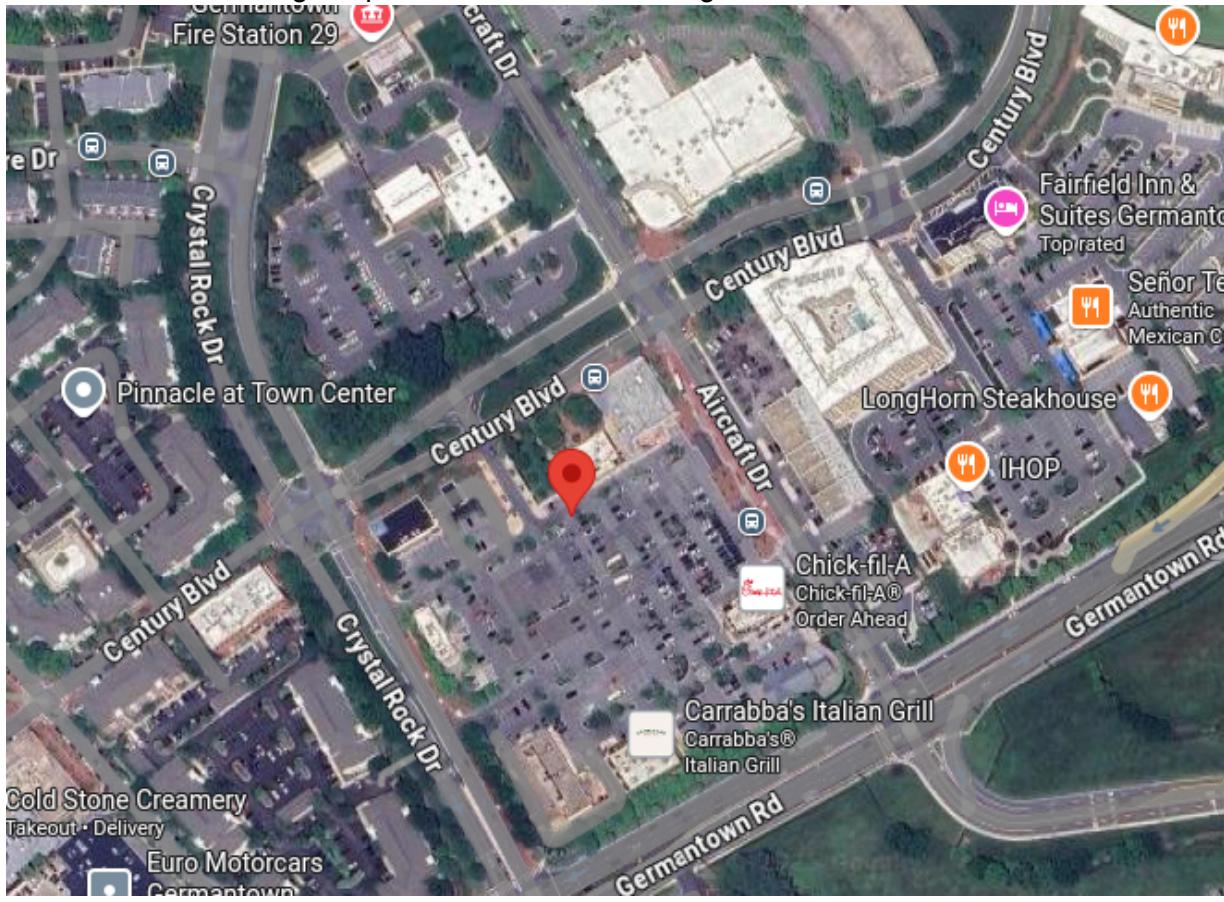


Send to
phone



Share

Screenshot for showing the pin where the second image is



Step 7 - (Optional) Remove EXIF Metadata for Privacy Awareness

Remove all the metadata with the exiftool
exiftool -all= IMG_1438.jpeg

Checking if the first image the data is removed
exiftool IMG_1438.jpeg

Remove all the metadata with the exiftool
exiftool -all= IMG_1438.jpeg

Checking if the first image the data is removed
exiftool IMG_1438.jpeg

```
alexmayretire@AlexPC447:~/Pictures$ exiftool -all= IMG_1438.jpeg
Warning: ICC_Profile deleted. Image colors may be affected - IMG_1438.jpeg
    1 image files updated
alexmayretire@AlexPC447:~/Pictures$ exiftool IMG_1438.jpeg
ExifTool Version Number      : 12.76
File Name                   : IMG_1438.jpeg
Directory                   : .
File Size                   : 4.2 MB
File Modification Date/Time : 2025:07:29 21:34:45-04:00
File Access Date/Time       : 2025:07:29 21:34:47-04:00
File Inode Change Date/Time: 2025:07:29 21:34:45-04:00
File Permissions            : -rw-rw-r--
File Type                   : JPEG
File Type Extension         : jpg
MIME Type                   : image/jpeg
Image Width                 : 4032
Image Height                : 3024
Encoding Process            : Baseline DCT, Huffman coding
Bits Per Sample             : 8
Color Components            : 3
YCbCr Sub Sampling          : YCbCr4:2:0 (2 2)
Image Size                  : 4032x3024
Megapixels                  : 12.2
alexmayretire@AlexPC447:~/Pictures$ exiftool -all= IMG_1440.jpeg
Warning: ICC_Profile deleted. Image colors may be affected - IMG_1440.jpeg
    1 image files updated
alexmayretire@AlexPC447:~/Pictures$ exiftool IMG_1440.jpeg
ExifTool Version Number      : 12.76
File Name                   : IMG_1440.jpeg
Directory                   : .
File Size                   : 3.1 MB
File Modification Date/Time : 2025:07:29 21:35:21-04:00
File Access Date/Time       : 2025:07:29 21:35:23-04:00
File Inode Change Date/Time: 2025:07:29 21:35:21-04:00
File Permissions            : -rw-rw-r--
File Type                   : JPEG
File Type Extension         : jpg
MIME Type                   : image/jpeg
Image Width                 : 5712
Image Height                : 4284
Encoding Process            : Baseline DCT, Huffman coding
Bits Per Sample             : 8
Color Components            : 3
YCbCr Sub Sampling          : YCbCr4:2:0 (2 2)
Image Size                  : 5712x4284
Megapixels                  : 24.5
```

Tools & Skills Used

Primary Tool: ExifTool

Supporting Platforms:

- Linux Command Line/Terminal
- Smartphone Camera (with location services)
- Google Maps

Core Skills:

- **Metadata Extraction:** Using exiftool to read and display EXIF (Exchangeable Image File Format) data embedded within a JPEG image.
- **Digital Forensics:** Analyzing metadata to uncover potentially sensitive information, such as GPS coordinates, timestamps, and camera details.
- **Coordinate System Conversion:** Manually converting GPS coordinates from the **DMS (Degrees, Minutes, Seconds)** format to **DD (Decimal Degrees)** using the formula: $DD=D+(M/60)+(S/3600)$.
- **Geospatial Analysis:** Plotting converted GPS coordinates on a mapping service to visualize the precise physical location where a photo was taken.
- **Data Sanitization:** Using exiftool `-all=` to permanently strip all metadata from a file, a crucial skill for protecting personal privacy.
- **Linux Package Management:** Installing software from the terminal using `sudo apt-get install`.

Reflection & Takeaways

This lab helped me use the exiftool to manually extract GPS coordinates and find the exact location being popped up in Google maps. When using this tool, I thought it would help me during my time with digital forensics and the precision of this tool could be unsettling. This leads to the next topic with privacy. I also learned to use extiftool `-all=` to remove all the metadata from images.