

# Producing Datasets: Capturing Images on Multi-Camera Smartphones for Source Camera Identification

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## Project Rationale & Goals

- The lack of available data in the forensic science community has proven to be an ongoing problem. Smartphones advance so quickly that current publicly available image datasets such as [1,2] don't contain images from newer smartphone cameras like front (selfie), telephoto, or ultra-wide-angle cameras. The main objective of this project was to create a publicly available dataset containing a sizeable number of images from all cameras available on multi-camera smartphones that are representative of images that could potentially be found on a person of interest's smartphone.
- This project will impact the forensic science community by providing access to an image database for source camera identification, as well as other forensic research. This database will show images from all cameras available on recent models of smartphones and it provides the public with more access to data that is representative of actual casework. This image database will be open and free for public use this spring

## Materials & Methods

- The digital evidence team at CSAFE used three recent models from two popular brands of smartphones: Apple and Samsung.
- A total of sixty smartphones were used:
  - 10 iPhone 11 Pro phones
  - 10 iPhone 12 Pro phones
  - 10 iPhone 14 Pro phones
  - 10 Samsung Galaxy Note 10 phones
  - 10 Samsung Galaxy s20 phones
  - 10 Samsung Galaxy s21 phones



Example of the six models of smartphones used by CSAFE's digital evidence team. From left to right, the iPhone 11, iPhone 12, iPhone 14, Samsung Galaxy Note 10, Samsung Galaxy s20, and Samsung Galaxy s21.

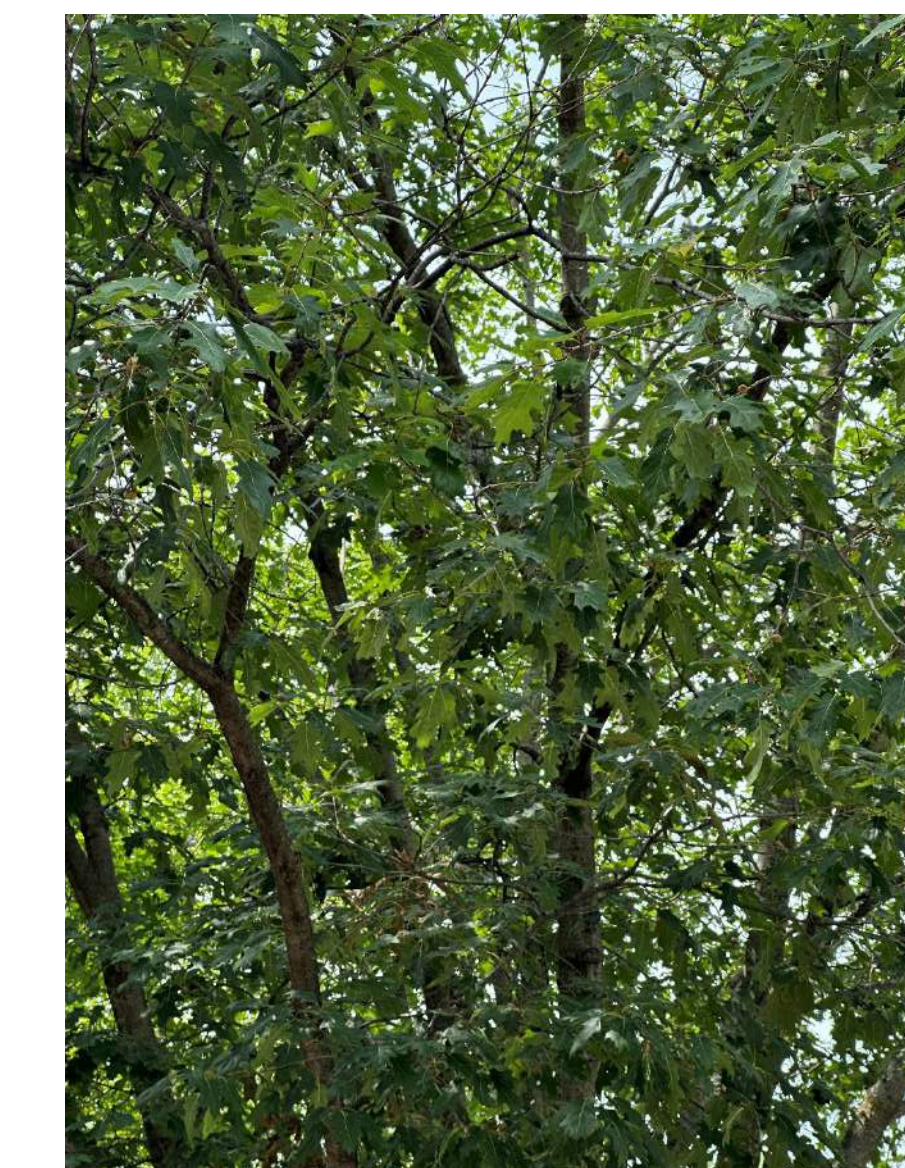
- Each of the sixty smartphones came equipped with four separate camera lenses:
  - Front lens, telephoto lens, wide lens, and ultra-wide lens
- All lenses on these smartphones were used in data collection to collect both natural scene and flatfield images.
  - Natural scene images contain photos of both indoor and outdoor scenes of plants, architecture, furniture, etc., but exclude all personally identifiable information.
  - Flatfield images are photos of blank white walls and are used to give each photosite in a camera's sensor array similar information.

## Results & Discussion

- After completion of our data collection, each of the sixty phones contained a total of eight hundred images.
  - During data collection, the Samsung Galaxy Note 10 was found to contain two sensors within the wide-angle lens, one for dim light and one for bright light.
  - To account for this, an additional one hundred images were captured on the ten Samsung Galaxy Note 10 smartphones.
- Half of the images on each smartphone were natural scene images and represent images that might be found on an individual's smartphone.
- The other half of the images were flatfield images and could be used to discover a "fingerprint" for each lens.
- After the collection of images was completed, each image was carefully checked to ensure the correct settings and lenses were used and to guarantee that no personally identifiable information, nor any copyrighted or trademarked material was present in any photos. This includes people, brand names, and logos.



Example natural scene photo from front lens of multicamera smartphone



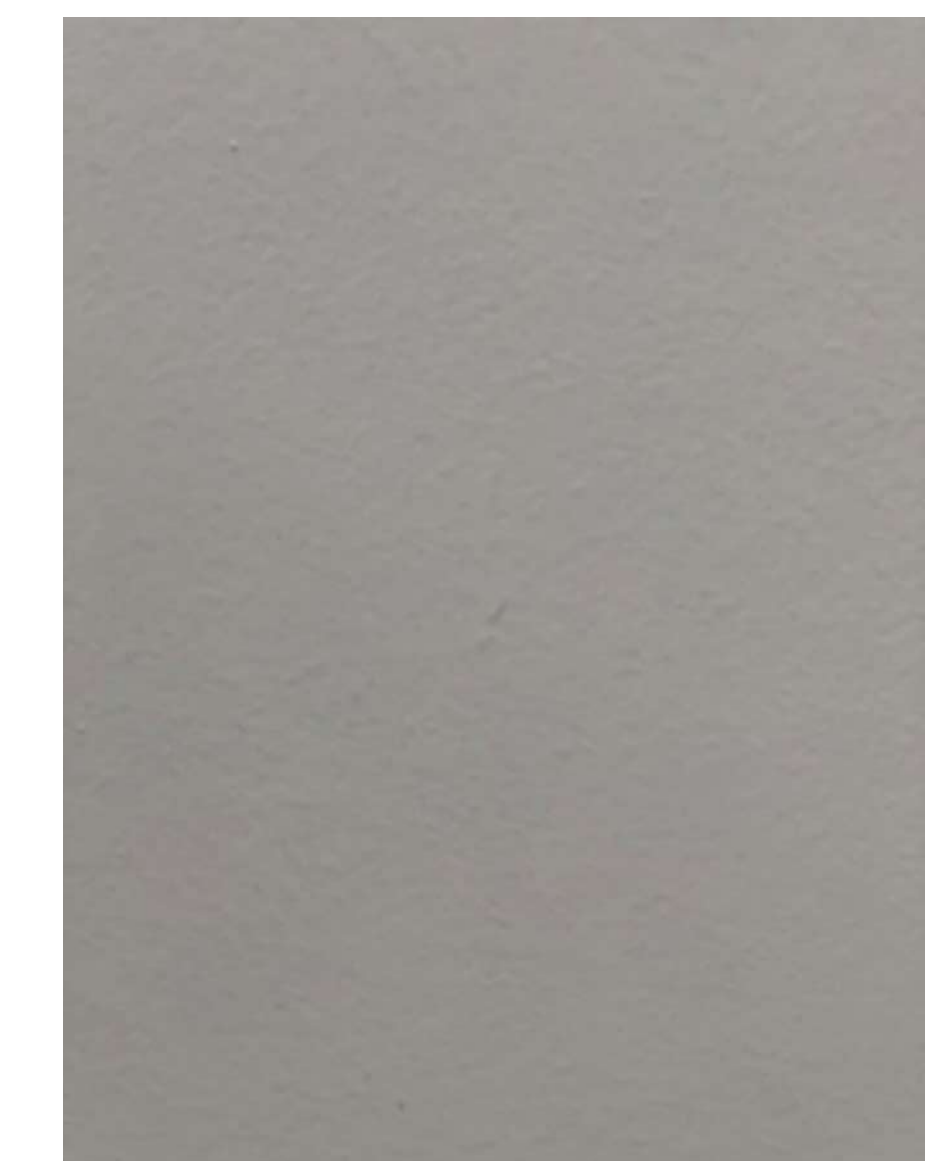
Example natural scene photo from telephoto lens of multicamera smartphone



Example natural scene photo from wide lens of multicamera smartphone



Example natural scene photo from ultra-wide lens of multicamera smartphone



Example flatfield photo from multicamera smartphone

## Conclusions

- The data collected will be available to the public in a database sometime this spring.
- The database will show images from all lenses available on the recent models of smartphones used by CSAFE's digital evidence team and it will provide the public with more access to data that is representative of actual casework.
- The database will offer user-friendly options to filter by the smartphone brand, model, device number, lens and scene.

## References

- [1] Shullani, D., Fontani, M., Iuliani, M. et al. VISION: a video and image dataset for source identification. EURASIP J. on Info. Security 2017, 15 (2017). <https://doi.org/10.1186/s13635-017-0067-2>
- [2] Newman, Jennifer, Li Lin, Wenhao Chen, Stephanie Reinders, Yangxiao Wang, Min Wu, and Yong Guan. "StegoAppDB: a steganography apps forensics image database." arXiv preprint arXiv:1904.09360 (2019)

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