

Anonymization using EgoBlur for Video Data

Abdulrahaman H. Ahmad

Khalifa University
Autonomous Vehicles Lab

May 12, 2025

Why Anonymization?

- ▶ Surveillance and mobility data often contain personally identifiable information (PII).
- ▶ Ethical and legal constraints (e.g., GDPR) demand anonymization before analysis or publication.
- ▶ Faces and license plates are sensitive elements in urban traffic data.

What is EgoBlur?

- ▶ **EgoBlur** is a model introduced by [1]
- ▶ It is a real-time anonymization model targeting privacy-sensitive regions.
- ▶ Introduced by Meta AI for mobile vision applications.
- ▶ Based on TorchScript and Detectron2 optimized for inference speed.

Integration into Our Dataset

- ▶ Loaded TorchScript-based license plate detector.
- ▶ Used tracking annotations (GMOT) for bounding boxes and object IDs.
- ▶ Processed each frame by iterating over object crops.
- ▶ Applied `ego_blur` on cropped regions, optionally full-frame.

Challenges and Solutions

- ▶ **Multiple detections:** Resolved using NMS with high IoU threshold.
- ▶ **Missed detections:** Re-attempted detection with relaxed thresholds (up to 5 times).
- ▶ **Irrelevant small crops:** Skipped crops below a dynamic area threshold.

Leveraging Object Tracking

- ▶ Each object ID is tracked across frames.
- ▶ If an object was blurred in past frames, we attempt to blur it again.
- ▶ Maintains consistency and avoids privacy leaks across time.

Visual Enhancement: Elliptical Gaussian Blur

- ▶ Applied elliptical masks instead of rectangles for natural blurring.
- ▶ Used object crop color to blend the Gaussian blur for visual harmony.
- ▶ Reduced harsh borders in sensitive areas.

Adaptive Detection Attempts

- ▶ Performed up to 5 attempts per object crop.
- ▶ On each retry, reduced the confidence threshold from 0.9 to 0.1.
- ▶ Ensured higher recall of sensitive information.

Dynamic Crop Area Filtering

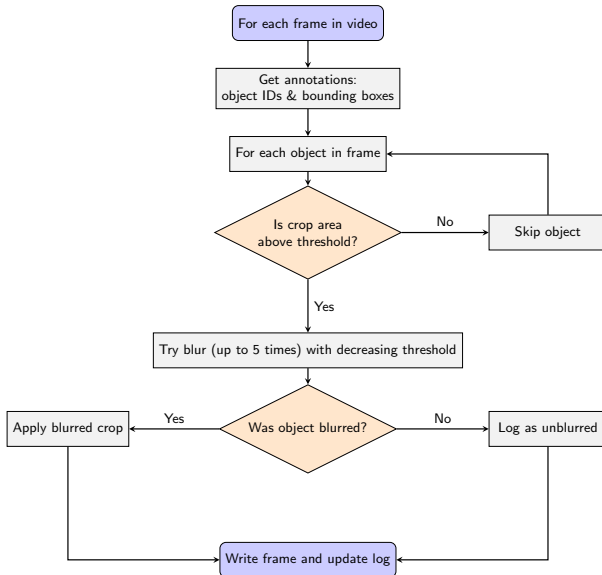
- ▶ Computed minimum area as $A_{\min} = H \times W \times 0.0002$
- ▶ Skip detections for very small crops to save processing time.
- ▶ Ensured computational efficiency and noise reduction.

Anonymization Algorithm

Pseudocode

```
for each frame in video:
    for each object in annotations:
        if crop is large enough:
            try 5 times:
                apply ego_blur with decreasing thresholds
                if blurred: break
            log blurred status
    if no objects blurred:
        optionally apply full-frame blur
```

Anonymization Pipeline Flowchart



Summary

- ▶ Privacy-preserving video preprocessing using EgoBlur.
- ▶ Leveraged annotations and tracking to guide selective blurring.
- ▶ Adaptive, efficient, and visually natural results.

References I



Nikhil Raina, Guruprasad Somasundaram, Kang Zheng, Sagar Miglani, Steve Saarinen, Jeff Meissner, Mark Schwesinger, Luis Pesqueira, Ishita Prasad, Edward Miller, Prince Gupta, Mingfei Yan, Richard Newcombe, Carl Ren, and Omkar M Parkhi.

Egoblur: Responsible innovation in aria, 2023.