Paper title: Towards Federated Learning Based Contraband Detection Within Airport Baggage X-Rays

Paper link:
https://ieeexplore.ieee.org/document/9996472

1 Summary:

1.1 Motivation:

The motivation of this paper is to propose a Federated Learning (FL)-based architecture for detecting contraband in airport baggage X-rays while maintaining user privacy. The aim is to achieve high accuracy rates with state-of-the-art algorithms while addressing the potential security and privacy concerns with centralized learning (CL) models.

1.2 Contribution:

The contribution of this paper is the introduction of a new approach to detecting contraband in airport baggage X-rays using machine learning models trained in a Federated learning (FL)-based architecture. This approach maintains user privacy while achieving high accuracy rates with state-of-the-art algorithms.

1.3 Methodology:

The methodology used in this paper involves training and evaluating the proposed FL-based architecture using the most recent state-of-the-art YOLOv7, SSD, and Faster R-CNN algorithms. The performance of the FL-based architecture is compared to non-FL algorithms using the PIDray dataset. The mean average precision at 0.50 and 0.75 for all algorithms is calculated and presented.

1.4 Conclusion:

The conclusion of this paper is that the proposed FL-based architecture for detecting contraband in airport baggage X-rays achieves high accuracy rates while maintaining user privacy. The performance of the FL-based architecture is comparable to non-FL algorithms, and the approach has the potential to be used in large-scale automatic detection of contraband in airports across the globe through collaboration.

2 Limitations:

2.1 First Limitation/Critique:

One limitation of this paper is that the performance of the FL-based architecture is evaluated using only one dataset (PIDray). Further evaluation using other datasets is needed to validate the effectiveness of the proposed approach.

2.2 Second Limitation/Critique:

Another limitation of this paper is that the proposed FL-based architecture may require more computational resources and longer training times compared to non-FL algorithms.

3 Synthesis:

The ideas presented in this paper have the potential to be applied in large-scale automatic detection of contraband in airports across the globe through collaboration. The FL-based architecture proposed in this paper can be used to maintain user privacy while achieving high accuracy rates with state-of-the-art algorithms. However, further evaluation using other datasets and optimization of computational resources and training times may be needed for practical implementation.