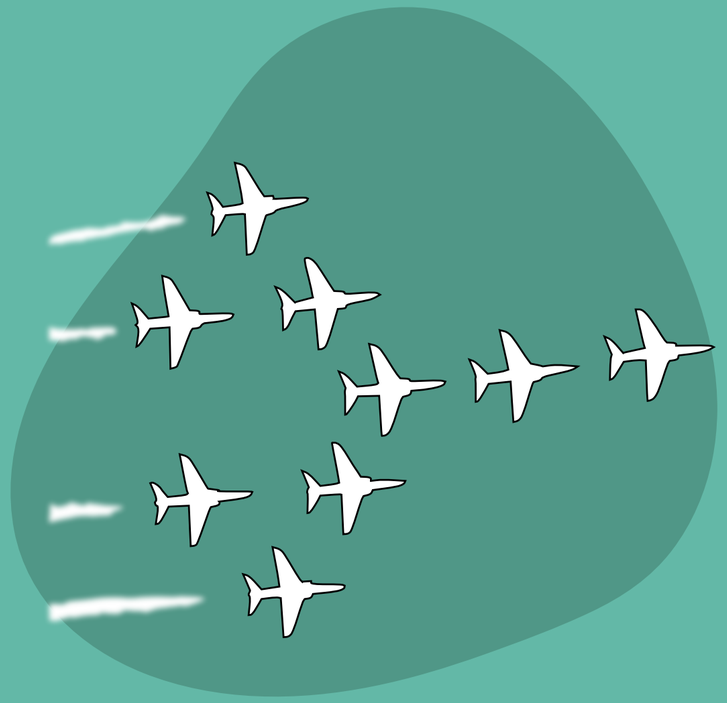
Military Vehicle Identification and Classification Using Pre-Trained Models

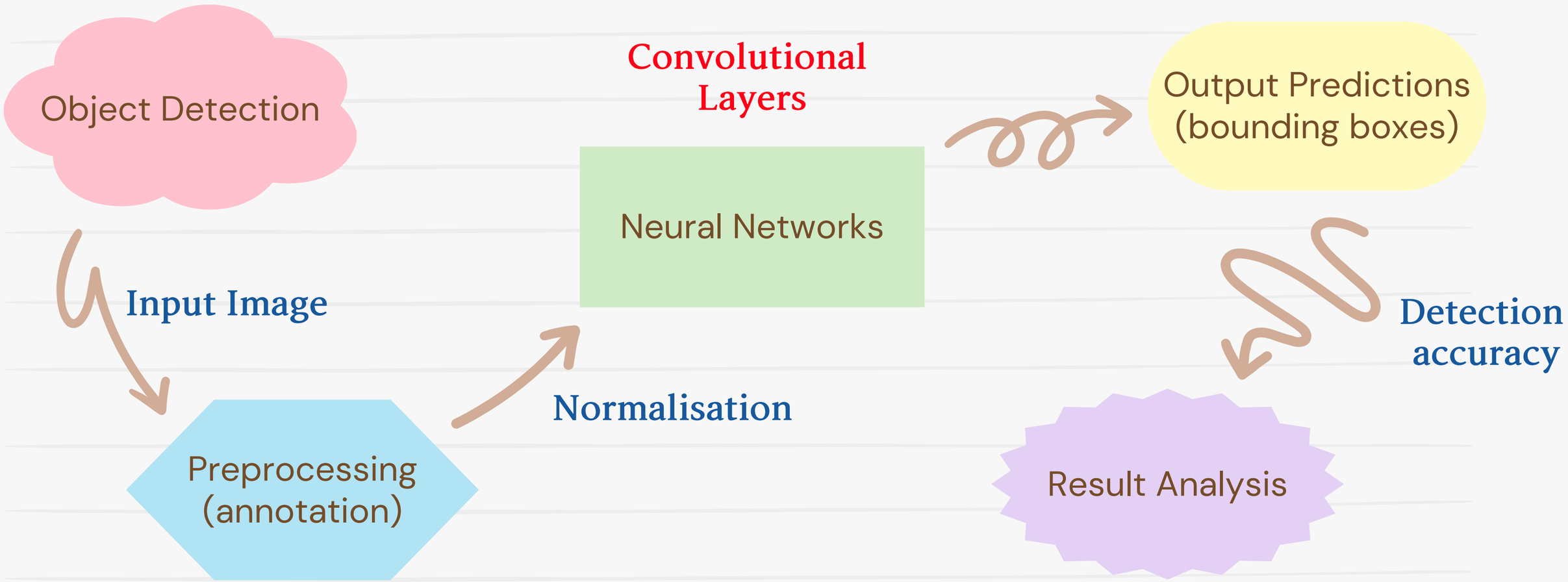


Group No. 12
DEC LCA

Intoduction

This project explores the use of machine learning for automating the identification of military vehicles. The goal is to leverage advanced algorithms to accurately recognize diverse military vehicle types, overcoming challenges posed by varying environmental conditions and the absence of predefined classes in existing datasets.

Block Diagram

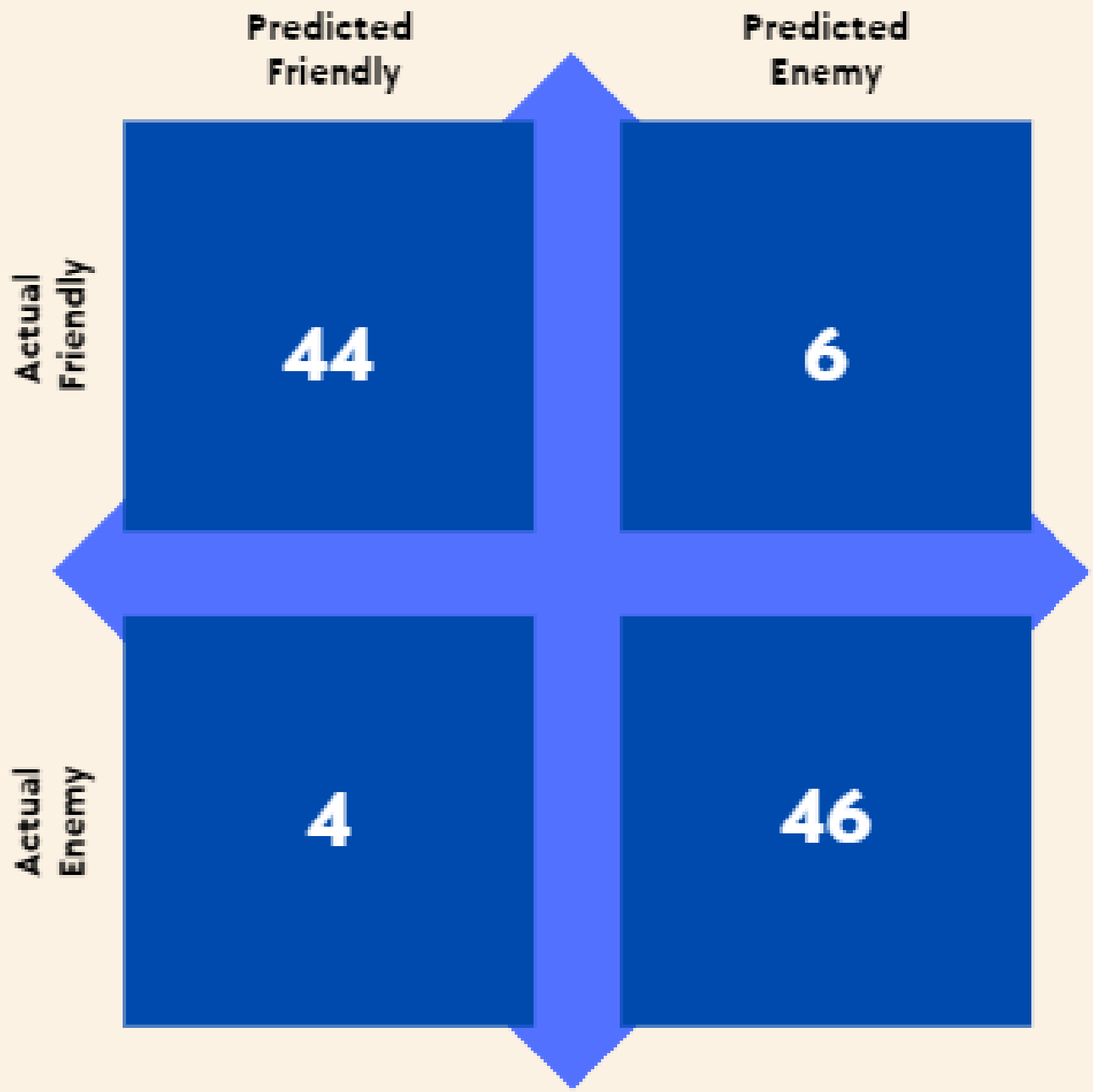


Standard Values for Pretrained models

Pre-trained models	Accuracy with DLR(%)	Accuracy without DLR(%)	Error Rate (%)	ROC (%)	Training loss	Validation loss
R-CNN	92	90	7.8	95.3	0.254	0.1548
SSD	94	92	6.4	96.6	0.2243	0.1768
YOLO V5	98	96	8.4	98.3	0.1253	0.1925
Dense Net-201	88.8	95.9	11.4	96.5	0.3325	0.2549
Alex NeT	78.6	90.1	21.3	89.6	0.4999	0.5174

Pre Trained models	Precision	Recall	F1-Score
R-CNN	0.88	0.85	0.86
SSD	0.92	0.89	0.84
YOLO V5	0.94	0.92	0.93
Dense Net-201	0.9	0.87	0.88
Alex Net	0.65	0.89	0.75

CONFUSION MATRIX



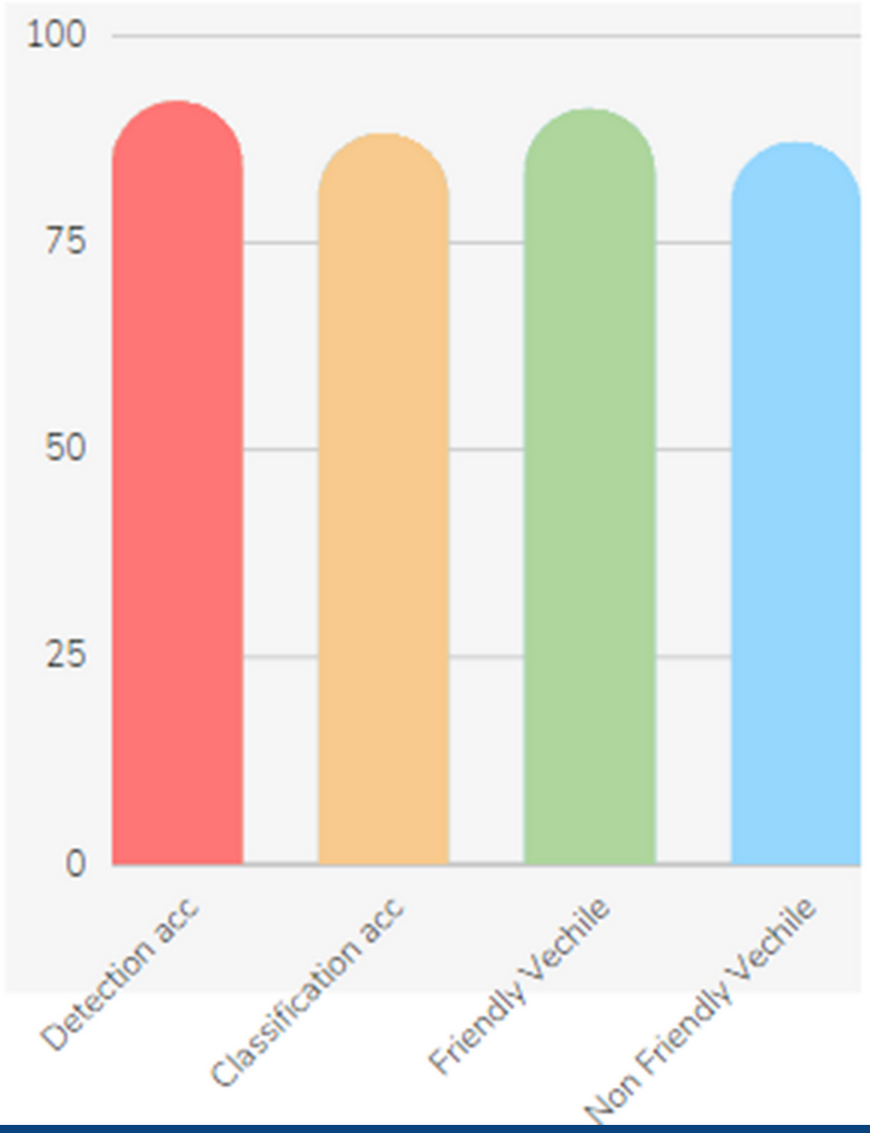
Test Cases : 50

Detection acc
Precision of identifying detected objects.

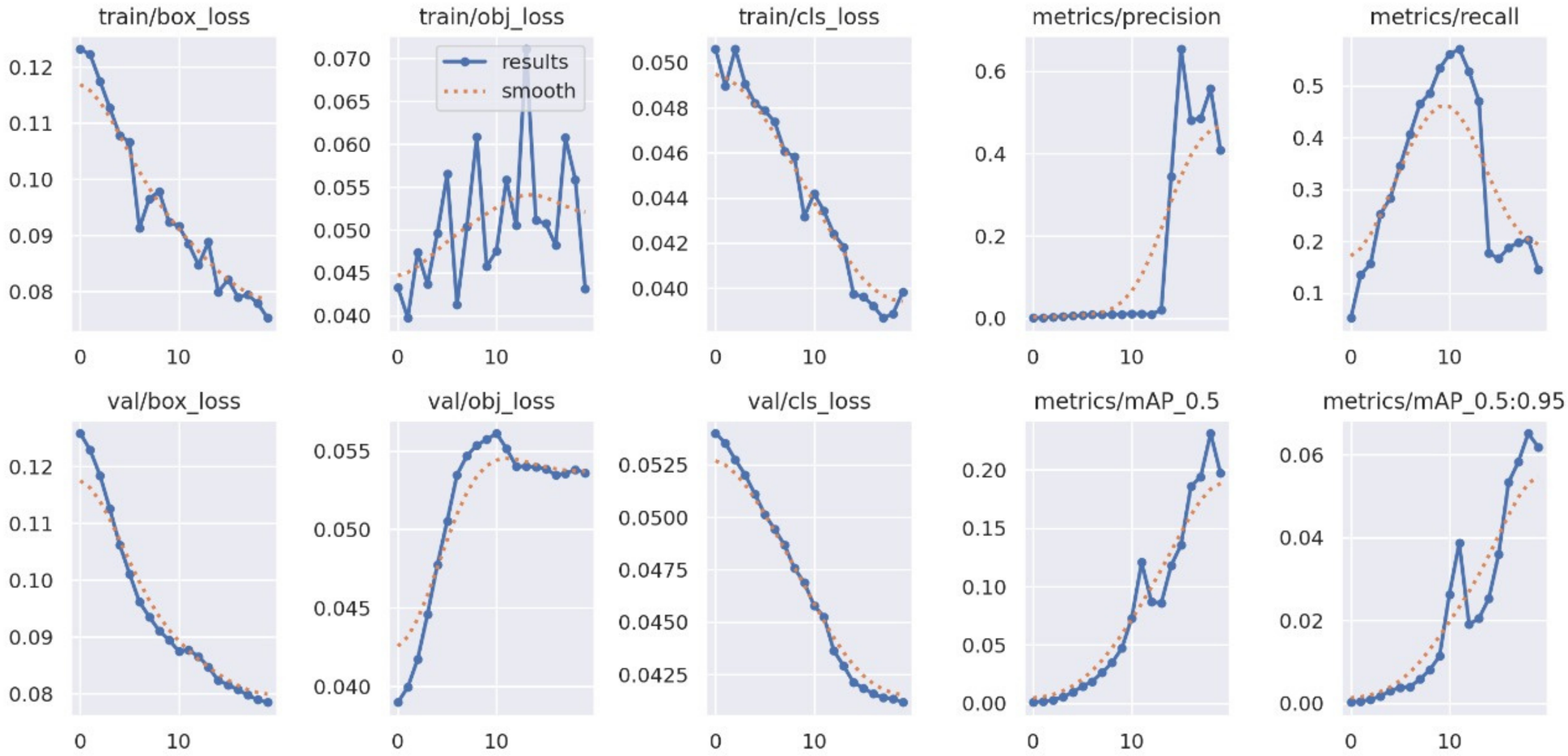
Classification acc
Correctly classified objects percentage.

F1 (Friendly)
Measure of vehicle classification performance.

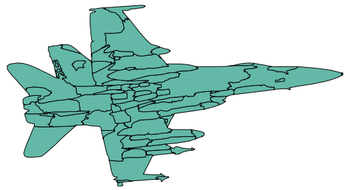
F1 (Non Friendly)
Measure of non-friendly vehicle classification.

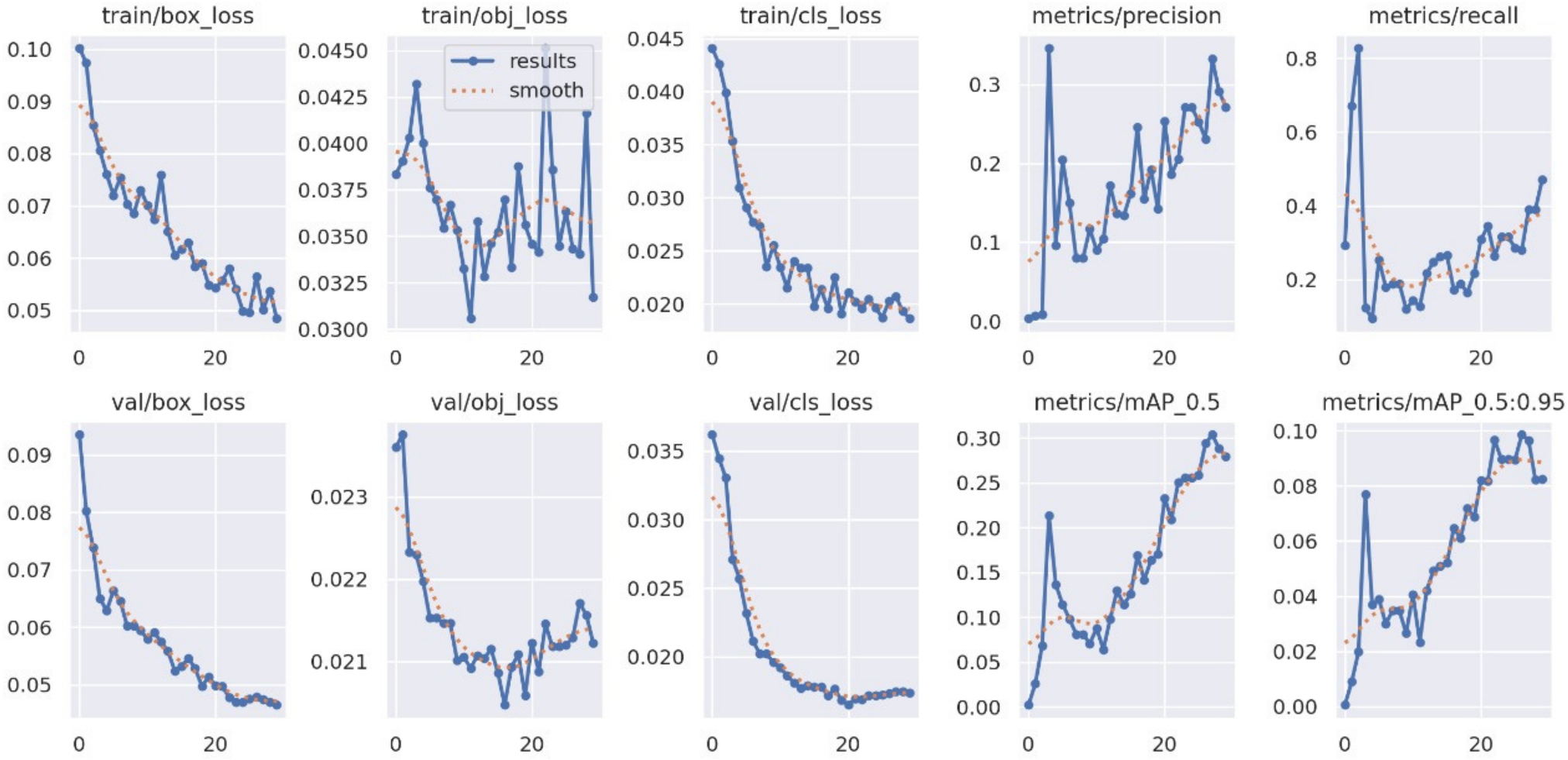


1st Iteration Results of YOLOv5 AI Generated Image – 49%

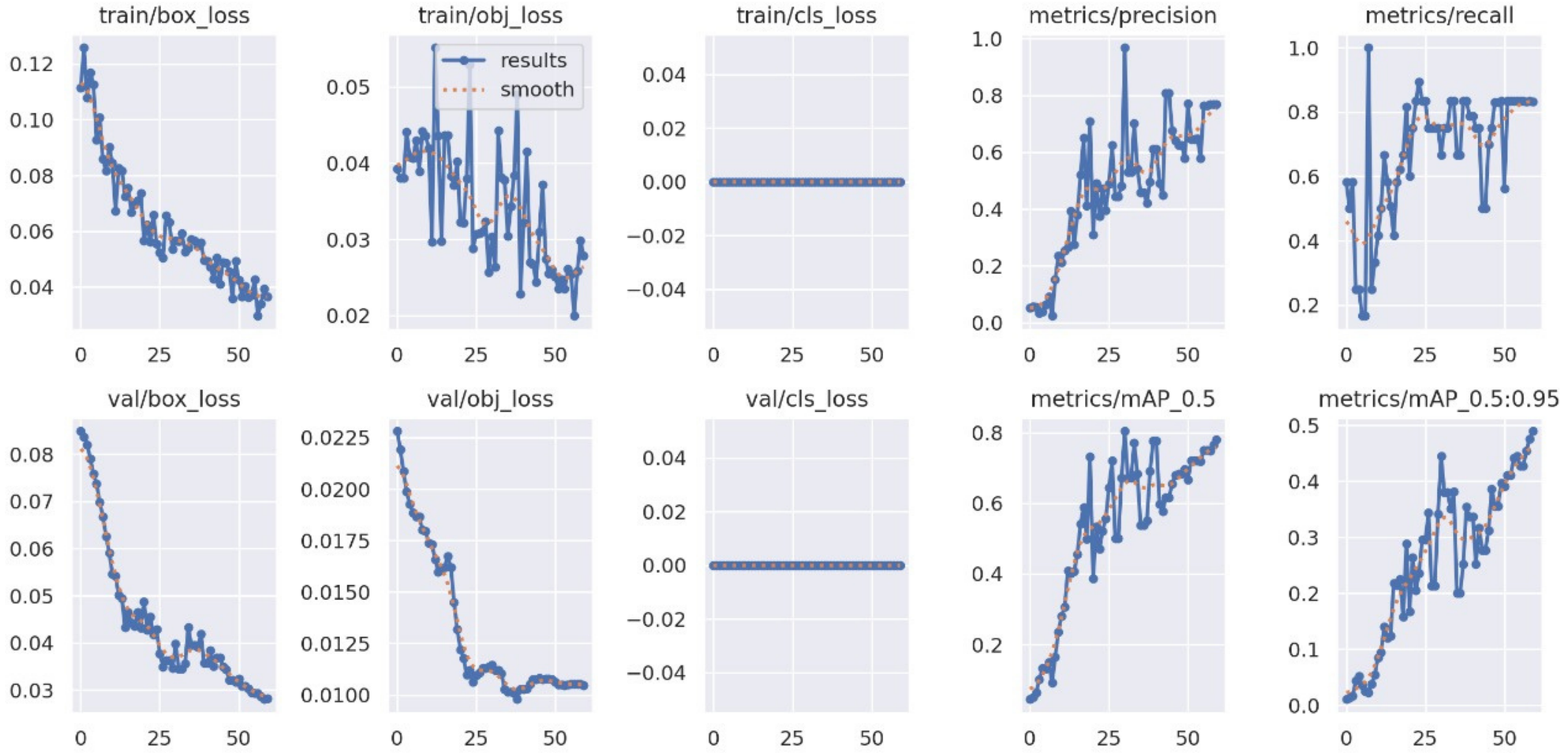


2nd Iteration Results of YOLOv5 using Actual Image – 62%



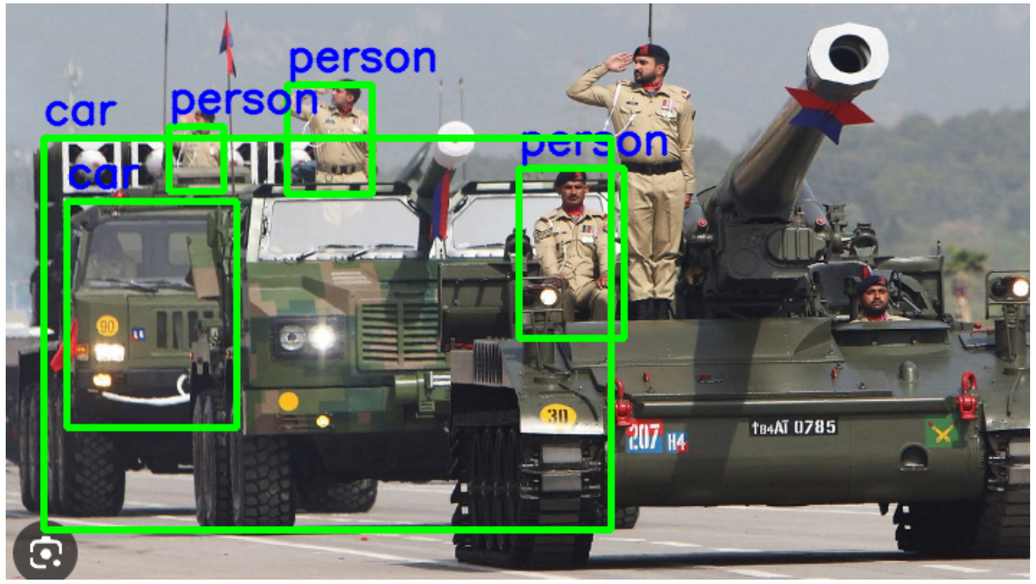


3rd Iteration Results of YOLOv8 using Actual Image – 61%

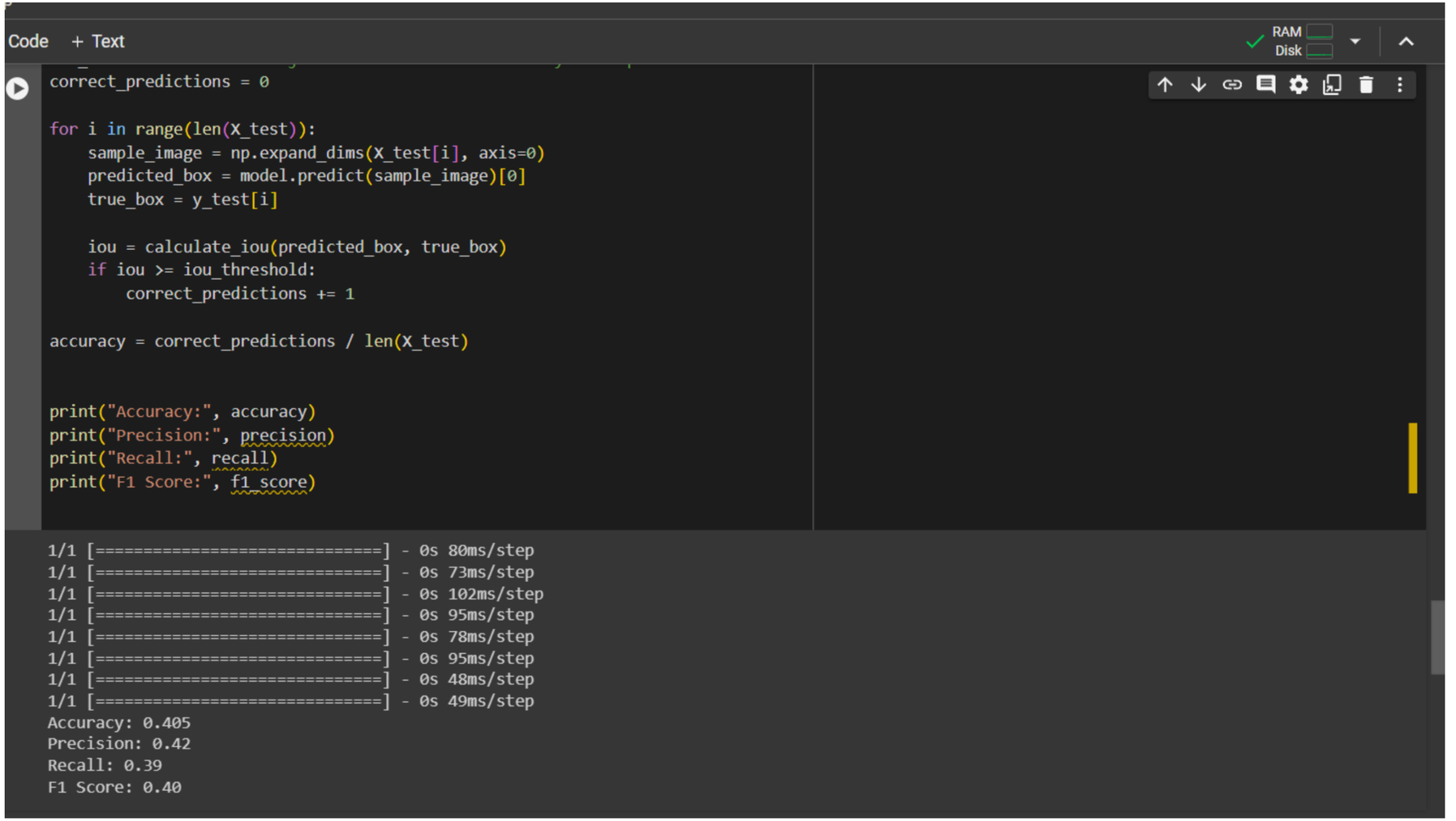


4th Iteration Results (SSD OpenCV)

Despite our best efforts, we encountered challenges in identifying military vehicles due to the absence of a predefined class in our dataset. The inability to retrain, evaluate, and adjust the algorithm posed significant obstacles for our project.



5th Iteration Results of CNN – 40%



Problem Faced

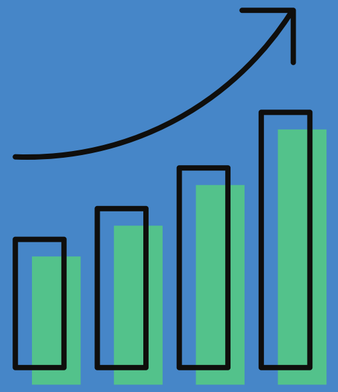
Addressing these challenges requires concerted efforts in data collection, model development, hardware optimization, ethical considerations, and collaboration among defense stakeholders to ensure effective and responsible deployment of military vehicle identification systems.

Limited Dataset Diversity

Adaptation to Environmental Variations

Model Bias and Generalization

Future Scope



while pre-trained models offer a strong foundation for military vehicle identification, continual research and development efforts

01 Customization and Optimization

02 Real-Time Deployment

03 Multi-Modal Fusion

04 Collaborative Framework

Conclusion

Pre-trained models offer high accuracy and adaptability for military vehicle identification, demonstrating efficiency and rapid deployment capabilities. They reduce data requirements and are versatile across varying environmental conditions. Advancements in model customization, real-time deployment, sensor integration, continual learning, collaborative development, and ethical considerations are key areas for further development in military vehicle identification systems.

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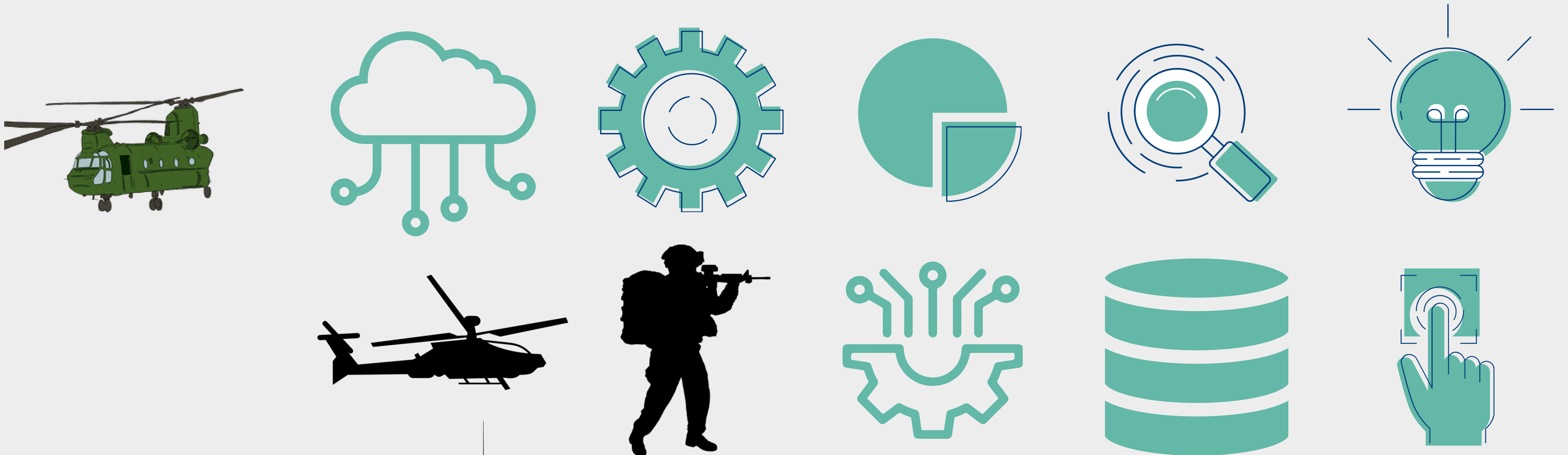

Icons

Icons we'll be using in the presentation