AI Model Evaluation Report (Federated Learning)

Insulator Defect Detection System (RetinaNet)

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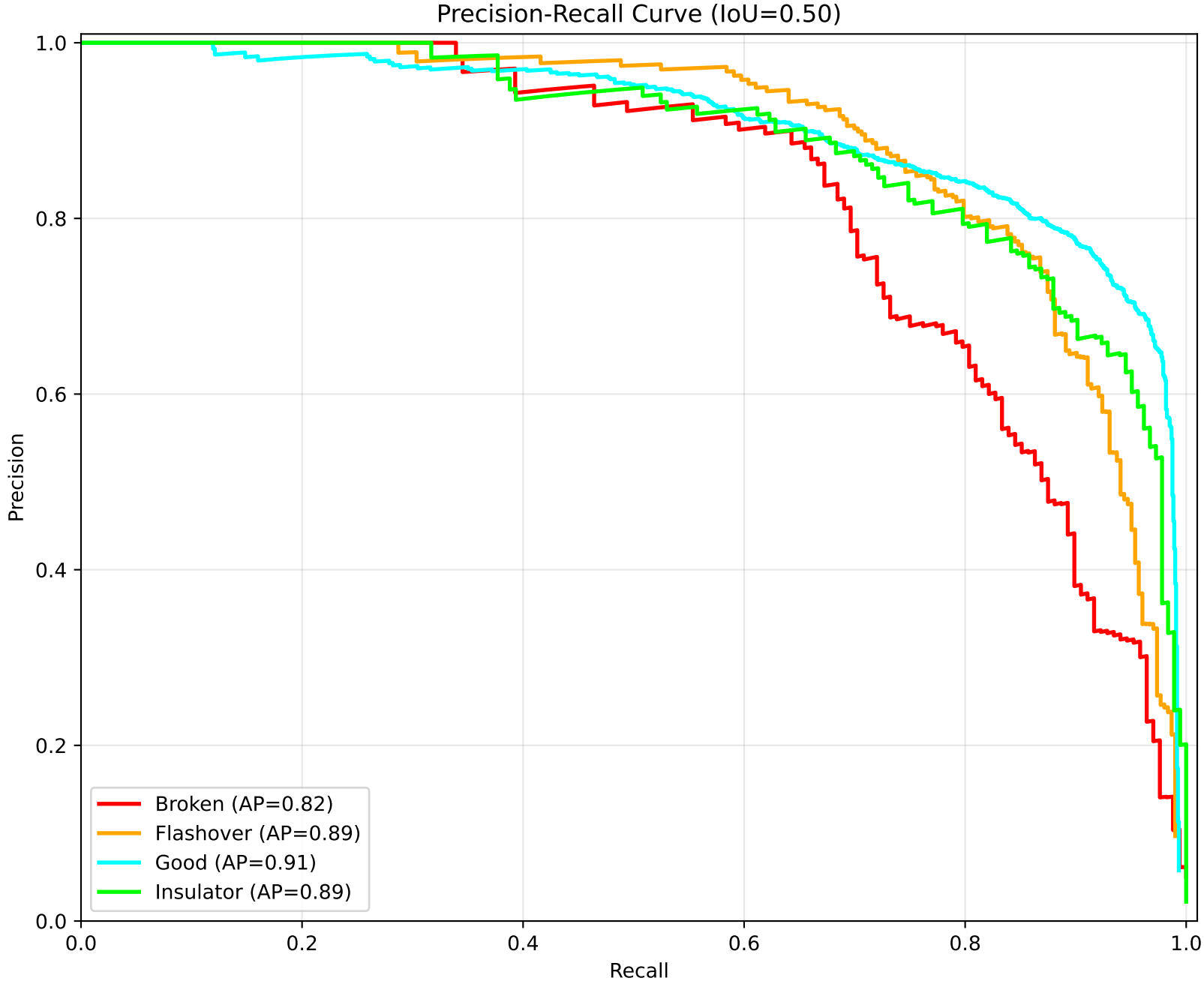
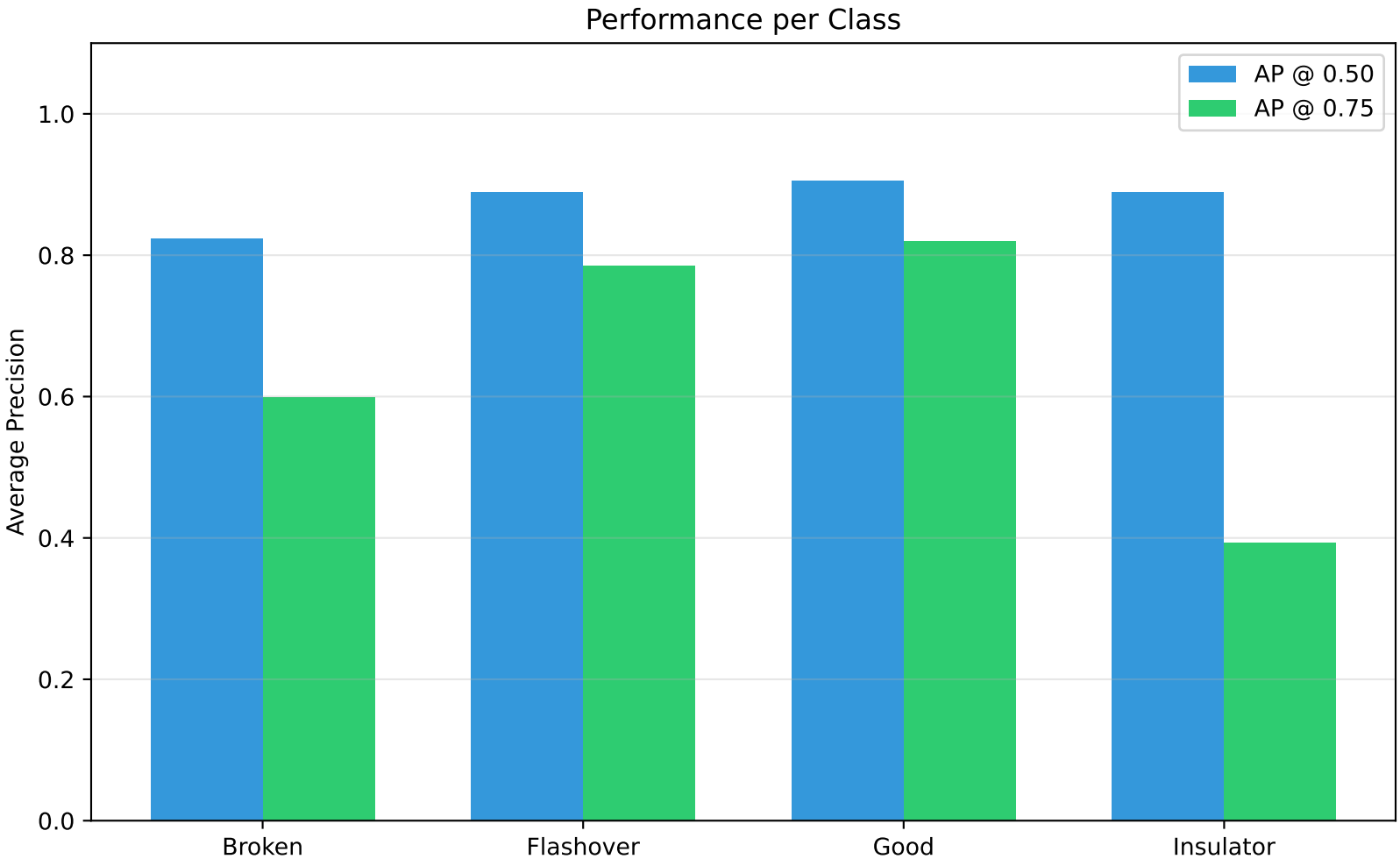
Date:                2025-12-30 22:56
Model Architecture: RetinaNet (ResNet50-FPN-V2)
Evaluation Dataset: IDID V1.2 (Validation Split)
Total Parameters:   36,414,865.0

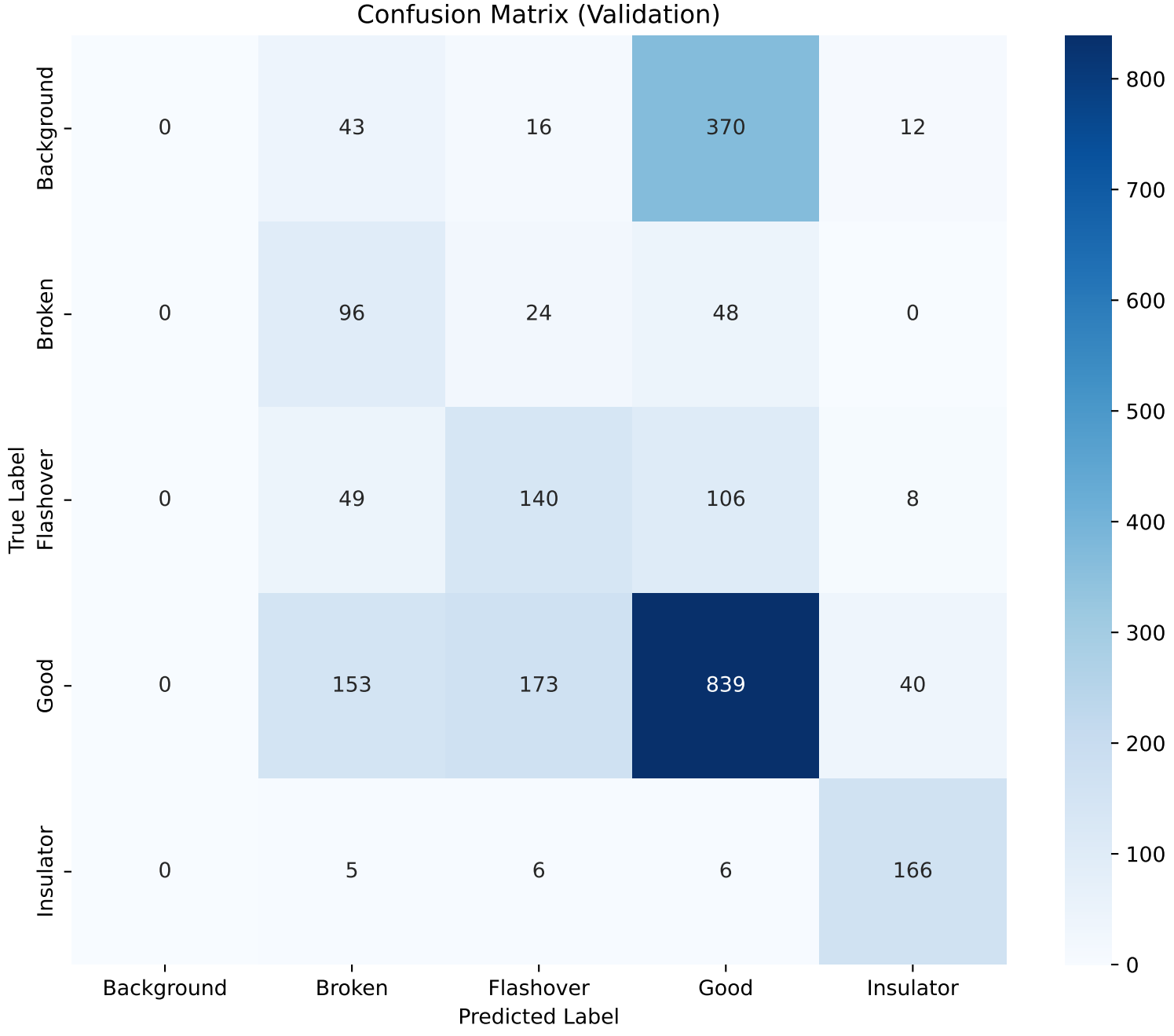
Real-World Performance Metrics
------------------------------------------------------
Inference Latency:          25.00 ms per image
Throughput (FPS):           40.00 frames/sec
Computational Cost:         129.12 GFLOPs (approx)

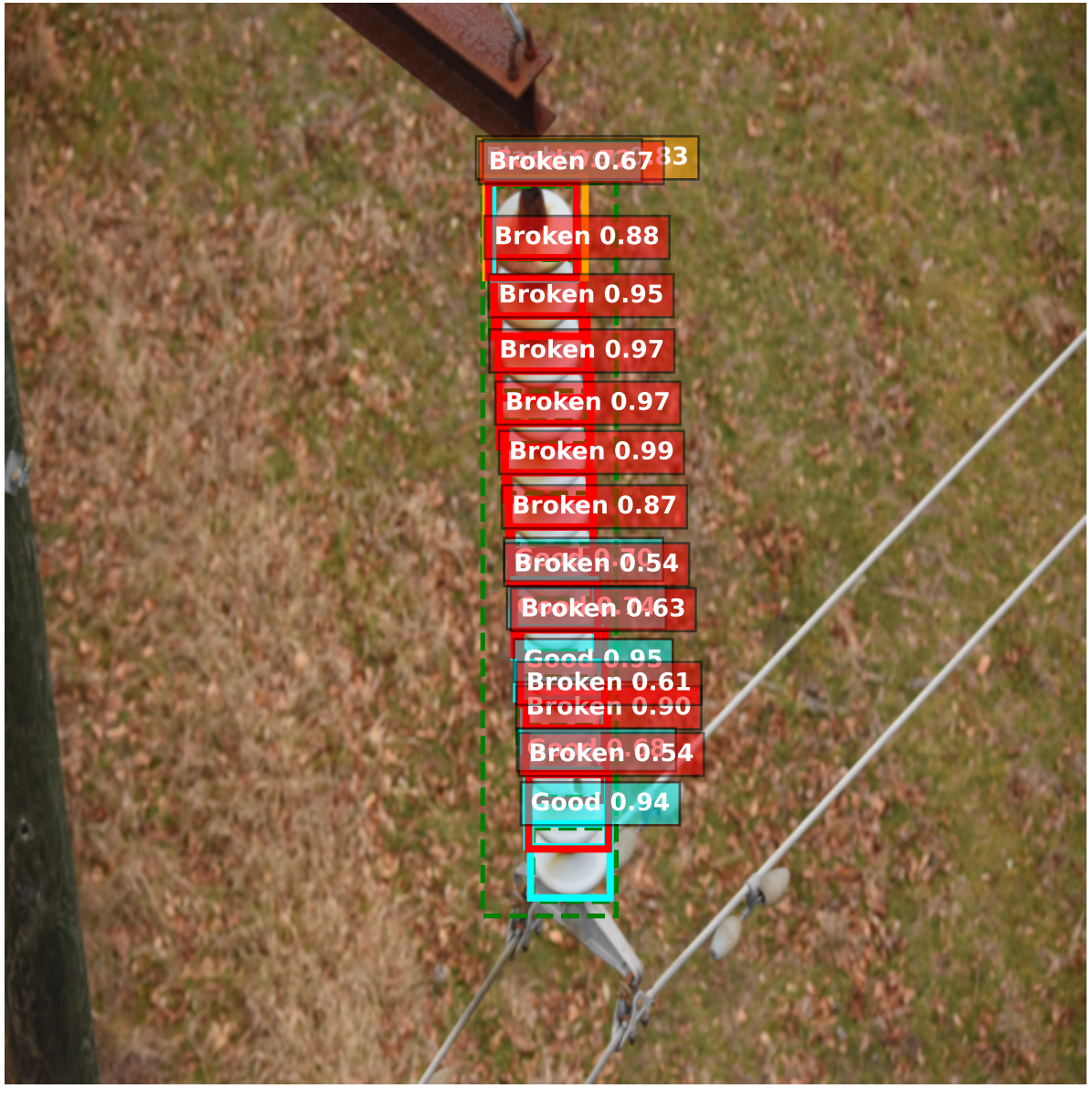
Overall Accuracy Metrics (Validation Set)
------------------------------------------------------
Mean Average Precision (mAP @ 0.50):            0.8770
Mean Average Precision (mAP @ 0.75):            0.6490

Class-wise Breakdown (AP @ 0.50)
------------------------------------------------------
Broken          : 0.8234
Flashover       : 0.8894
Good            : 0.9055
Insulator       : 0.8895
```

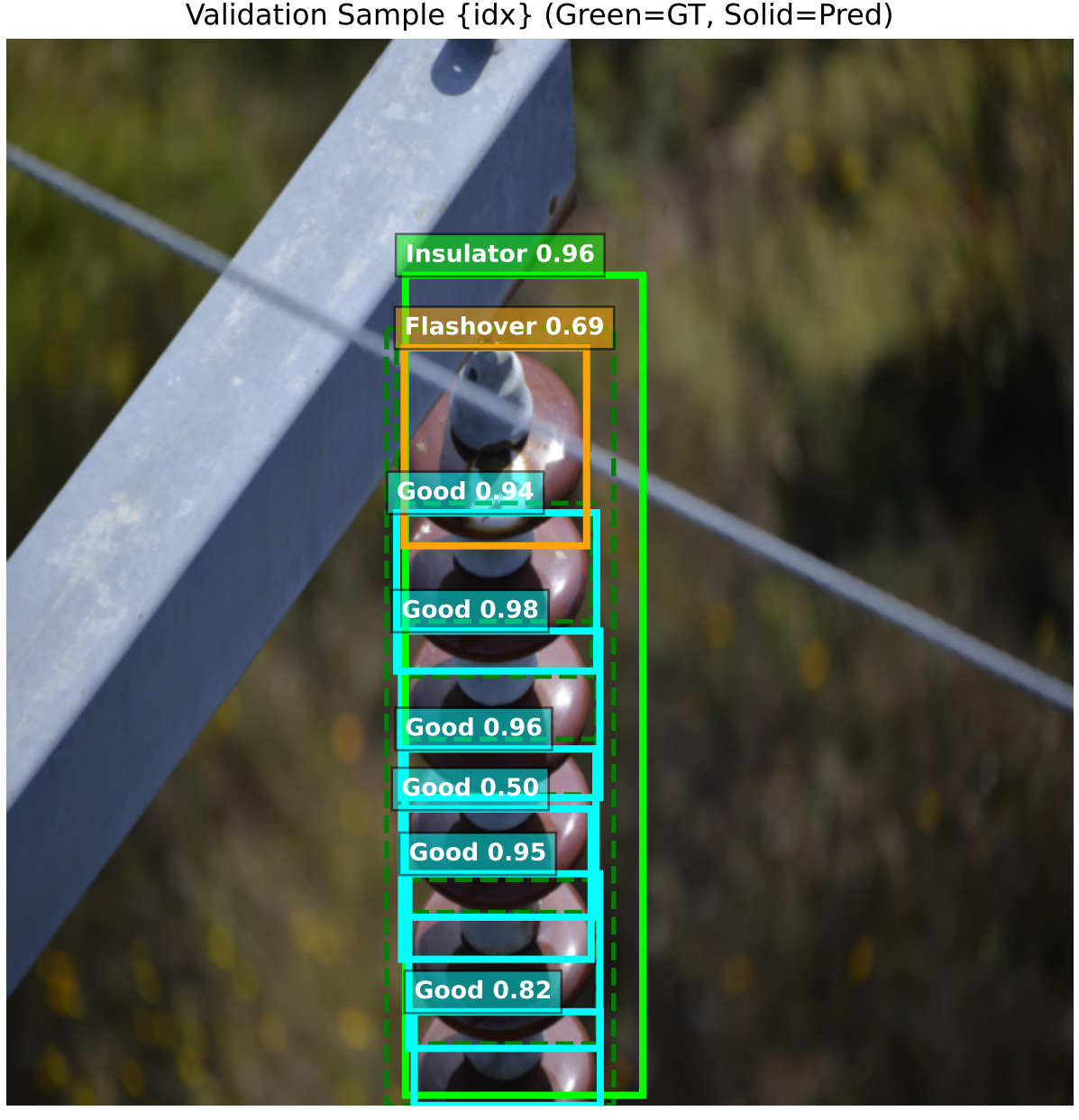

Precision-Recall Curve (IoU=0.50)
Precision
Recall
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Broken (AP=0.82)
Flashover (AP=0.89)
Good (AP=0.91)
Insulator (AP=0.89)


Performance per Class
AP @ 0.50
AP @ 0.75
Average Precision
1.0
0.8
0.6
0.4
0.2
0.0
Broken
Flashover
Good
Insulator

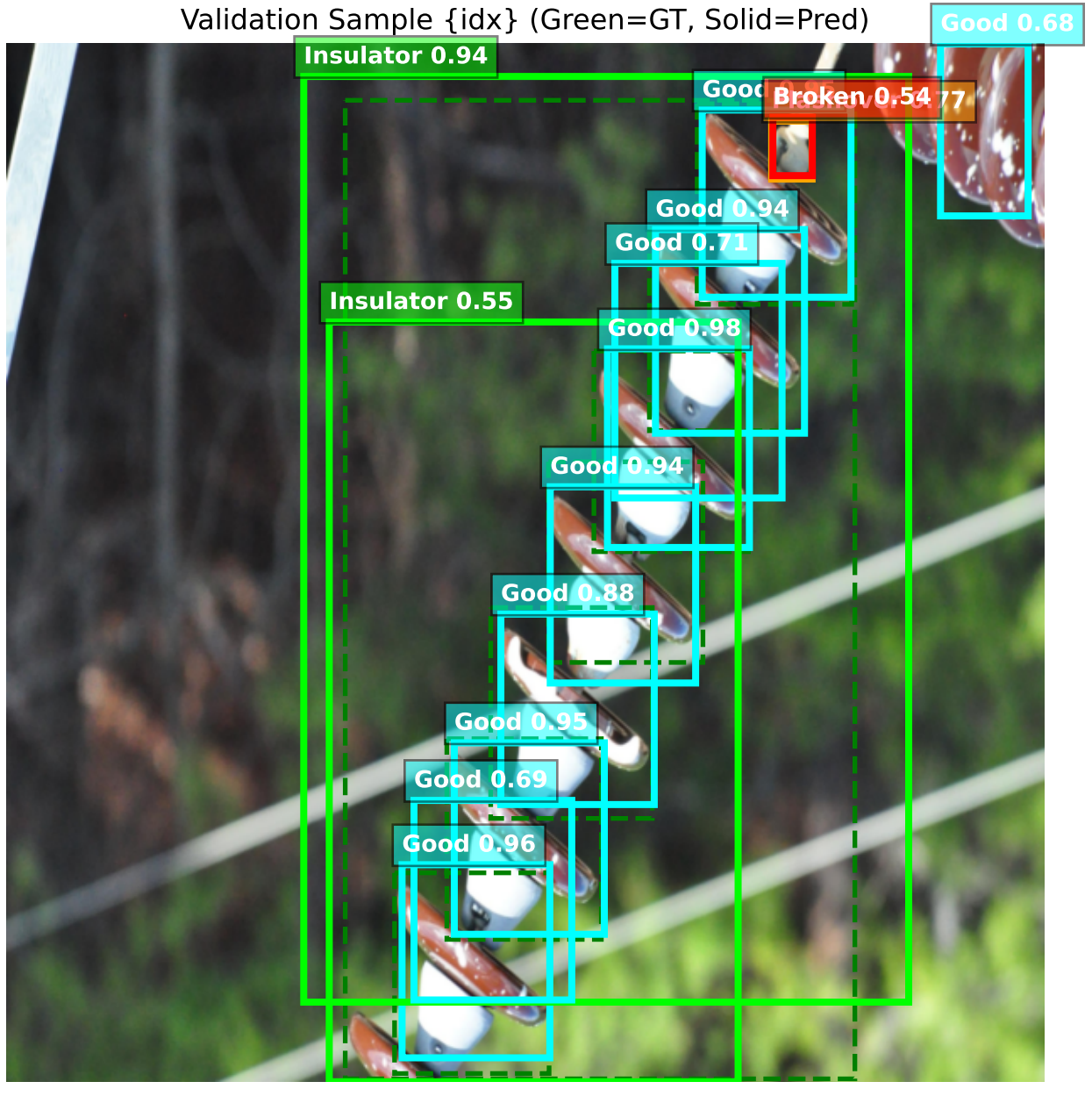

Confusion Matrix (Validation)
True Label
Predicted Label
Background
Broken
Flashover
Good
Insulator
0 43 16 370 12
0 96 24 48 0
0 49 140 106 8
0 153 173 839 40
0 5 6 6 166
800
700
600
500
400
300
200
100
0


Validation Sample {idx} (Green=GT, Solid=Pred)
Broken 0.67
Broken 0.88
Broken 0.95
Broken 0.97
Broken 0.97
Broken 0.99
Broken 0.87
Broken 0.54
Broken 0.63
Broken 0.61
Broken 0.54
Good 0.94

Validation Sample {idx} (Green=GT, Solid=Pred)


Validation Sample {idx} (Green=GT, Solid=Pred)
Insulator 0.96
Flashover 0.69
Good 0.94
Good 0.98
Good 0.96
Good 0.50
Good 0.95
Good 0.82


Validation Sample {idx} (Green=GT, Solid=Pred)
Good 0.90
Insulator 0.85
Broken 0.66
Good 0.90
Good 0.99
Good 0.95
Good 0.95
Good 0.55
Good 0.97
Good 0.95


Validation Sample {idx} (Green=GT, Solid=Pred)
Insulator 0.94
Broken 0.54
Good 0.68
Good 0.94
Good 0.71
Insulator 0.55
Good 0.98
Good 0.94
Good 0.88
Good 0.95
Good 0.69
Good 0.96