

ForestPersons: A Large-Scale Dataset for Under-Canopy Missing Person Detection

Deokyun Kim^{1*} Jeongjun Lee^{2*} Jungwon Choi^{2*} Jonggeon Park^{2*}
Giyoung Lee¹ Yookyung Kim¹ Myungseok Ki¹ Juho Lee² Jihun Cha¹

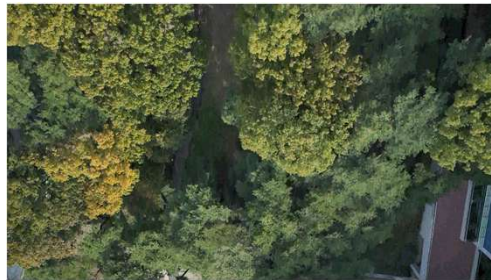
¹Autonomous UAV Research Section, ETRI ²Kim Jaechul Graduate School of AI, KAIST

**Equal Contribution E-mail: deokyunkim@etri.re.kr*



Background and Limitations of Existing Missing Person Detection

- While Unmanned Aerial Vehicles (UAVs) are effective for covering large, inaccessible areas, they rely heavily on **top-down or oblique aerial imagery**.



High-altitude aerial UAV



Low-altitude aerial MAV

Limitations of Prior Datasets

- Consequently, prior large-scale object detection and SAR-oriented datasets are also mostly constructed based on these UAV top-down perspectives.
- As a result, both existing methods and prior benchmarks often miss critical visual cues hidden beneath the dense forest canopy.

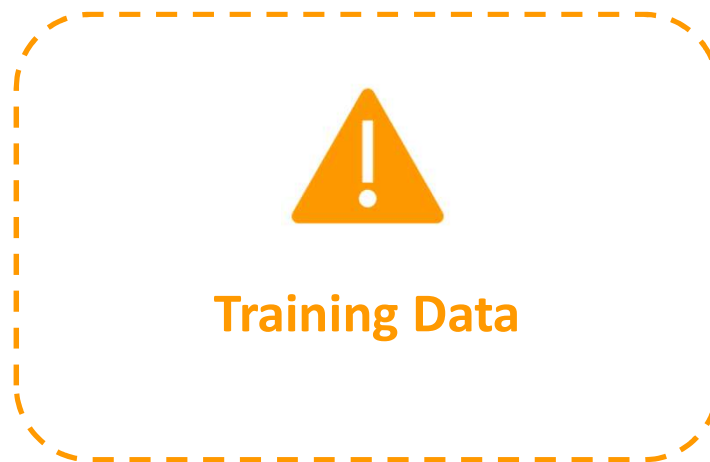
Dataset	Scenario	Configuration Environments	View Point	Dataset Size		Attributes	
				#Images	#Annotations	Occlusion	Pose
HERIDAL (Kundid Vasić & Papić, 2022)	SAR	Forest	Top-down	1,600	3,194	X	X
WiSARD (Broyles et al., 2022)	SAR	Forest, Maritime	Oblique	44,588	74,204	X	X
SARD (Sambolek & Ivasic-Kos, 2021)	SAR	Forest	Oblique	1,981	6,532	X	✓
VTSaR (Zhang et al., 2025)	SAR	Urban, Maritime, Forest	Top-down	12,465	19,956	X	X
Visdrone (Zhu et al., 2021)	Surveillance	Urban	Oblique	10,209	147,747	✓	X
NII-CU (Speth et al., 2022)	Detection	Urban	Oblique	5,880	18,736	✓	X
Okutama-Action (Barekatin et al., 2017)	Detection	Urban	Oblique	77,365	524,649	X	✓
ForestPersons	SAR	Forest	Ground-level	96,482	204,078	✓	✓

Dataset Bottlenecks in the SAR Field

- With recent technological advancements, autonomous flight Micro Aerial Vehicles (MAVs) can navigate through complex forests, and AI is outperforming in various tasks due to remarkable progress.
- However, the Search and Rescue (SAR) field is facing a **severe bottleneck due to the lack of appropriate datasets.**



Autonomous Flight
MAV



AI Detection Model

ForestPersons

- Proposal of a novel large-scale dataset specifically designed for under-canopy environments.
- Closely reflects the ground-level and low-altitude visual conditions encountered by MAVs.
- Contains 96,482 images and 204,078 annotations collected under diverse environmental and temporal conditions.
- Provides bounding box, pose, and visibility labels for occlusion-aware analysis.



Experimental Results

- Baseline evaluations were conducted using Faster R-CNN trained on prior SAR-oriented datasets or Ground-level datasets.
- This demonstrates a clear gap in prior datasets regarding under-canopy missing person detection, indicating that **prior benchmarks are not well aligned with this specific challenge**.

UAV-based SAR dataset

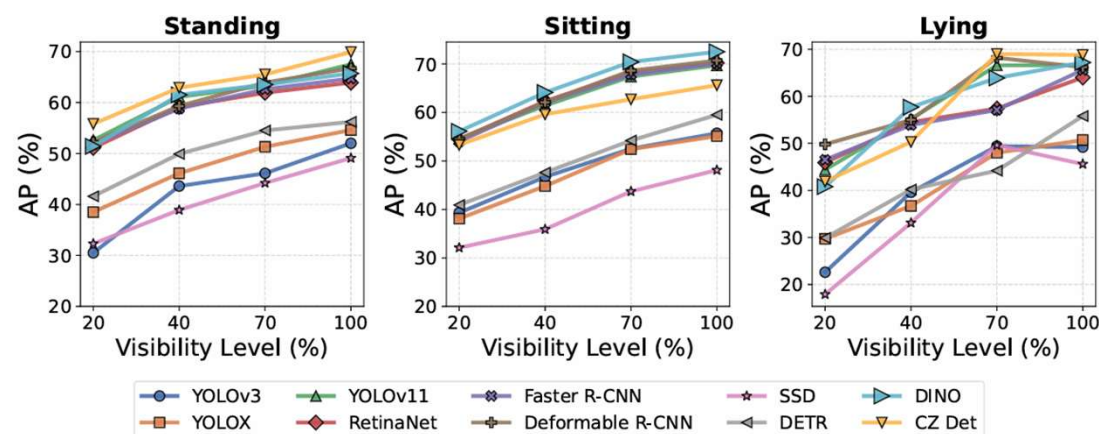
Train	Test	AP	AP ₅₀	AP ₇₅
SARD	SARD	58.6	90.8	68.4
	ForestPersons	3.0	7.8	1.6
HERIDAL	HERIDAL	35.0	70.8	29.3
	ForestPersons	0.2	0.3	0.2
WiSARD	WiSARD	18.5	51.7	7.9
	ForestPersons	11.3	29.0	6.4

Ground-level person dataset

Train	Test	AP	AP ₅₀	AP ₇₅
COCOPerson	COCOPerson	54.0	82.5	58.2
	ForestPersons	40.8	66.9	45.2
CrowdHuman	CrowdHuman	39.4	74.8	37.3
	ForestPersons	31.9	58.8	31.0
CityPersons	CityPersons	38.7	62.5	42.1
	ForestPersons	5.9	15.1	3.7

Benchmark Results

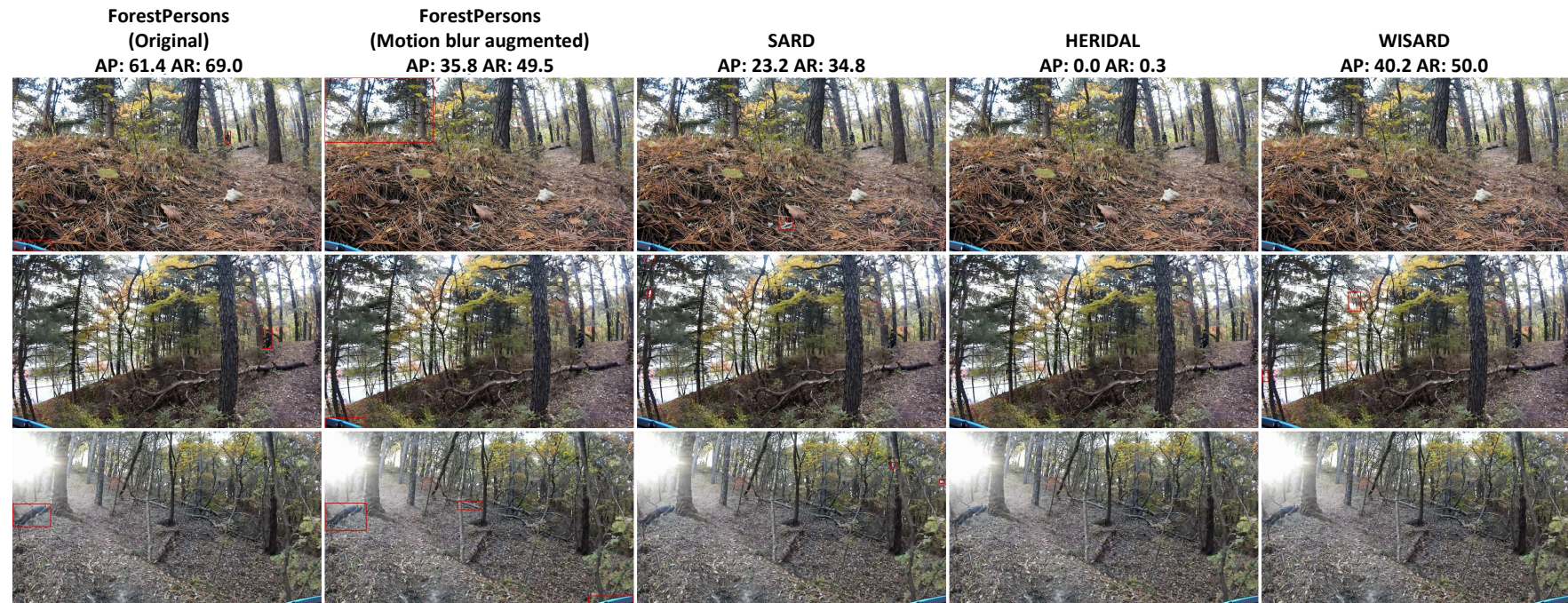
- Evaluations reveal that the performance of object detection models varies significantly depending on visibility levels in forest environments.
- This demonstrates the critical importance of constructing datasets that encompass varying visibility labels, poses, and diverse environmental and temporal conditions to effectively address real-world SAR complexities.



Train Attributes	(a) Pose						(b) Season								
	Standing			All Poses			Summer			Winter			All Seasons		
Test Attributes	Standing	Sitting	Lying	Standing	Sitting	Lying	Summer	Fall	Winter	Summer	Fall	Winter	Summer	Fall	Winter
YOLOv3	45.3	30.0	32.1	49.3	51.5	47.5	49.7	53.7	25.7	4.5	1.4	54.0	51.1	58.2	50.7
YOLOX	47.3	30.3	31.7	52.2	50.6	47.9	56.8	57.1	17.2	5.5	1.5	60.0	50.0	53.6	56.5
YOLOv11	60.1	44.5	46.0	65.5	65.7	65.1	65.4	65.4	21.6	6.3	1.6	66.9	65.3	72.8	68.0
RetinaNet	57.5	47.2	43.8	62.3	66.3	60.3	63.4	66.3	43.8	14.6	4.7	63.4	66.0	73.2	63.1
Faster R-CNN	58.0	47.0	42.2	63.1	66.1	61.0	65.7	66.9	34.6	18.7	11.7	61.5	65.9	71.6	64.0
Deformable R-CNN	59.4	48.2	45.0	65.2	66.3	65.4	66.4	68.7	34.1	15.7	6.7	63.3	66.8	72.3	66.3
SSD	39.3	22.3	22.8	46.1	43.7	45.1	44.2	49.0	21.9	5.2	1.9	50.1	42.5	55.2	50.6
DETR	43.2	29.4	26.2	54.1	54.3	48.4	31.9	41.9	22.0	8.4	3.3	54.8	53.2	63.8	57.1
DINO	59.9	50.3	46.3	64.2	67.6	64.1	51.3	48.9	32.0	17.6	7.1	57.0	68.0	74.9	64.6
CZ Det	50.7	30.6	33.8	67.5	62.5	66.8	56.9	52.5	13.0	7.3	0.2	61.8	60.5	69.7	72.6

Evaluation in Simulated Missing Person Scenarios using Real Autonomous Flight MAVs

- Evaluations were conducted on simulated missing person scenarios using real MAV.
- This demonstrates that the ForestPersons fully supports missing person detection capabilities in real-world SAR scenarios.



Conclusion

- Establishes a new ground-level/low-altitude detection foundation that overcomes the limitations of existing aerial imagery.
- Offers a benchmark to support advanced person detection capabilities in real-world SAR scenarios.
- [The dataset is publicly available](#) to foster advancements and subsequent research within the community.



Demo Youtube



ForestPersons



ForestPersonsIR

Thanks for your interest in our work!

E-mail: deokyunkim@etri.re.kr