

Synthetic Data Generation for All Weather Image Enhancement and Object Detection

General Dataset Specifications

All teams must clearly specify and follow these common requirements:

1. Dataset Generation Methodology

Participants must use publicly available datasets (e.g., Kaggle) containing clear ground-truth images as the reference. Participants must clearly describe how the synthetic images are generated.

The dataset may be created using one or more of the following approaches:

- Algorithmic / Coding-based methods
(e.g., Python, OpenCV, image processing, physical models)
- Simulation or Smart Tools
(e.g., Blender, Unity, CARLA)
- Generative Models
(e.g., GANs, Diffusion Models)

2. Dataset Size

- Minimum 5,000 images per weather category
- Minimum 3 severity levels (e.g., light, medium, heavy)
- Balanced distribution across severity levels

3. Image Specifications

- Resolution: Minimum 640×480 (preferred: 1280×720)
- Format: JPEG
- Color Space: RGB

4. Object Classes

- Minimum 3 object classes (examples: person, car, bike, traffic sign)
- Clearly define class names in a classes.txt file

5. Annotations

- Bounding-box annotations (YOLO / COCO / Pascal VOC – specify format)
- Each image must have:

- ❖ Object class label
- ❖ Bounding box coordinates
- Annotation consistency is critical

6. Metadata

Each image must include metadata (Word Document) containing:

- Weather type
- Severity level
- Parameter values used for generation
- Random seed (if applicable)

7. Reproducibility

- Clearly describe the pipeline
- Parameter ranges must be documented
- Same input + same parameters → same output

Problem Statements:

7. Combined Adverse Conditions Dataset

Generate a small dataset with combined conditions (e.g., rain + low light, fog + night).

Requirements:

- At least **two combined conditions**, such as:
 - ❖ Rain + low light
 - ❖ Fog + night
 - ❖ Snow + smoke
- Object annotations under complex visibility degradation
- Metadata describing each contributing condition

Final Deliverables

Teams must submit:

1. Dataset (images + annotations)
2. Metadata files
3. README explaining setup and usage
4. Sample visualization results
5. Technical report (PDF, max 10 pages)