

Dataset, Preprocessing Pipeline, and Initial Exploratory Analysis Report

1. Datasets

DIV2K (images): Benchmark dataset containing ~800 high-resolution (2K) images used for single-image super-resolution.

Vimeo90K (video): Large video dataset with high-quality 7-frame sequences suitable for temporal SR training.

Gaze-Tracking Data (Optional): A small consent-based dataset of gaze coordinates used to fine-tune foveation behavior.

2. Preprocessing Pipeline

Cleaning:

- Remove corrupted images.
- Normalize RGB channels.
- Standardize colorspace.

Resolution Standardization:

- HR→LR bicubic downsampling.
- LR/HR crop-pair generation (e.g., 128→256 px).
- For video: consistent frame sizes, sequential extraction.

Foveation Labels:

- Synthetic gaze points.
- Gaussian/acuity-based foveal/peripheral masks.
- Masks transformed during augmentations.

Augmentation:

- Spatial: random crop, flip, small rotations.
- Photometric: brightness/contrast jitter, compression noise.
- Motion-aware blur for video.

3. Exploratory Data Analysis (EDA)

Dataset Statistics:

DIV2K: ~800 images, diverse scenes.

Vimeo90K: 89k clips, motion-rich sequences.

Pixel Distribution:

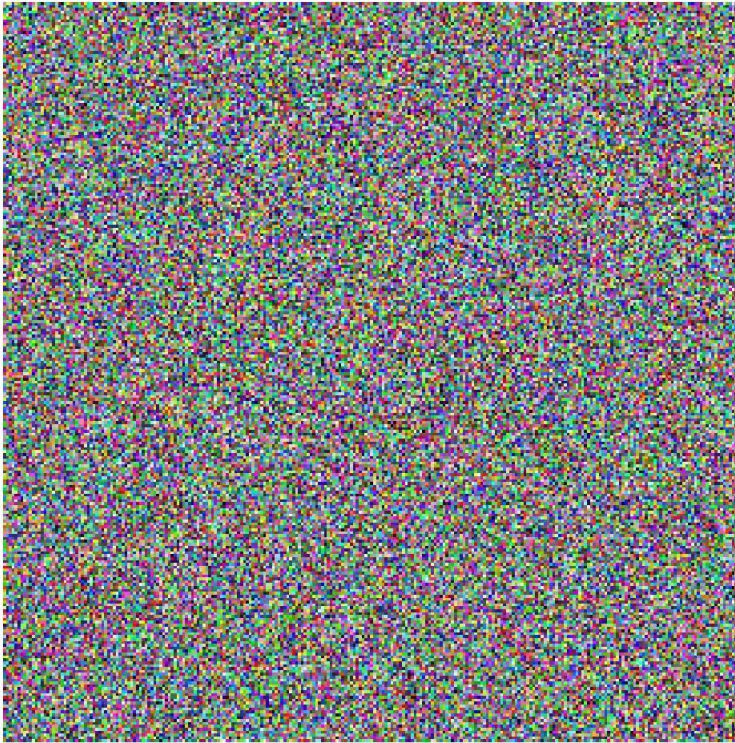
- RGB histograms.
- Channel means/variances.
- LR–HR baseline PSNR/SSIM.

Foveation Map Analysis:

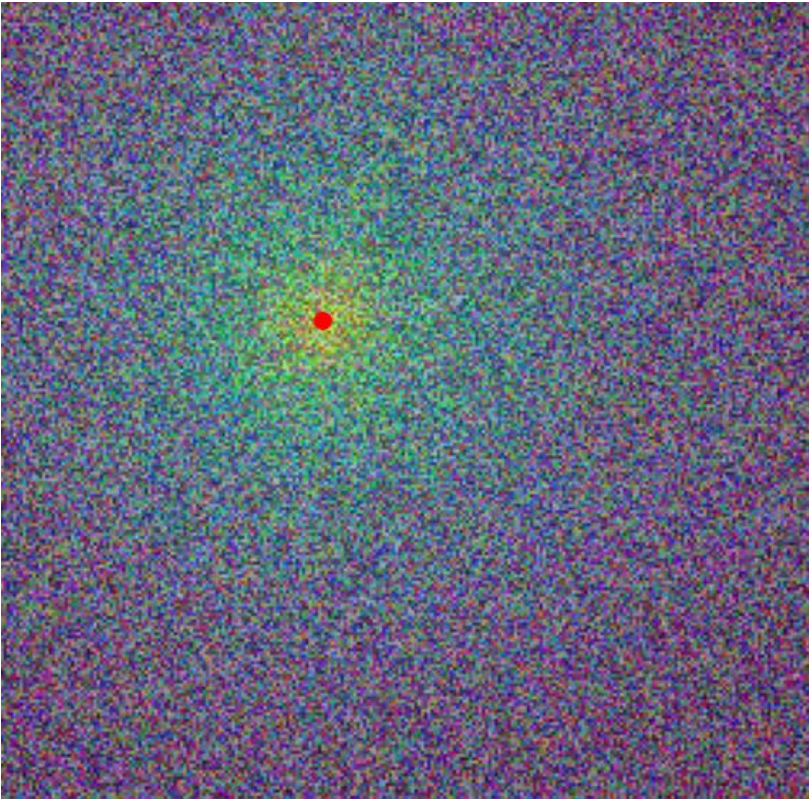
- Foveal radius distribution.
- Fovea:periphery pixel ratio.
- Mask stability under augmentations.

4. Example Visualizations

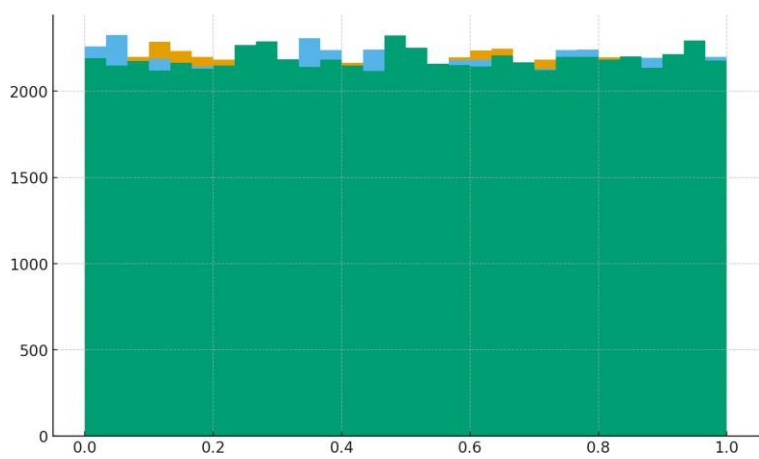
LR vs HR Sample Pairs



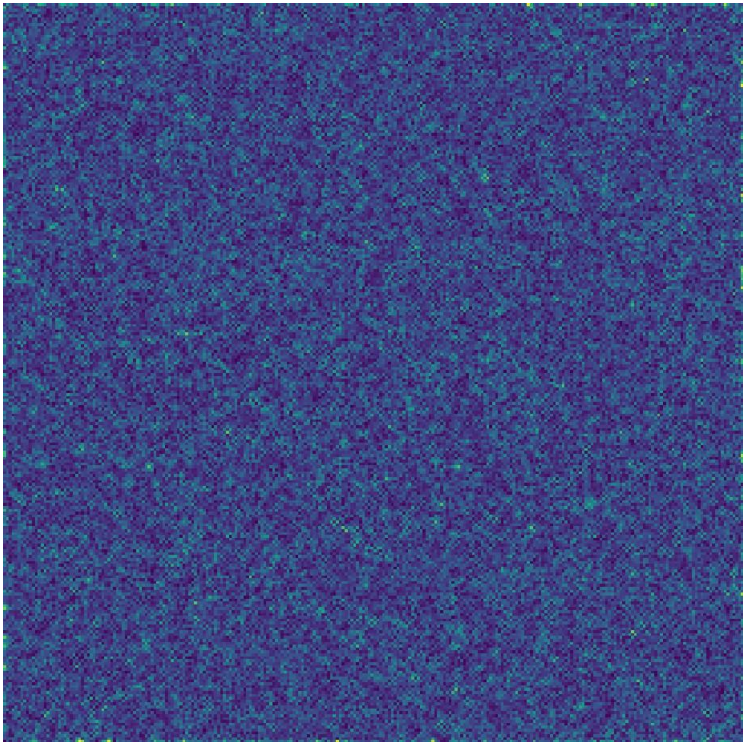
Gaze Point + Foveation Mask



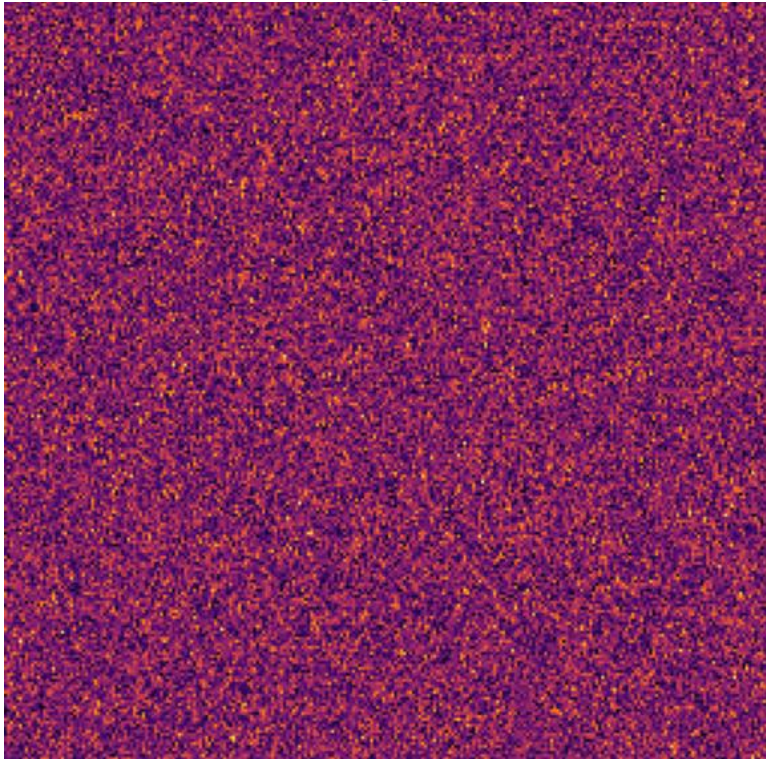
RGB Histograms



Entropy / Texture Heatmap



Consecutive-Frame Motion Magnitude



Summary

Preprocessing ensures clean LR/HR pairs, accurate foveation masks, and sufficient dataset analysis for the development of a gaze-aware on-device super-resolution system.