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.

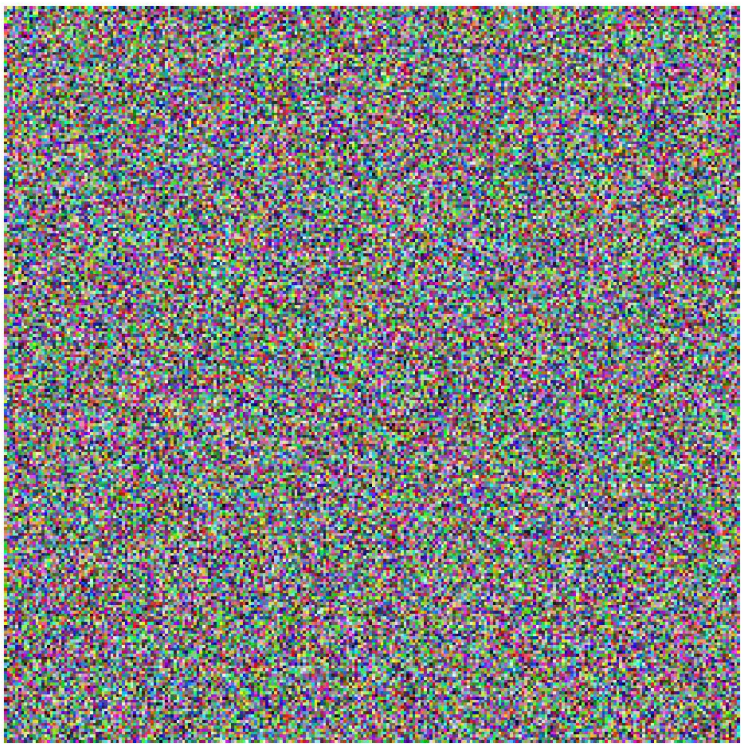
Pixel Distribution:
• RGB histograms.
• Channel means/variances.
• LR–HR baseline PSNR/SSIM.

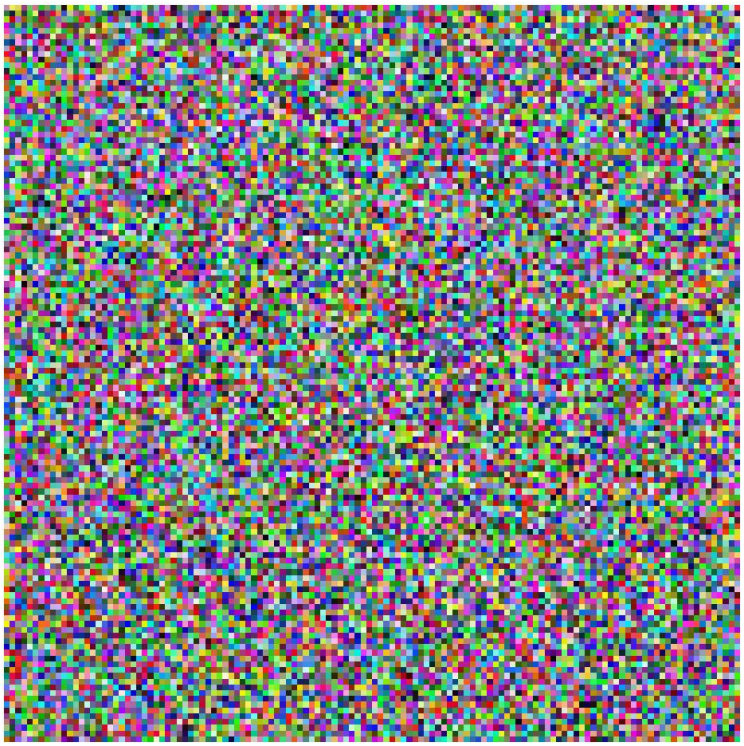
Foveation Map Analysis:

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

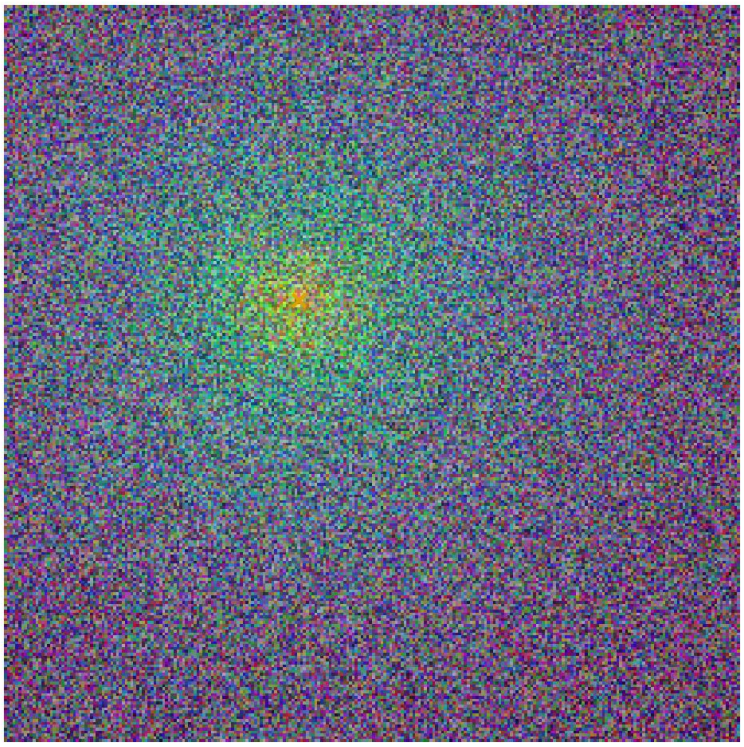
4. Example Visualizations

LR vs HR Sample Pairs

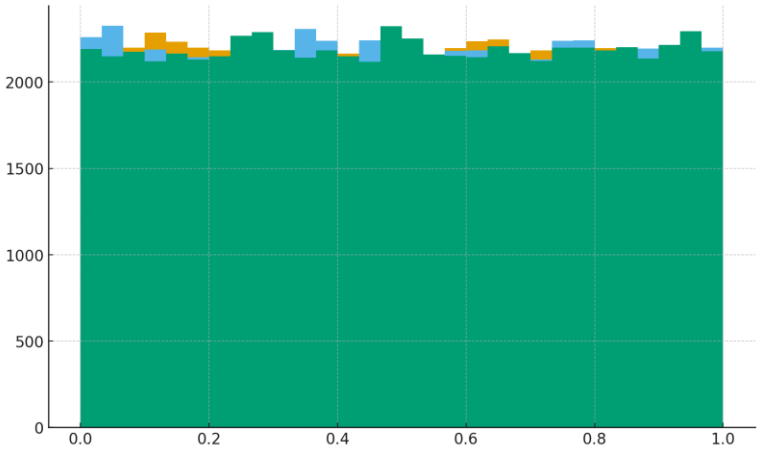




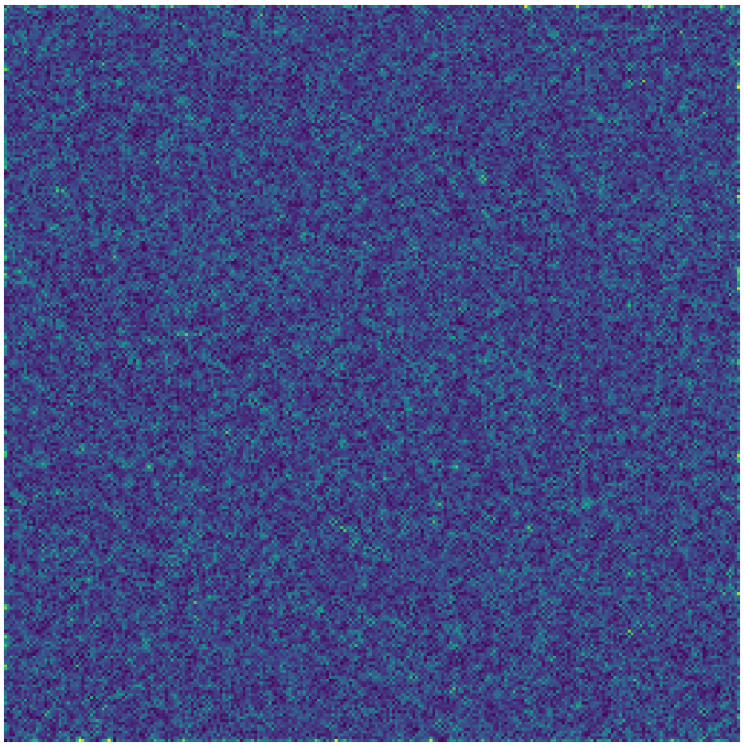
Gaze Point + Foveation Mask



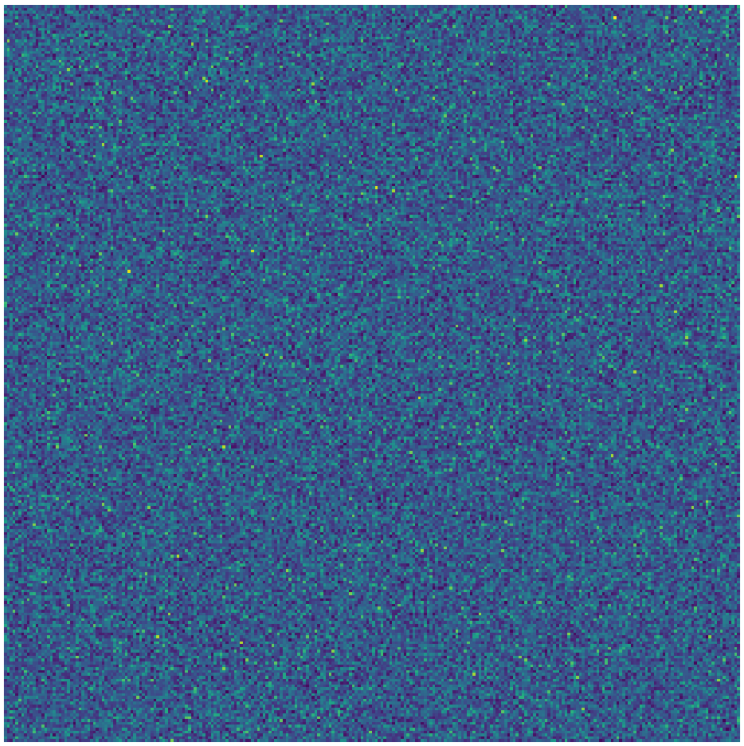
RGB Histograms



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.