Image Super Resolution via CNN (SRCNN)

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Overview

This project implements the **Super-Resolution Convolutional Neural Network (SRCNN)** to enhance low-resolution images by reconstructing high-resolution versions using deep learning.

Model Architecture

The SRCNN is a three-layer convolutional neural network composed of the following stages:

Layer	Purpose	Kernel Size	Channels	Activation
1	Feature Extraction	9 × 9	1 → 64	ReLU
2	Non-Linear Mapping	5 × 5	64 → 32	ReLU
3	Reconstruction	5 × 5	32 → 1	None

The model is trained to minimize Mean Squared Error (MSE) Loss and its performance is evaluated using the Peak Signal-to-Noise Ratio (PSNR) metric.

Datasets

- **Training Dataset:** `91-image.h5`
- **Validation Dataset:** `Set5.h5`

These are standard benchmark datasets widely used for evaluating image super-resolution models.

Experiments

Parameter	Value
Epochs	100
Batch Size	16
Learning Rate	1e-3, 1e-4, 1e-5
Scale Factors	×2, ×3, ×4
Optimizer	Adam
Loss Function	MSELoss

Results

Scale	Learning Rate	PSNR(dB)
x2	1e-4	36.48
x3	1e-4	33.13
x3	1e-4	30.15

- **Best Performance:** The highest reconstruction quality was achieved with a scale factor of **×2**, resulting in a **PSNR of 36.48 dB**.
- **Key Observation:** There is an inverse relationship between the upscaling factor and performance; higher factors lead to reduced reconstruction quality.