INTEL UNNATI TRAINING REPORT

Problem statement 2

Image Sharpening using Knowledge Distillation

OBJECTIVE:

The goal of this research is to use knowledge distillation in a teacher-student learning framework to improve the sharpness of low-resolution (LR) photographs. To retain good picture quality at a lower cost of computation, the goal is to transfer information from a large, high-performing teacher model to a smaller, more effective student model.

DATASET OVERVIEW:

1. **Total Images**: 200 high-resolution (HR) images from the DIV2K Dataset on Kaggle.
2. **Preprocessing:**
   - Gaussian blur applied to simulate degradation
   - Downsampling (×4) followed by upsampling for LR image creation
   - Images resized to 128×128 pixels
   - Custom dataset class handles HR-LR pairing and transformations

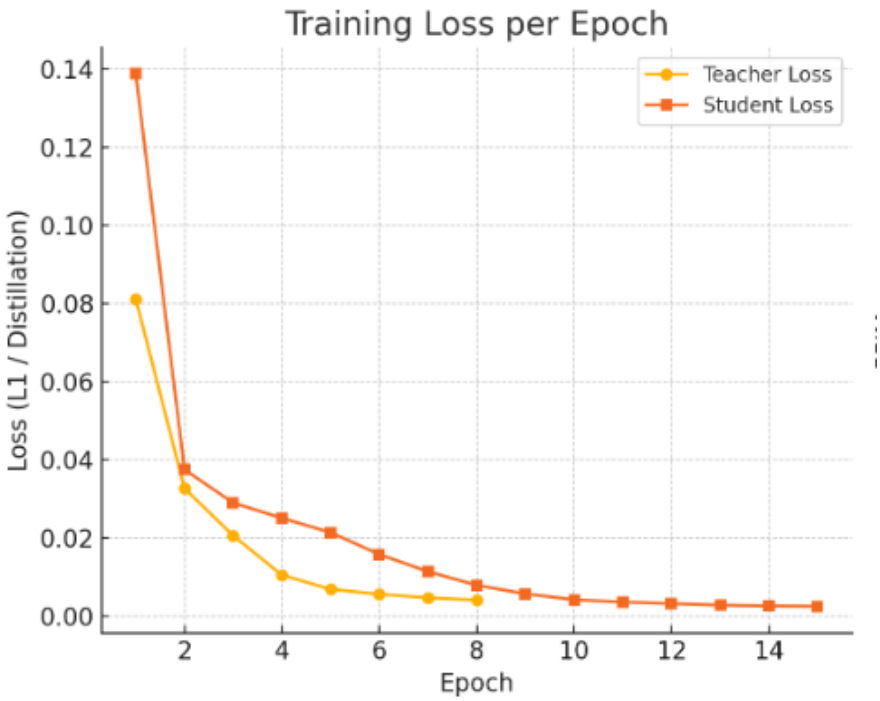
ARCHITECTURE OF MODELS:

1. **Teacher Model:**
   - Built using multiple residual blocks
   - Wide and deep network trained with L1 loss against ground truth HR images
   - Serves as the feature and output generator for student supervision

2. **Student Model:**
   - Shallow architecture with reduced parameters
   - **L1 loss** to match HR outputs
   - **MSE loss** between student and teacher intermediate features
   - Objective: Match teacher performance with lower complexity

MODEL TRAINING RESULTS:

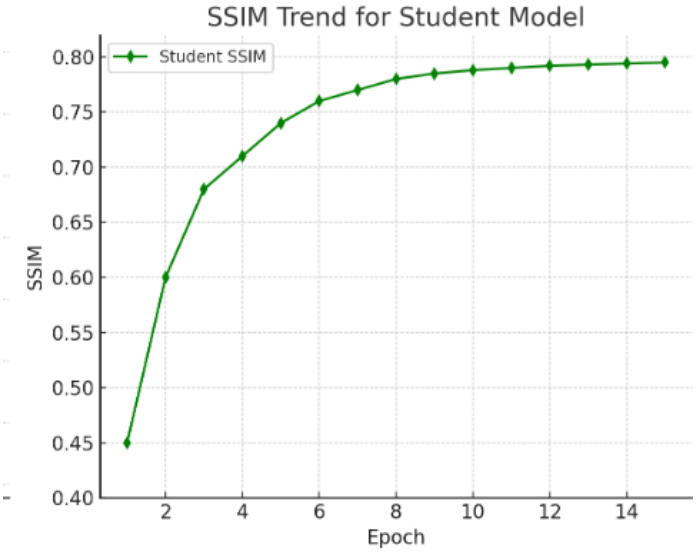
1. Loss dropped over 30× for both teacher and student during training.
2. The student reached near-teacher performance by epoch 15.



PERFORMANCE EVALUATION:

MODEL	FINAL SSIM
Teacher	0.89
Student	0.795

RESULTS:



Average SSIM Score: 0.795