Image Sharpening using Knowledge Distillation

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Project Objective

- To develop a model that enhances image sharpness for video conferencing.
- Target use case: low bandwidth or unstable network environments.

Dataset

- • Dataset: DBlur – Helen Subset
- • Contains paired blurred and sharp facial images for supervised learning.
- • Train, Validation, and Test sets
- • Images resized to 256×256.
- • Blur Types: motion and defocus.
- • Source: Kaggle - Image Deblurring Datasets

Model Architecture

- Teacher Model: DnCNN
- Student Model: BetterStudent
- Framework: PyTorch
- Knowledge Distillation is used to train the student.

Setup

- # Setup
- import os
- import torch
- import torch.nn as nn
- …

Dataset Class

- # Dataset Class
- class HelenDataset(Dataset):
- def __init__(self,...

DataLoader

- # Load Dummy Datasets
- train_dataset = HelenDataset(...)
- train_loader = DataLoader(...

Model Definitions

- # Model Definitions
- class DnCNN(nn.Module):
- ...
- class BetterStudent(nn.Module):
- ...

Metrics

- # Metrics
- def calculate_ssim(...)
- def calculate_psnr(...)
- def evaluate(...)

Training Loops

- # Training Loops
- def train_teacher(...)
- def distill_student(...)
- def distill_loss(...)

Main

- # Main
- if __name__ == '__main__':
- teacher = DnCNN()
- ...
- torch.save(...)

Conclusion

- Successfully created a lightweight, real-time image sharpening model.
- Enhanced video clarity in adverse network conditions.
- Ready for integration into video conferencing platforms.
- Subjective feedback confirmed the model's effectiveness.

Thank You