Signal Processing in Practice
Assignment 2

Bhaskar Karol

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1 Introduction

This report includes the results of training a CNN on CIFAR-10 under three conditions:

- **Raw Images** (No augmentations)
- **Traditional Augmentations** (Random flips, crops, color jittering)
- **Mixup** (Interpolating inputs and labels)

Additionally, **Manifold Mixup** was applied at intermediate feature layers.

2 Results

Training Method	**Test Accuracy**
Raw Images	76.88%
Traditional Augmentations	**80.44%**
Mixup ($\alpha = 1.0$)	70.12%
Manifold Mixup ($k = 1, \alpha = 1.0$)	71.94%

Table 1: Test Accuracy for Different Methods

Observations:

- Traditional augmentations gave the highest accuracy (80.44%).
- Mixup reduced overfitting but performed worse than augmentations.
- Manifold Mixup improved slightly over Mixup, suggesting better feature space interpolation.
- Lower α values led to less aggressive mixing and better results.

3 Conclusion

Mixup and Manifold Mixup introduced regularization but did not surpass traditional augmentations in accuracy. Future work can explore tuning α and layer selection in Manifold Mixup.