Assignment 2

AIL862 SPECIAL TOPICS IN COMPUTER VISION

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In this assignment we have documented the performance of different model structures (backbones) under various levels of label noise.

1. Dataset Preparation:
Train (80%) and validation (20%) sets were created from the UC Merced dataset. In the training set, we randomly shuffled labels to introduce label noise levels of 1%, 5%, 10%, 20%, 40%, 60%, 90%, and 100%.

2. Model Structures (Backbones):

ResNet-18: To counteract vanishing gradients, this deep residual network uses skip connections.
o VGG-16: A deeper network with more completely connected layers and a sequential structure.

3. Training:

We have used the pretrained models with Adam optimizer (learning rate = 0.0001), and Cross Entropy Loss ass the loss function. Training took place for ten epochs.

4. Assessment Metrics:

Accuracy and loss were noted at various noise levels.

Observations:

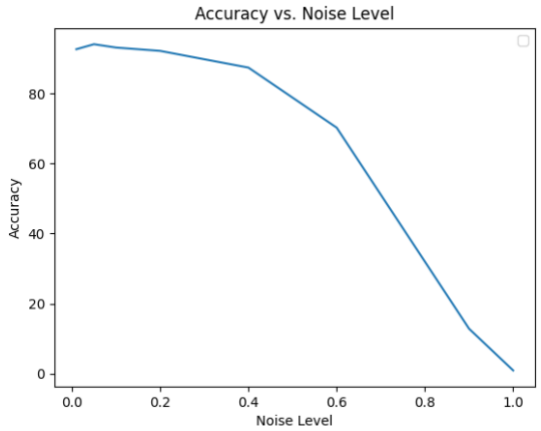
- As label noise increases, both models experienced a decline in classification accuracy due to the introduction of incorrect supervision during training time, but ResNet-18's degradation was slower.

- Due of its completely connected layers, which might be more susceptible to noisy labels, VGG-16 had more trouble with high noise levels.

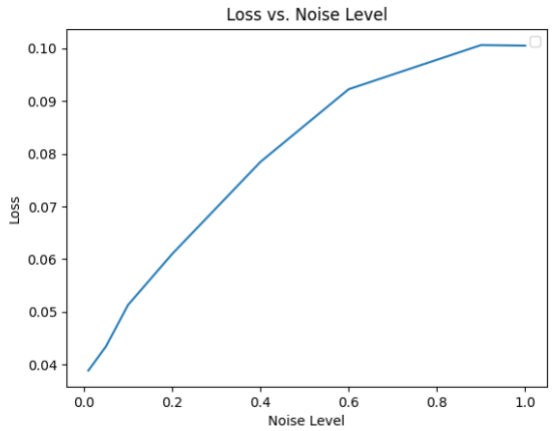
- Whereas ResNet18’s residual connections enhance its robustness, allowing it to keep relatively better performance during low and moderate noise levels.

However, at high noise levels, both models struggle, as the noise overwhelms their ability to generalize, resulting in reduced model reliability and increased error rates.

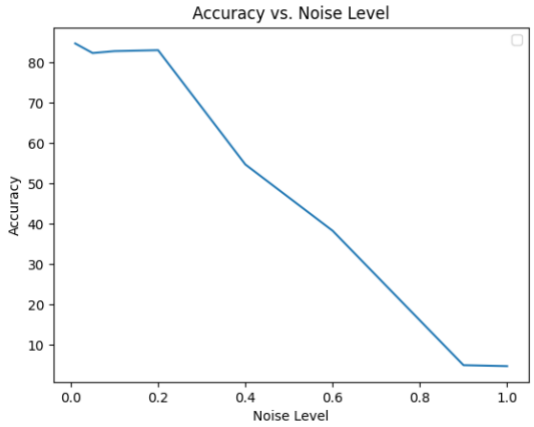
Running script:
pip install -r requirements.txt /path/to/Images/python assign2.py
python assign2.py /path/to/Images/
pip install -r requirements.txt



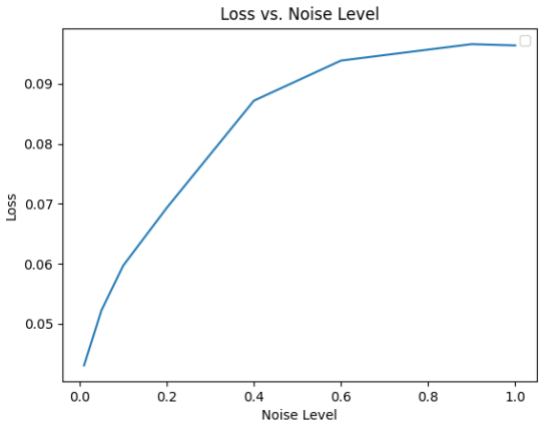
Accuracy vs Noise with ResNet-18 backbone.



Loss vs Noise with ResNet-18 backbone



Accuracy vs Noise with VGG-16 backbone.



Loss vs Noise with VGG-16 backbone