

Supplemental Applications

This section presents extended application examples demonstrating the practical utility of our optimization framework across diverse domains, complementing the case studies in Section ??.

S4.1 Machine Learning Applications

S4.1.1 Neural Network Training

We applied our optimization framework to train deep neural networks for image classification, following the methodology described in [?]. The results demonstrate significant improvements over standard optimizers:

| Optimizer | Training Accuracy | Test Accuracy | Epochs to Conv |
|------------|-------------------|---------------|----------------|
| Our Method | 0.987 | 0.942 | 45 |
| Adam | 0.982 | 0.938 | 62 |
| SGD | 0.975 | 0.935 | 78 |
| RMSProp | 0.978 | 0.936 | 71 |

Table 1: Neural network training performance comparison