MODEL CARD

ResNet18 Multi-Class Fruit Classification Model

MODEL DETAILS

The model is trained to classify 5 types of fruits: Apple, Orange, Banana, Grape, and Mango. It processes 32×32 pixel RGB images and outputs class probabilities for each fruit category. It is optimized for embedded deployment on Lattice FPGAs using quantization-aware training (LSQ/FPQ) for efficient inference.

MODEL SPECIFICATIONS

Inputs

- Input: 32×32×3 RGB image(s)

Outputs

- 5 Fruit classes (Apple, Orange, Banana, Grape, Mango)

Architecture

- The model uses a ResNet18 architecture optimized for 32×32 pixel input images
- There are six ResNet blocks with progressive channel expansion (8→16→16→32→64→64→128 channels)
- Feature extraction uses global average pooling followed by a dense classification layer
- The architecture employs residual connections with post-activation
- Classification outputs are raw logits (5 classes) without softmax activation

Parameters

- 451,709 total parameters (447,533 trainable, 4,176 non-trainable)

AUTHORS	Lattice Semiconductor
VERSION	ResNet18-cpnx
RELEASE	2025-12-18
LICENSE	Lattice Semiconductor

TOOLCHAIN	LATTE LSCQuant

DATA AUGMENTATION

Data Augmentation Techniques

- Brightness adjustment
- Horizontal flip
- Random crop
- Rotation (±15 degrees)
- Gaussian noise
- Contrast adjustment
- Color jitter

PERFORMANCE METRICS

Training Dataset Split

- 70% train, 20% validation, 10% test

MODEL ACCURACY COMPARISON

Metric	Original ResNet18 Model	Modified ResNet18 model (PTQ)	ResNet18 model with LSC Quantization
Train Accuracy (No Augmentation)	0.99803	0.97389	0.98273
Test Accuracy (No Augmentation)	0.99705	0.98137	0.98137
Test Total Losses (No Augmentation)	0.00664	0.09322	0.08782
Train Accuracy (With Augmentation)	0.99852	0.99064	0.98471
Test Accuracy (With Augmentation)	0.99314	0.98922	0.98922
Test Total Losses (with Augmentation)	0.01948	0.05094	0.05083