Enhanced Model Architecture (2D): Parameters per Module

Input CSI (T×C×F) → Conv1 (Kernels=32, Kernel=3×3, Stride=1) → Conv2 (Kernels=64, Kernel=3×3, Stride=2) → Conv3 (Kernels=128, Kernel=3×3, Stride=2) → SE Block (Reduction r=16, GAP→FC(128→8)→ReLU, FC(8→128)→Sigmoid) → BiLSTM (Hidden=128×2, Output=256 (concat)) → Temporal Attention (Heads=4, d_model=256, Window=5, Dropout=0.1) → Classifier (FC(256→H), Softmax)
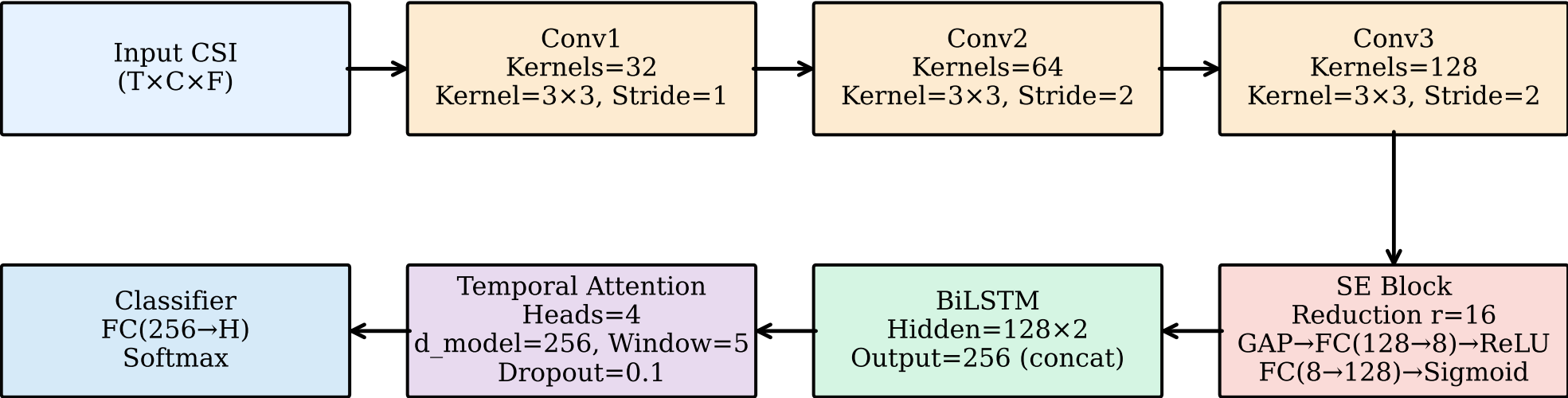
Training: AdamW, lr=3e-4, batch=64; 20% labels.
Metrics: LOSO/LORO Macro-F1, ECE calibration; Stability Index; Deployment Readiness.