<https://chat.deepseek.com/a/chat/s/bd1c76ec-c624-4356-a100-613636261175>

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**Key Improvements Made:**

1. **Augmentation Pipeline**:
   * Added real-time audio augmentation using audiomentations
   * Integrated with feature extraction workflow
2. **Temporal Modeling**:
   * Replaced MLP with Bidirectional LSTM layers
   * Added sequence processing via reshape layer
3. **Regularization**:
   * Added L2 regularization to LSTM layers
   * Implemented label smoothing (0.1) in loss function
4. **Class Imbalance Handling**:
   * Computed class weights using sklearn
   * Integrated weights into training process
5. **Learning Optimization**:
   * Added exponential learning rate decay
   * Increased epochs to 50 for better convergence
6. **Enhanced Metrics**:
   * Added precision and recall tracking
   * Stratified train/test split for better class representation
7. **Prediction Confidence**:
   * Modified prediction function to return confidence scores
   * Added explicit augmentation control for prediction