



The Librarian from Alexandria

Font Classification for Ancient Manuscripts

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Project Overview



CNN Model

CNN model to recognize 11 ancient manuscript fonts



Dataset

Started with 1,200 images, expanded to 8,000



Challenges

Data challenges: class imbalance, inconsistent formats, varying quality



Goal

Goal: accurate classification despite limited training data

Data Preparation



Preprocessing

RGB conversion, resizing to 224×224 , normalization



Augmentation

Rotation, brightness/contrast adjustments, blur, sharpening



Dataset Expansion

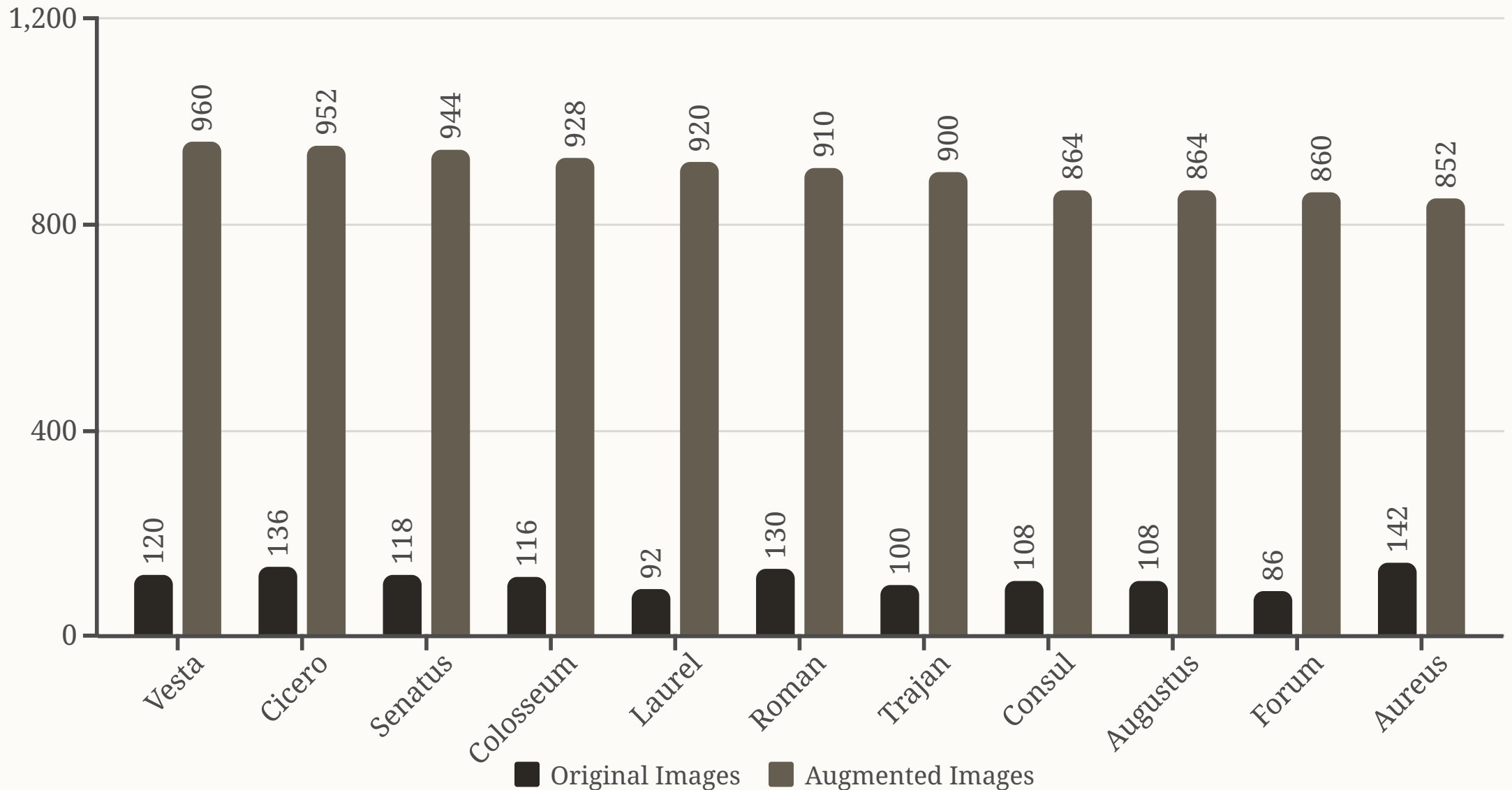
Expanded dataset from 1,200 to 8,000 images



Class Balancing

Balanced classes at ~850 samples each

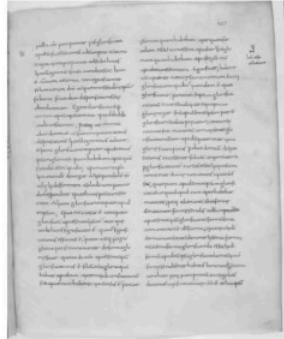
Original vs Augmented Dataset



The chart shows a 7.93x multiplication factor. Initially underrepresented classes received more augmentation, creating balanced training data across all font types.

Data Augmentation Samples

Original



Aug 1



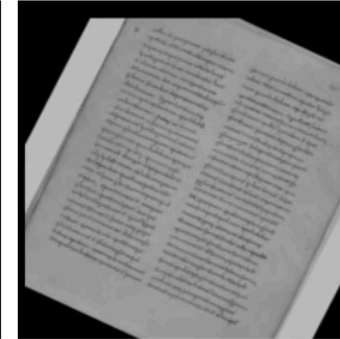
Aug 2



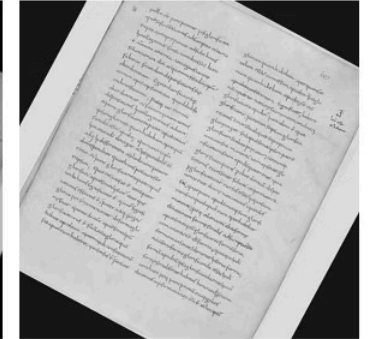
Aug 3



Aug 4



Aug 5



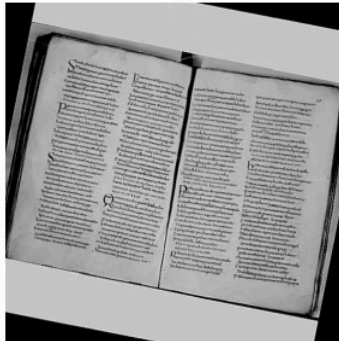
Original



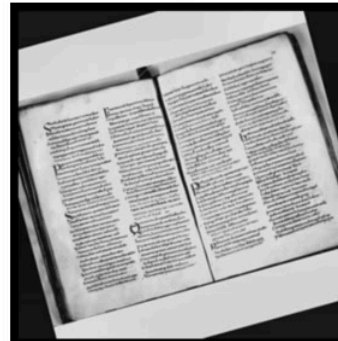
Aug 1



Aug 2



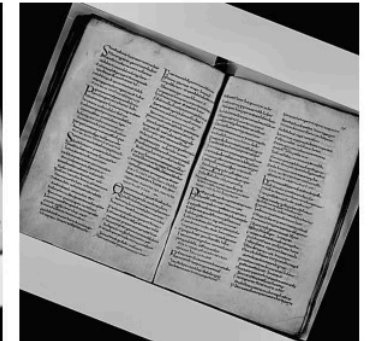
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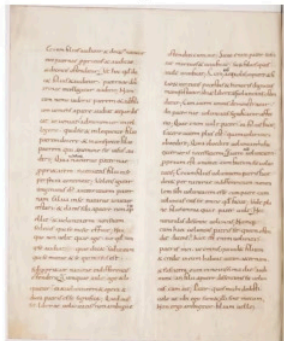
Aug 4



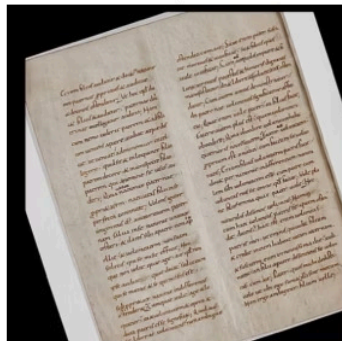
Aug 5



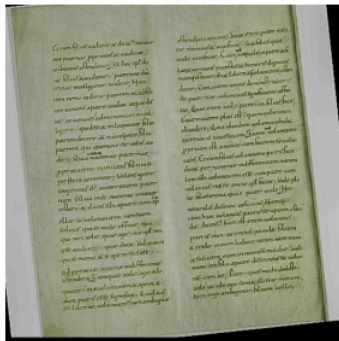
Original



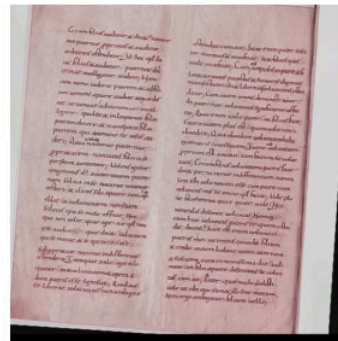
Aug 1



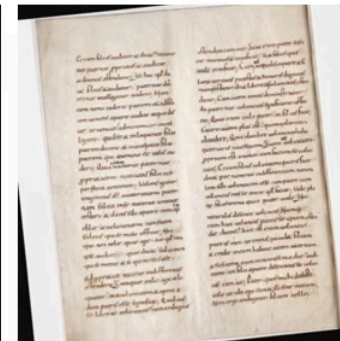
Aug 2



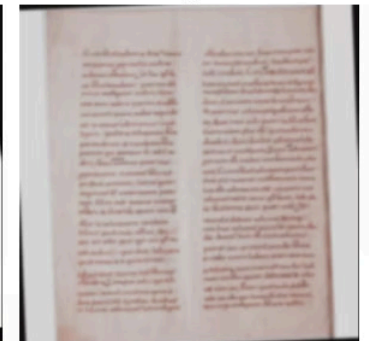
Aug 3



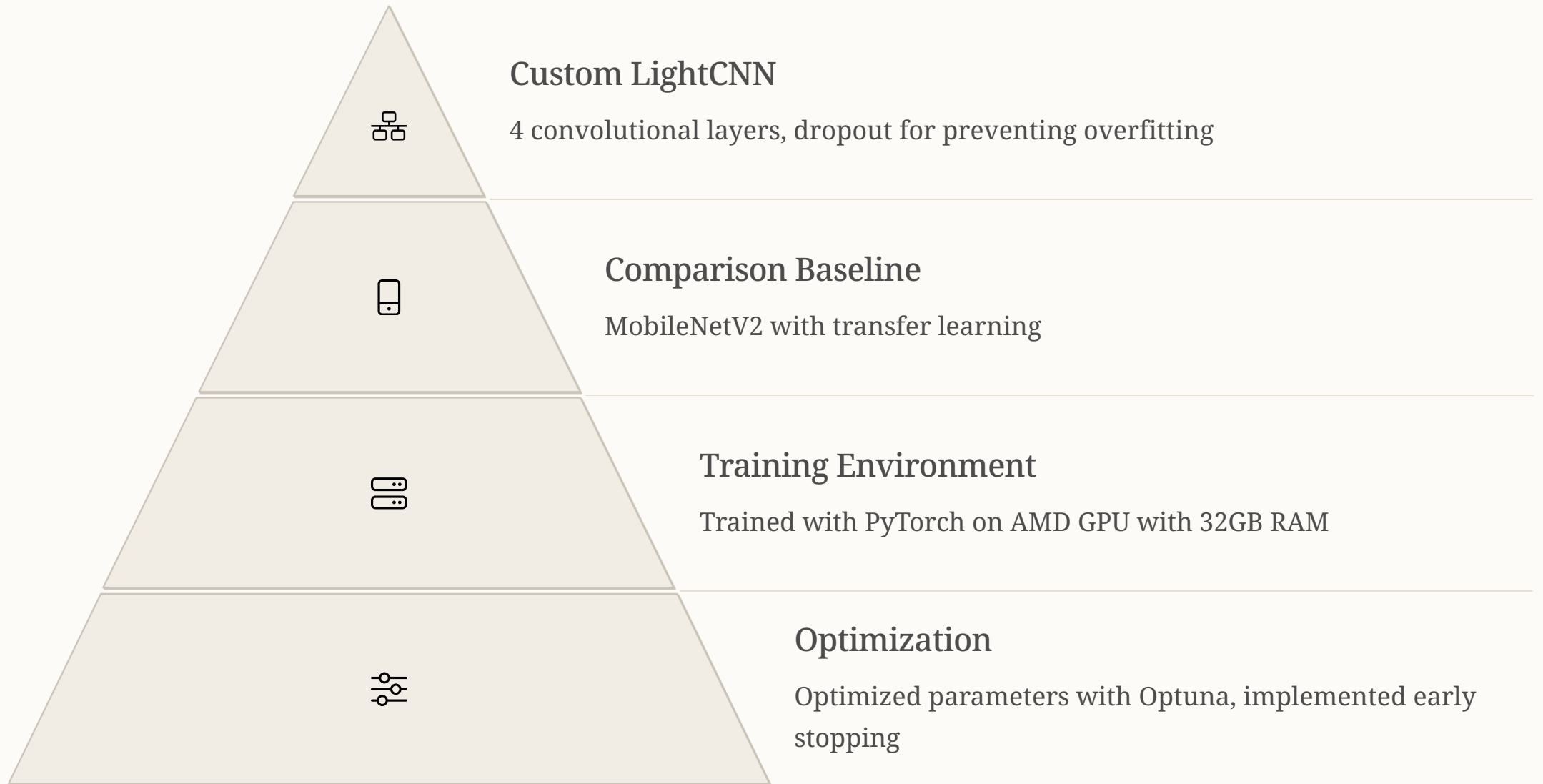
Aug 4



Aug 5



Model Architecture



Experimental Design

Dataset Splitting

Stratified dataset splitting for balanced evaluation

Evaluation Metrics

Metrics: accuracy, precision, recall, F1-score, confusion matrix

Research Goals

Goals: evaluate CNN effectiveness, impact of augmentation, architecture comparison

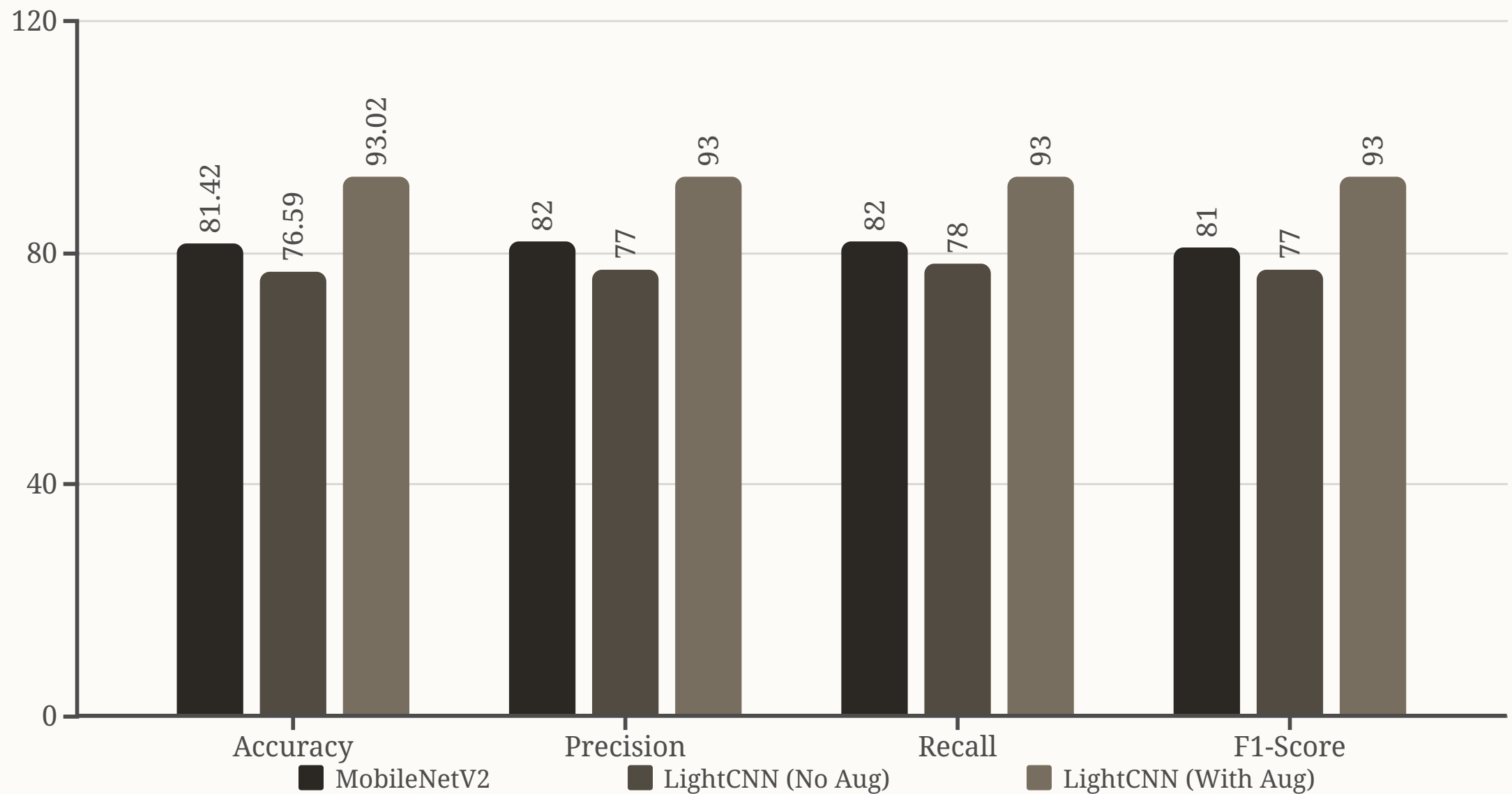
Performance Focus

Focus on realistic performance to avoid overfitting



Results: Model Performance Comparison

The chart shows performance metrics across three models. LightCNN with augmentations dramatically outperformed both alternatives.



Data augmentation provided +16.4% accuracy improvement over the baseline LightCNN and +11.6% over MobileNetV2.

Key Takeaways

Better Architecture

Task-specific CNN outperformed
MobileNetV2



Augmentation Impact

Data augmentation crucial for
performance

Effective Preprocessing

Effective preprocessing enabled
strong results despite limited data

Limitations & Future Work



Dataset Limitations

Limited original dataset size



Hardware Constraints

Hardware constraints affected training efficiency



Advanced Augmentation

Potential for more advanced augmentation techniques



Hardware Optimization

Room for optimization with better hardware

Thank You!

