

Data Augmentation Experiment Results

Performance Metrics

Higher Pearson r values indicate better correlation
Lower RMSE values indicate better accuracy

Individual Augmentation Methods

Jitter Standard Deviation Analysis

Jitter Std	Pearson r	RMSE
0.00 (Control)	0.7088	0.1 185
0.01	0.7154	0.1156
0.02	0.7095	0.1 176
0.04	0.71 13	0.1 171
0.06	0.7076	0.1 173
0.08	0.7098	0.1 174
0.10	0.7133	0.1 159
0.20	0.7147	0.1 158

Crop Ratio Analysis

Crop Ratio	Pearson r	RMSE
Control	0.7088	0.1 185
0.1	0.6976	0.1 198
0.2	0.7045	0.1 176
0.3	0.7077	0.1 180
0.4	0.7059	0.1 194
0.5	0.7050	0.1 175

Permutation Segments Analysis

Permutation Segments	Pearson r	RMSE
None (Control)	0.7088	0.1 185
2 Segments	0.7096	0.1 182
3 Segments	0.7149	0.1 153

Mixup Alpha	Pearson r	RMSE
Control	0.7088	0.1 185
0.1	0.7131	0.1 170
0.2	0.7009	0.2423
0.4	0.7104	0.1 162
0.6	0.7127	0.1 179
4 Segments	0.7162	0.1 147

Mixup Alpha Analysis

Cutmix Alpha Analysis

Cutmix Alpha	Pearson r	RMSE
Control	0.7088	0.1 185
0.1	0.7163	0.1 159
0.2	0.7184	0.1 147
0.3	0.7132	0.1 159
0.4	0.7147	0.1 154

Combined Augmentation Strategy

Methodology

The combined augmentation approach integrates multiple techniques with optimized parameters:

- Cutmix with alpha = 0.2 (best performing individual method)
- Permutation with 4 segments (optimal segmentation)
- Jitter with standard deviation = 0.01 (best jitter parameter)

Performance Comparison

Augmentation Strategy	Pearson r	RMSE	Performance Notes
Control (No Augmentation)	0.7088	0.1 185	Baseline model
Best Individual Method	0.7184	0.1 147	Cutmix a=0.2
Combined Strategy	0.7185	0.1 161	Multi-method approach

Combined Augmentation Results

Pearson correlation: 0.7185

Root Mean Square Error: 0.1 161

The combined augmentation strategy achieves performance comparable to the best individual augmentation method while potentially providing more robust generalization through diverse data transformations.

Artifact Filtering Analysis

Filtering Method	Pearson r	RMSE
Baseline (No Filtering)	0.7088	0.1185
Artifact Filtering Applied	0.7363	0.1092

The artifact filtering approach provides significant performance improvement (+3.9% Pearson correlation, -7.8% RMSE) by removing low-quality signal segments based on three quality metrics: skewness, kurtosis, and relative power in physiologically relevant frequency bands.