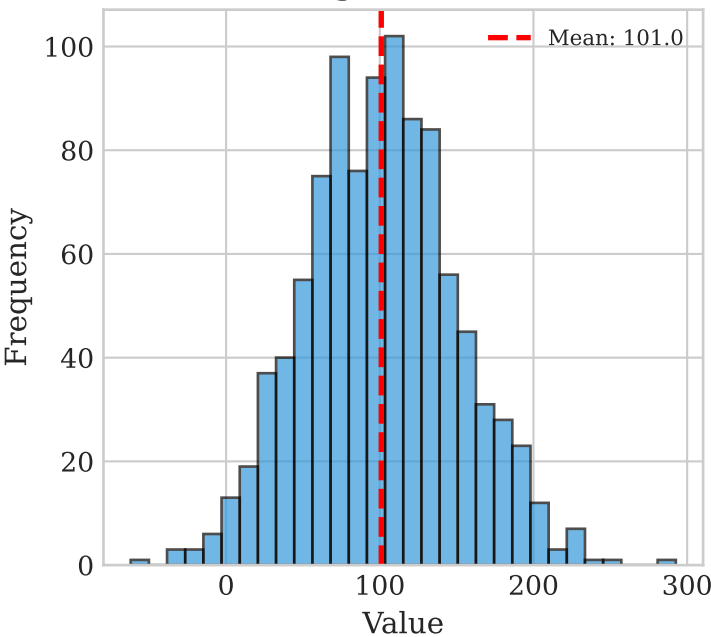
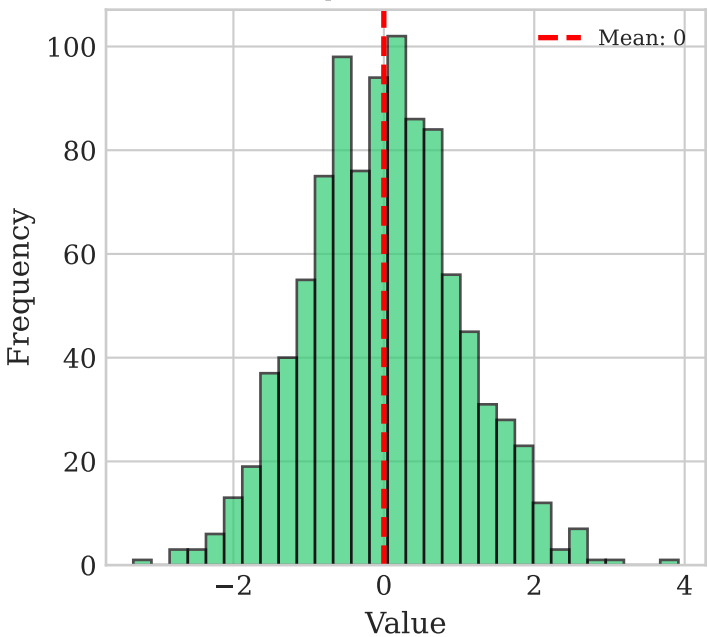


Data Normalization and Standardization Techniques

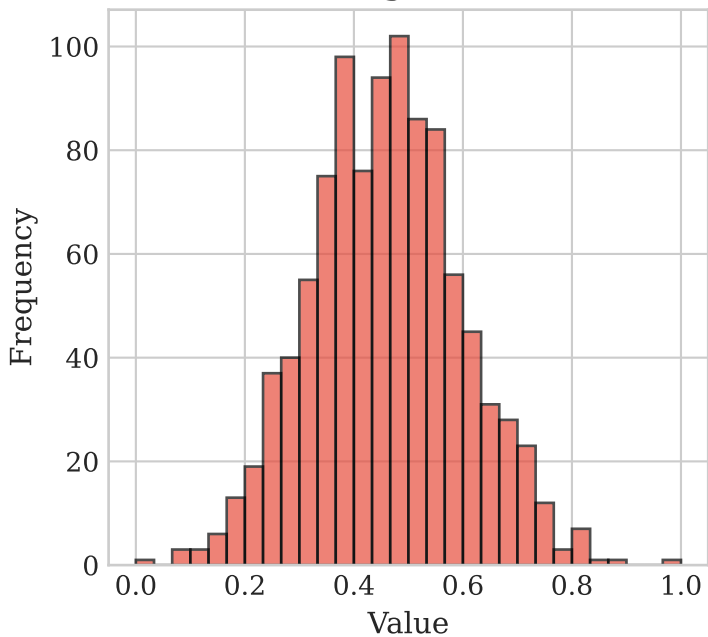
Raw EEG Data
(Original Scale)



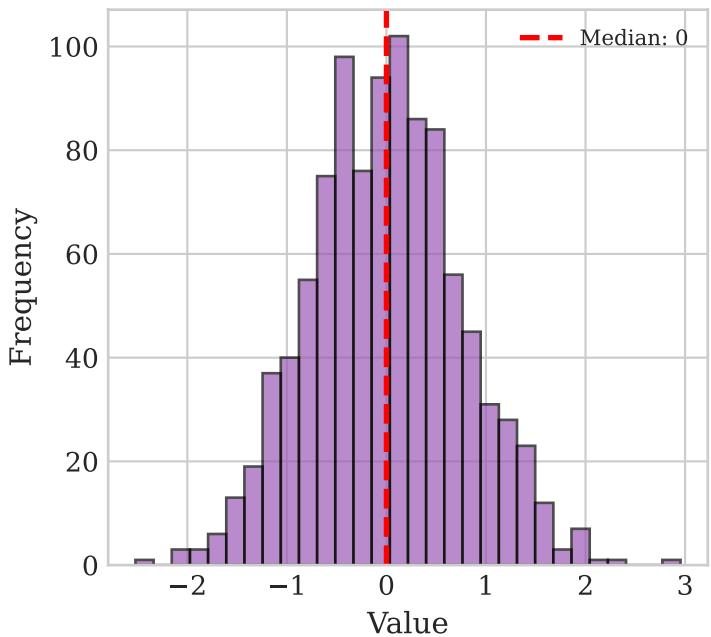
Z-Score Normalization
($\mu=0, \sigma=1$)



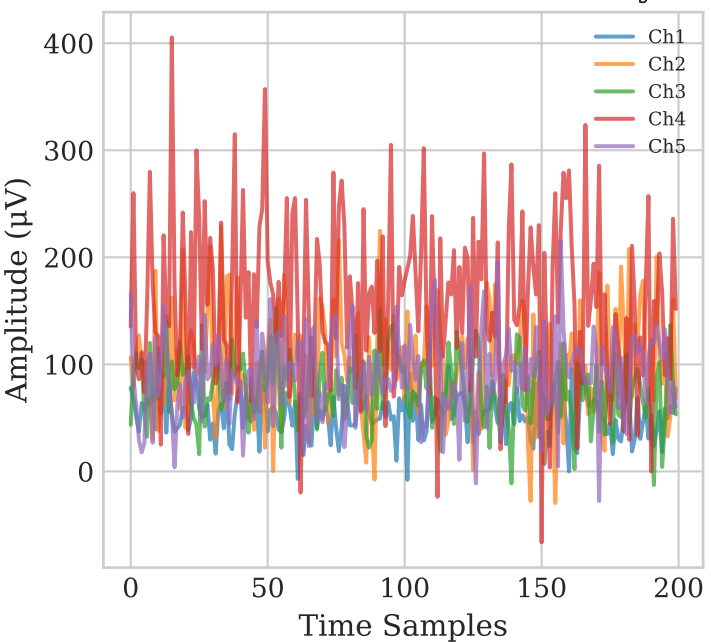
Min-Max Normalization
(Range: 0-1)



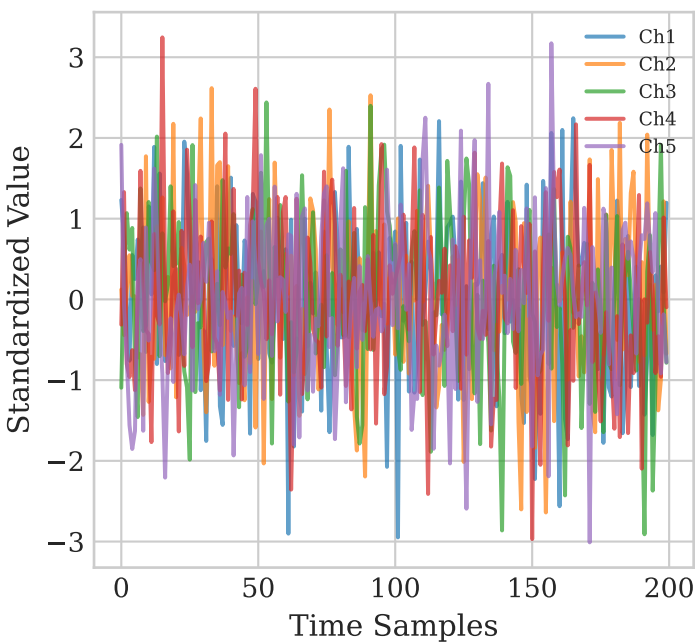
Robust Scaling
(Median & IQR)



Before: Channel Scales Vary



After: Channel-wise Z-Score



Normalization Methods Summary

Method	Formula	Range	Use Case
Z-Score	$(x-\mu)/\sigma$	$(-\infty, +\infty)$	Normal dist.
Min-Max	$(x-\min)/(\max-\min)$	$[0, 1]$	Bounded data
Robust	$(x-\text{median})/\text{IQR}$	$(-\infty, +\infty)$	Outliers
L2 Norm	$x/\ x\ _2$	$[0, 1]$	Unit vectors

Training Convergence Impact

