

Improving Neural Network Efficiency and Accuracy with PCA

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Abstract

Siamese Neural Networks (SNNs) are widely used in tasks requiring similarity measurement, such as object detection, facial recognition, and medical image analysis. By mapping high-dimensional features to lower-dimensional spaces, SNNs enhance the discriminative ability of features, making them more effective for classification tasks. However, challenges such as high computational costs and overfitting remain significant. This study explores the integration of Principal Component Analysis (PCA) into neural network workflows to address these challenges. By applying PCA for dimensionality reduction, the complexity of hidden layer features is reduced, enabling faster training, lower computational requirements, and improved model interpretability. Experimental results demonstrate that combining PCA with neural networks enhances efficiency and accuracy, offering a practical solution for large-scale applications in real-world scenarios.