

# FashionPAI: Dendritic Optimization on Fashion-MNIST

## Overview

This case study demonstrates the application of Dendritic Optimization using the PerforatedAI library to improve the classification performance of a Convolutional Neural Network (CNN) on the Fashion-MNIST dataset.

The project explores how bio-inspired neural structures ("dendrites") can be integrated into standard deep learning architectures to reduce error rates and achieve higher accuracy on image classification tasks.

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Dataset: Fashion-MNIST (Zalando's article images)  
Framework: PyTorch

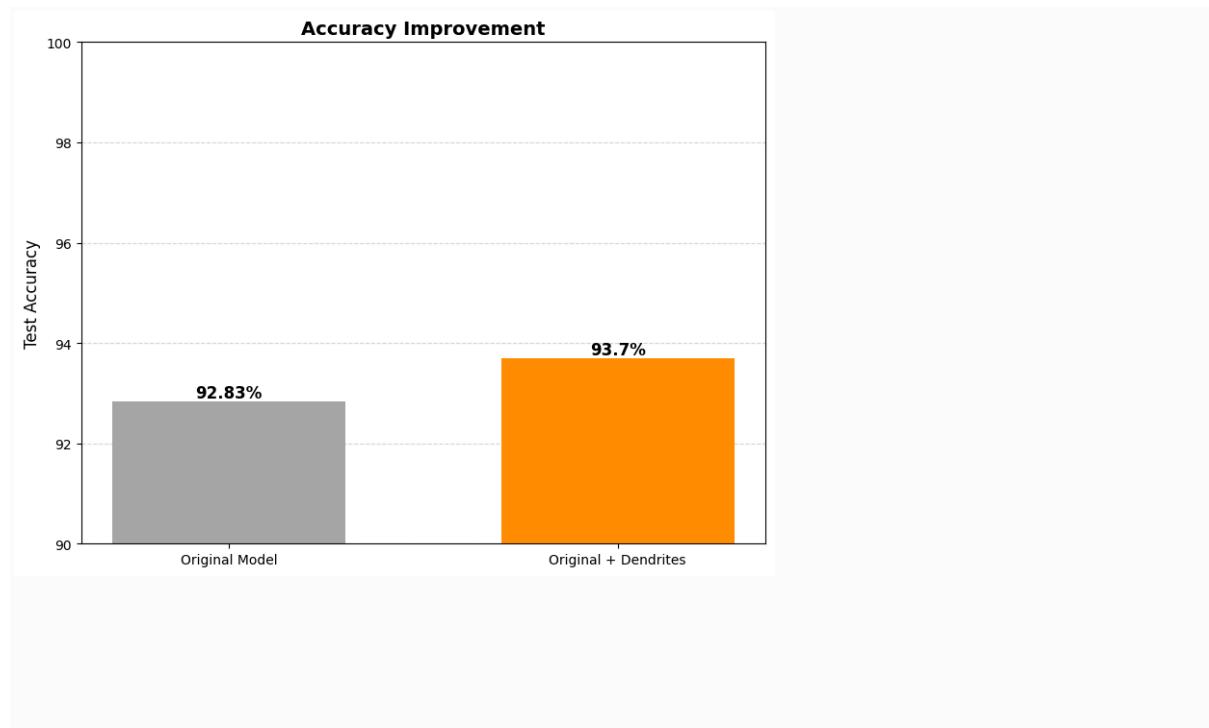
## Implementation Experience

The project leveraged the PerforatedAI library to dynamically enhance a baseline CNN. The implementation focused on ease of use and reproducibility.

## Results

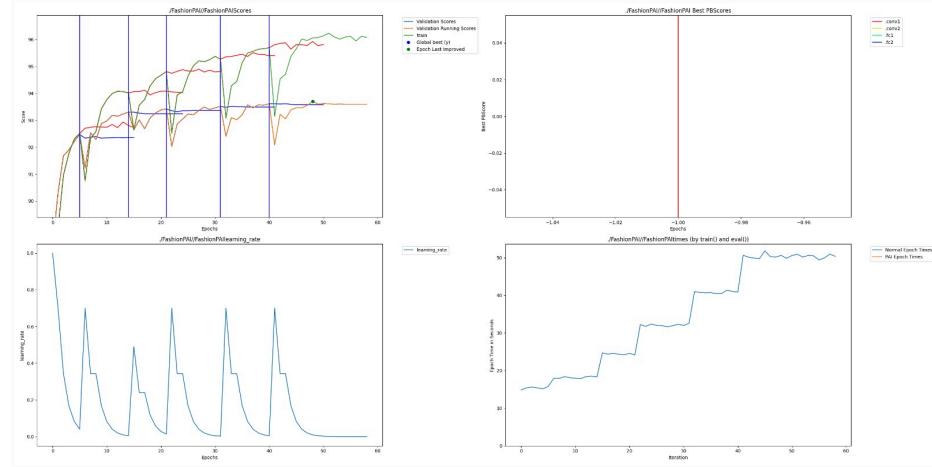
The Dendritic Optimization process successfully improved the model's ability to generalize on unseen test data.

The chart below illustrates the lift in Test Accuracy achieved by adding dendrites to the original CNN architecture.



## Training Process (PAI)

The following graph shows the training dynamics managed by PerforatedAI, including validation scores, learning rate decay, and epoch timings.



## Conclusion

This case study validates the efficacy of the PerforatedAI library in optimizing standard computer vision models. With minimal overhead, we were able to boost the Fashion-MNIST classification accuracy by nearly 1%, proving the value of dendritic neural structures for practical machine learning applications.