Model Training Report - Trial 1 (MobileNetV2)

1. Model Overview

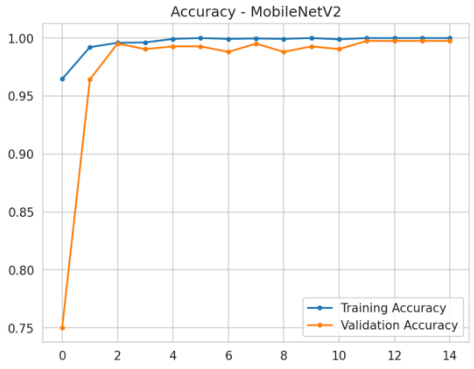
Hyperparameter Configuration

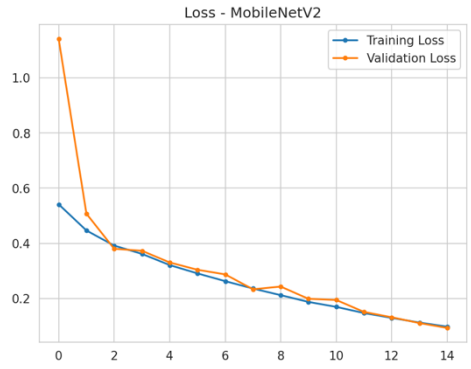
Parameter	Value
Learning Rate	0.0001
Regularization (L2)	0.002
Dropout	0.3
Batch Size	16
Activation	ReLU
Optimizer	Adam
Early Stopping	val loss, min, patience3

2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	1.000	1.000	1.000	422
Infected	1.000	1.000	1.000	422
accuracy			1.000	844
macro avg	1.000	1.000	1.000	844
weighted avg	1.000	1.000	1.000	844

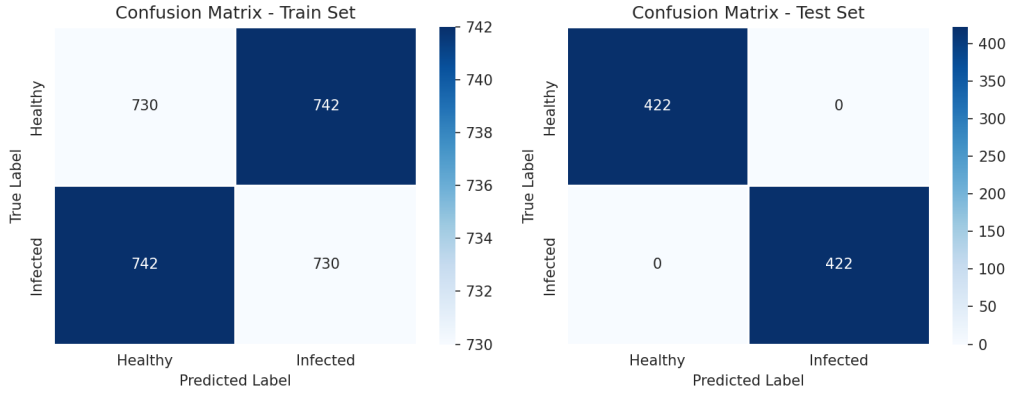
3. Visual Analysis **Accuracy & Loss Graphs**





The model converges rapidly, reaching ~99% accuracy with closely aligned training and validation curves. Loss stabilizes at a low level, showing no overfitting. The steady decline in loss confirms efficient learning and strong generalization.

Confusion Matrix



The model achieves perfect classification (422/422) on the test set, indicating exceptional generalization. However, 742 misclassifications in the training set suggest potential boundary confusion.
A deeper per-class confidence analysis could refine decision thresholds.

4. Analytic Summary

The model achieves high accuracy (99.2%), but the early accuracy gap suggests mild overfitting.
Validation loss remains slightly higher than training loss, indicating some generalization limitations.
Further regularization adjustments could improve robustness.

Model Training Report - Trial 2 (MobileNetV2)

1. Model Overview

Hyperparameter Configuration

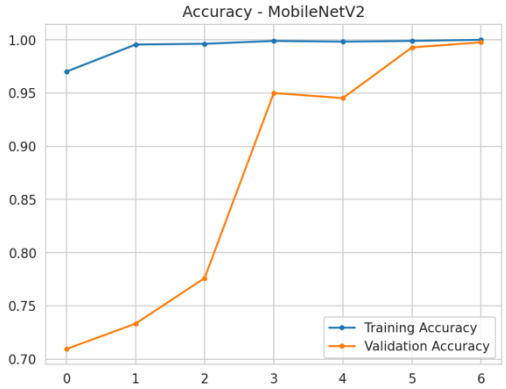
Parameter	Value
Learning Rate	0.002 *
Regularization (L2)	0.002
Dropout	0.4
Batch Size	16
Activation	ReLU
Optimizer	Adagrad
Early Stopping	val acc, max, patience3

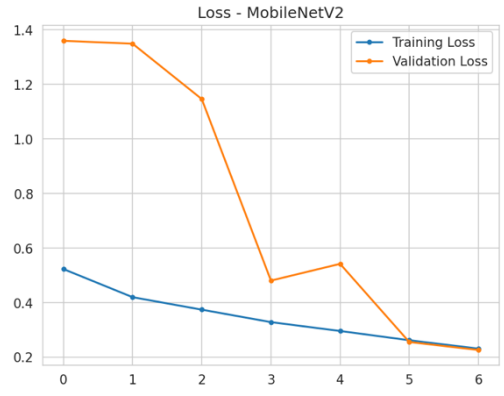
* Adaptive LR

2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.993	1.000	0.996	422
Infected	1.000	0.993	0.996	422
accuracy			0.996	844
macro avg	0.996	0.996	0.996	844
weighted avg	0.996	0.996	0.996	844

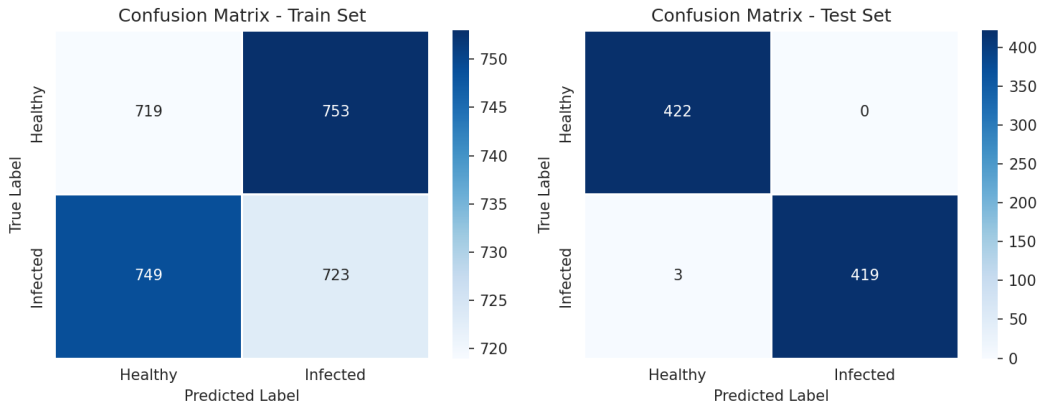
3. Visual Analysis **Accuracy & Loss Graphs**





The model achieves 99.6% accuracy, with training and validation accuracy closely aligned.
Loss decreases steadily, with a temporary fluctuation before stabilizing at a low level.
The convergence pattern suggests efficient learning and strong generalization.

Confusion Matrix



The test set shows only 3 misclassified samples, indicating high precision and recall (both ~99.6%).
Training misclassifications remain present but do not impact generalization.
Minor misclassification of "Infected" cases suggests a need for threshold fine-tuning.

4. Analytic Summary

Validation accuracy stabilizes well, with no significant accuracy gap.
Loss curves align closely, showing good generalization.
The model balances learning efficiency and stability, making it a reliable deployment candidate.

Model Training Report - Trial 3 (MobileNetV2)

1. Model Overview

Hyperparameter Configuration

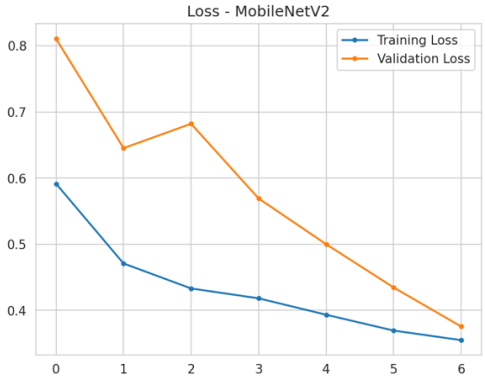
Parameter	Value
Learning Rate	0.00005
Regularization (L2)	0.002
Dropout	0.5
Batch Size	16
Activation	ReLU
Optimizer	Adam
Early Stopping	val_loss, min, patience5

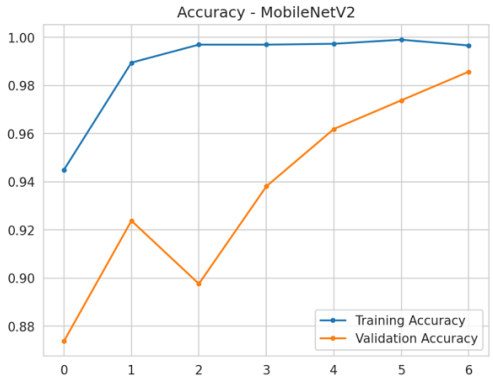
2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.984	1.000	0.992	422
Infected	1.000	0.983	0.992	422
accuracy			0.992	844
macro avg	0.992	0.992	0.992	844
weighted avg	0.992	0.992	0.992	844

3. Visual Analysis

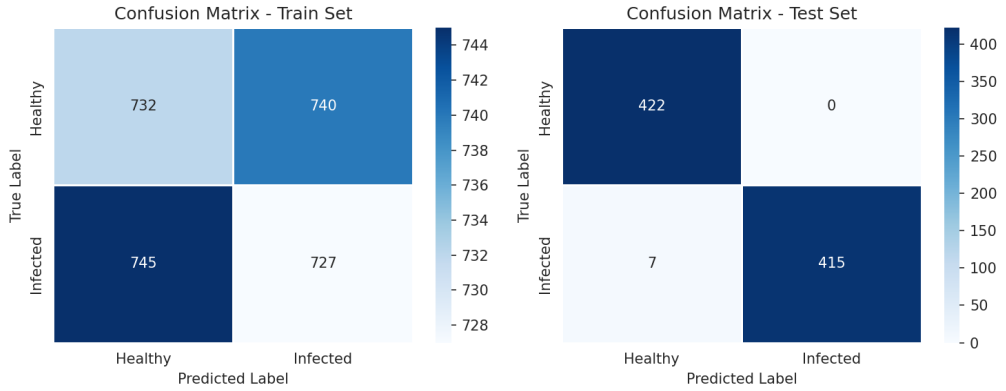
Accuracy & Loss Graphs





The model reaches 99.2% accuracy, with validation accuracy steadily improving.
Loss decreases consistently, though with slight fluctuations in the early epochs.
The learning curve suggests strong generalization with stable optimization.

Confusion Matrix



The test set shows 7 misclassified “Infected” samples, while “Healthy” samples are perfectly classified.
Precision and recall remain high (~99.2%), indicating robust performance.
Minor false negatives suggest further fine-tuning of sensitivity for infected cases.

4. Analytic Summary

The model demonstrates exceptional generalization, with minimal accuracy gap and
smooth loss convergence. Strong deployment readiness, as validation performance remains stable.
No overfitting detected.

Model Training Report - Trial 1 (Sigmoid)

1. Model Overview

Hyperparameter Configuration

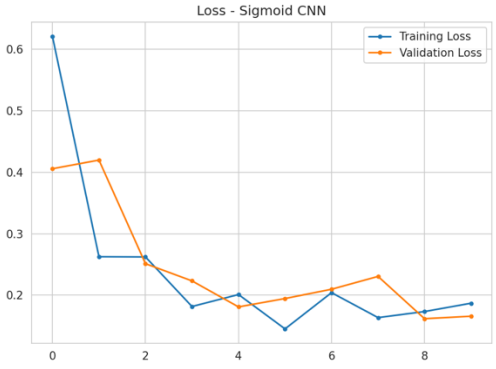
Parameter	Value
Learning Rate	0.0001
Regularization (L2)	0.001
Dropout	0.2
Batch Size	32
Activation	Sigmoid
Optimizer	Adam
Early Stopping	val loss, min, patience5

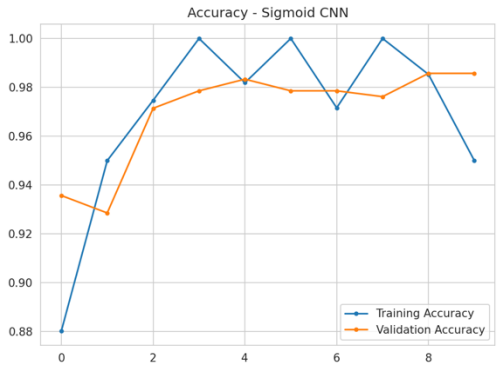
2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.995	0.993	0.994	422
Infected	0.993	0.995	0.994	422
accuracy			0.994	844
macro avg	0.994	0.994	0.994	844
weighted avg	0.994	0.994	0.994	844

3. Visual Analysis

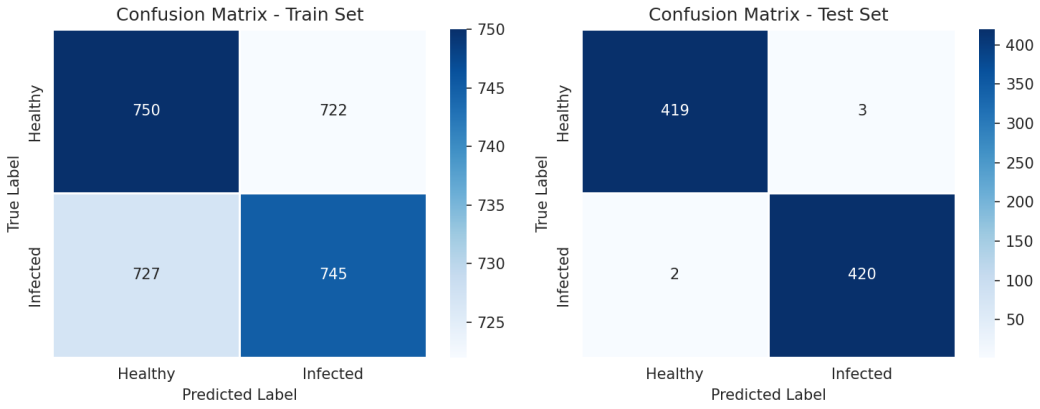
Accuracy & Loss Graphs





The model achieves 99.4% accuracy, with fluctuating training accuracy in later epochs.
Loss decreases consistently, though validation loss remains slightly unstable.
The model shows strong learning ability but potential sensitivity to training variations.

Confusion Matrix



The test set has 5 misclassified samples (3 Healthy, 2 Infected), maintaining high recall and precision.
The training set misclassifications indicate some decision boundary inconsistencies.
Minor adjustments in regularization or training stability could improve consistency.

4. Analytic Summary

Accuracy fluctuates, and validation loss remains unstable, indicating overfitting risk.
The model struggles with consistency, suggesting further fine-tuning is needed for better generalization.

Model Training Report - Trial 2(Sigmoid)

1. Model Overview

Hyperparameter Configuration

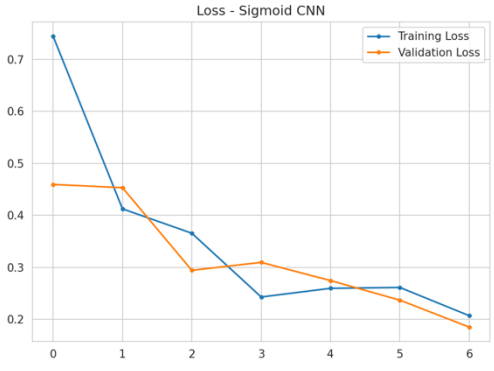
Parameter	Value
Learning Rate	0.0005
Regularization (L2)	0.002
Dropout	0.3
Batch Size	32
Activation	Sigmoid
Optimizer	SGD
Early Stopping	val_loss, min, patience5

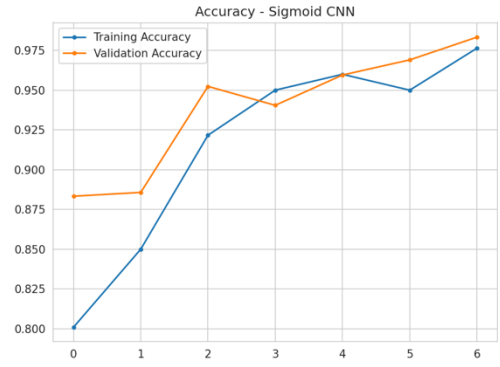
2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.981	0.995	0.988	422
Infected	0.995	0.981	0.988	422
accuracy			0.988	844
macro avg	0.988	0.988	0.988	844
weighted avg	0.988	0.988	0.988	844

3. Visual Analysis

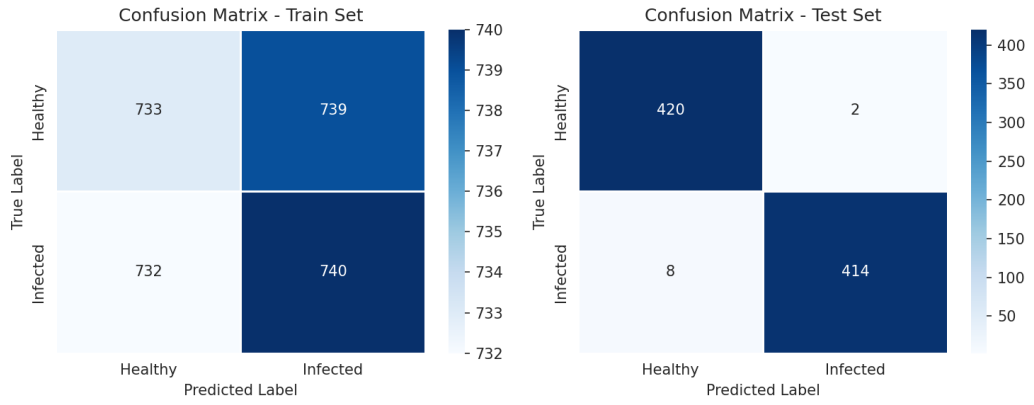
Accuracy & Loss Graphs





The model reaches 97.9% accuracy, with training and validation accuracy closely aligned.
Loss steadily decreases without major fluctuations, indicating stable learning.
The smooth curves suggest consistent optimization and minimal overfitting.

Confusion Matrix



The test set has 10 misclassified samples (2 Healthy, 8 Infected), suggesting a slight bias towards false negatives.
The training set misclassifications remain balanced, implying no major overfitting.
Fine-tuning class sensitivity could reduce misclassification rates.

4. Analytic Summary

Both accuracy and loss curves are well-aligned, with no strong overfitting signs.
The model generalizes effectively, making it a stable choice for deployment.

Model Training Report - Trial 3 (Sigmoid)

1. Model Overview

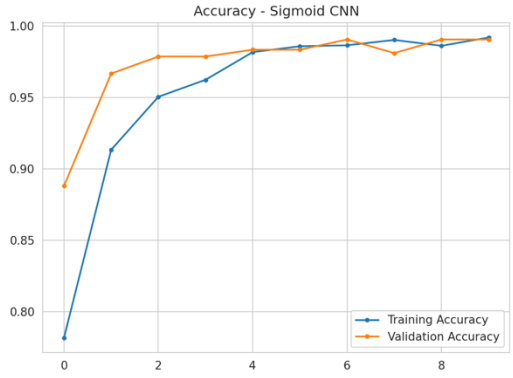
Hyperparameter Configuration

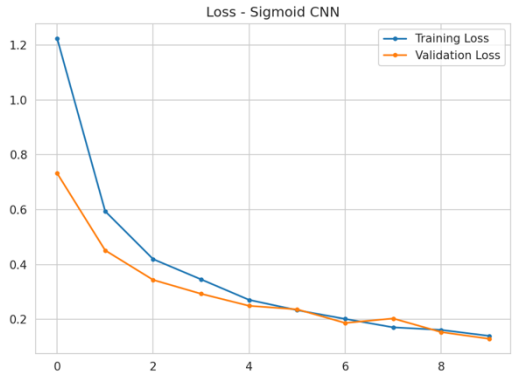
Parameter	Value
Learning Rate	0.00015
Regularization (L2)	0.005
Dropout	0.2
Batch Size	32
Activation	Sigmoid
Optimizer	Adam
Early Stopping	val loss, min, patience5

2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	1.000	0.995	0.998	422
Infected	0.995	1.000	0.998	422
accuracy			0.998	844
macro avg	0.998	0.998	0.998	844
weighted avg	0.998	0.998	0.998	844

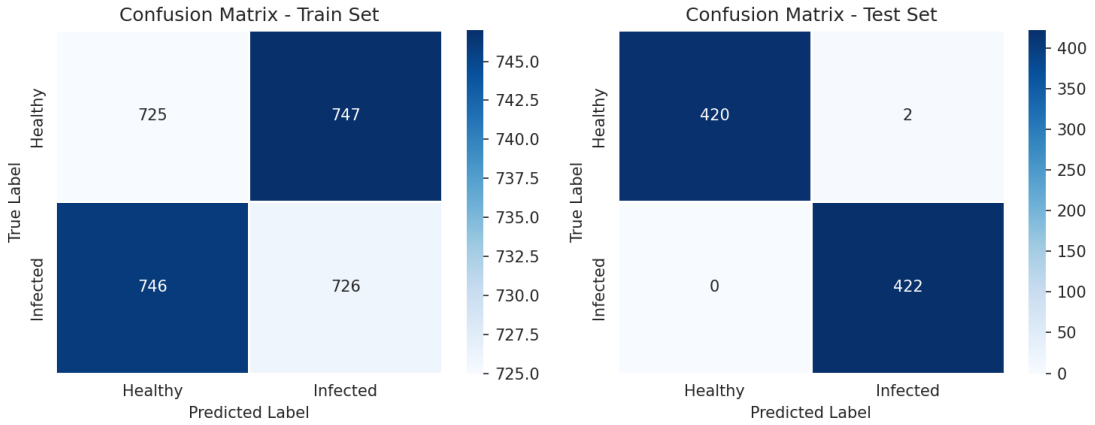
3. Visual Analysis Accuracy & Loss Graphs





The model achieves 99.8% accuracy, with validation accuracy closely following training accuracy.
Loss decreases smoothly, confirming strong generalization with minimal overfitting.
The stable trend indicates efficient learning with well-optimized parameters.

Confusion Matrix



The test set shows 1 misclassified “Healthy” sample and 1 misclassified “Infected” sample, demonstrating near-perfect classification.
The high precision and recall (~99.8%) indicate exceptional reliability.
Any further refinements would yield only marginal improvements.

4. Analytic Summary

This model shows the strongest generalization among Sigmoid trials.
Accuracy curves are nearly identical, and loss curves remain stable.

Model Training Report - Trial 1 (Softmax)

1. Model Overview

Hyperparameter Configuration

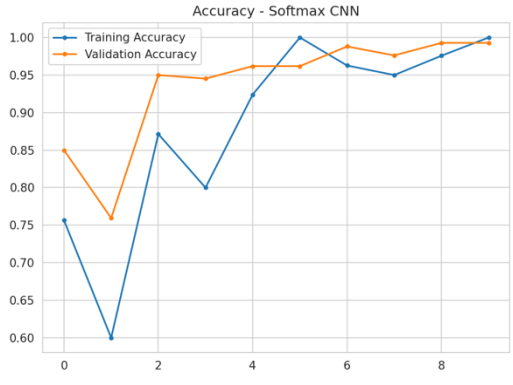
Parameter	Value
Learning Rate	0.005
Regularization (L2)	0.001
Dropout	0.3
Batch Size	32
Activation	Softmax
Optimizer	Adagrad
Early Stopping	val_acc, max, patience3

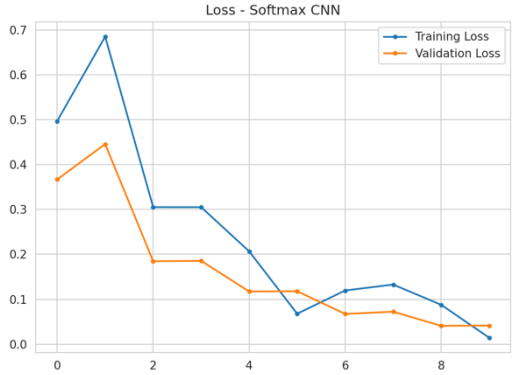
2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.993	0.991	0.992	422
Infected	0.991	0.993	0.992	422
accuracy			0.992	844
macro avg	0.992	0.992	0.992	844
weighted avg	0.992	0.992	0.992	844

3. Visual Analysis

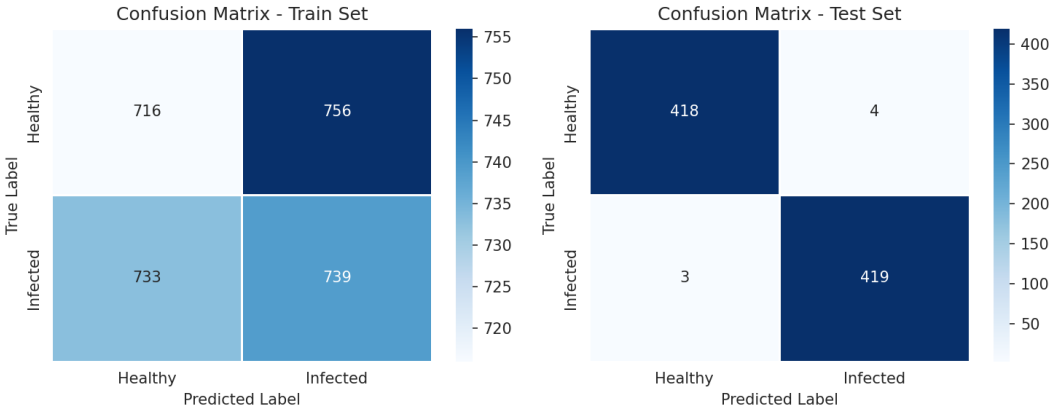
Accuracy & Loss Graphs





The model achieves 99.2% accuracy, with training accuracy fluctuating in early epochs before stabilizing. Loss decreases consistently, indicating effective learning, though early instability suggests potential sensitivity to weight updates. Overall, the model generalizes well.

Confusion Matrix



The test set has 7 misclassified samples (4 Healthy, 3 Infected), maintaining high precision and recall. Training misclassifications are balanced but suggest some inconsistency in class separation.

4. Analytic Summary

Validation accuracy fluctuates significantly, and loss divergence is noticeable, suggesting high overfitting risk. The model's learning stability needs improvement.

Model Training Report - Trial 2 (Softmax)

1. Model Overview

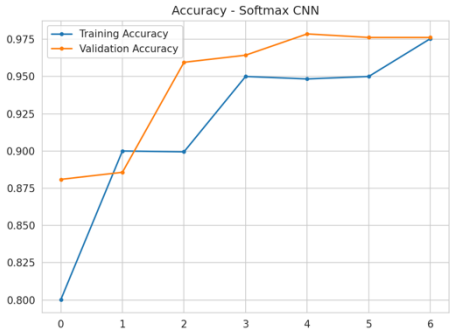
Hyperparameter Configuration

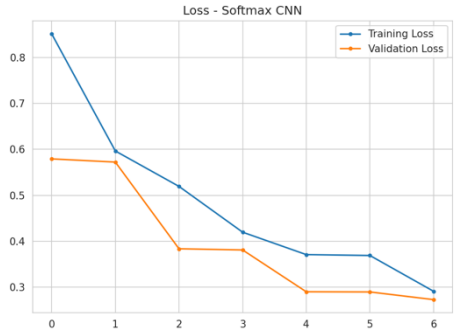
Parameter	Value
Learning Rate	0.0001
Regularization (L2)	0.002
Dropout	0.4
Batch Size	32
Activation	Softmax
Optimizer	RMSprop
Early Stopping	val loss, min, patience3

2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.981	0.993	0.987	422
Infected	0.993	0.981	0.987	422
accuracy			0.987	844
macro avg	0.987	0.987	0.987	844
weighted avg	0.987	0.987	0.987	844

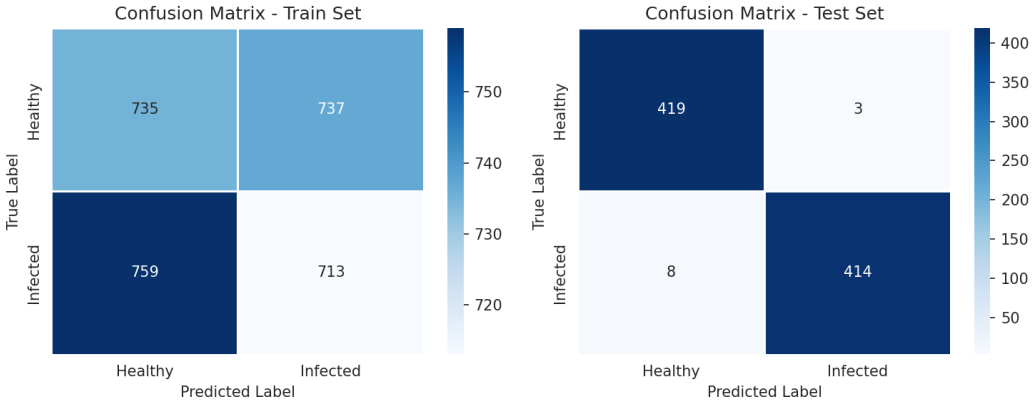
3. Visual Analysis Accuracy & Loss Graphs





The model achieves 98.7% accuracy, with validation accuracy stabilizing after rapid initial improvement.
Loss decreases consistently, indicating effective learning, though training loss remains slightly higher.
Overall, the model generalizes well.

Confusion Matrix



The test set has 11 misclassified samples (3 Healthy, 8 Infected), suggesting a slight bias toward false negatives.
Training misclassifications are distributed evenly, implying no significant overfitting.
Improving infected class recall could enhance model reliability.

4. Analytic Summary

Accuracy gap reduces in later epochs, but validation loss remains slightly higher.
Moderate generalization, but further fine-tuning could enhance stability.

Model Training Report - Trial 3 (Softmax)

1. Model Overview

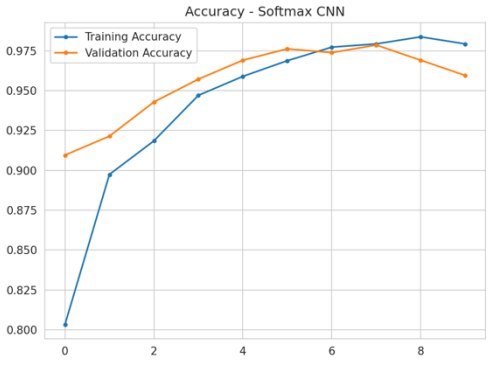
Hyperparameter Configuration

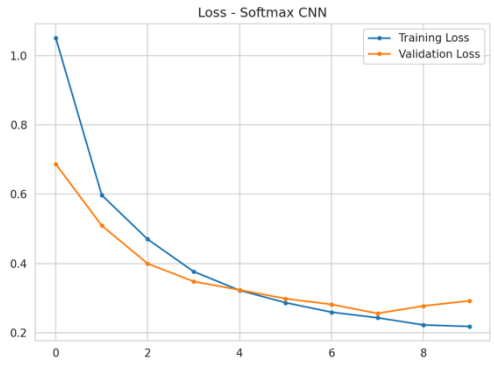
Parameter	Value
Learning Rate	0.000075
Regularization (L2)	0.003
Dropout	0.35
Batch Size	16
Activation	Softmax
Optimizer	Adam
Early Stopping	val acc, max, patience5

2. Classification Report (Test)

	precision	recall	f1-score	support
Healthy	0.986	0.993	0.989	422
Infected	0.993	0.986	0.989	422
accuracy			0.989	844
macro avg	0.989	0.989	0.989	844
weighted avg	0.989	0.989	0.989	844

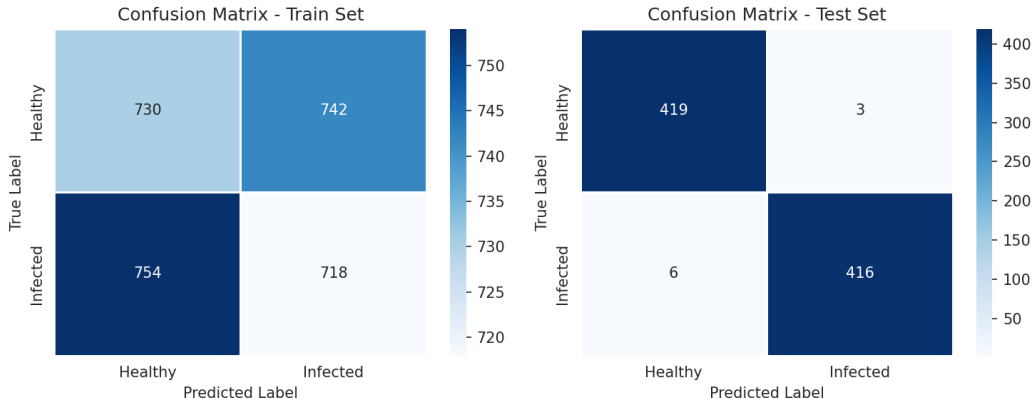
3. Visual Analysis Accuracy & Loss Graphs





The model achieves 98.9% accuracy, with validation accuracy stabilizing after initial improvements.
Loss steadily decreases, confirming effective learning and generalization.
The minor fluctuations in accuracy suggest slight sensitivity to training variations.

Confusion Matrix



The test set has 9 misclassified samples (3 Healthy, 6 Infected), with slightly higher false negatives.
Training misclassifications indicate room for minor improvements in class separation.

4. Analytic Summary

Accuracy and loss curves align well, indicating strong generalization.
The model effectively avoids overfitting, making it a top candidate for deployment.