

# Model Evaluation Report

## 1.1 Project Overview

This project aims to classify dental conditions (Caries, Gingivitis) from images using a convolutional neural network (CNN). The dataset consists of dental images, and data augmentation techniques were applied to enhance model generalization.

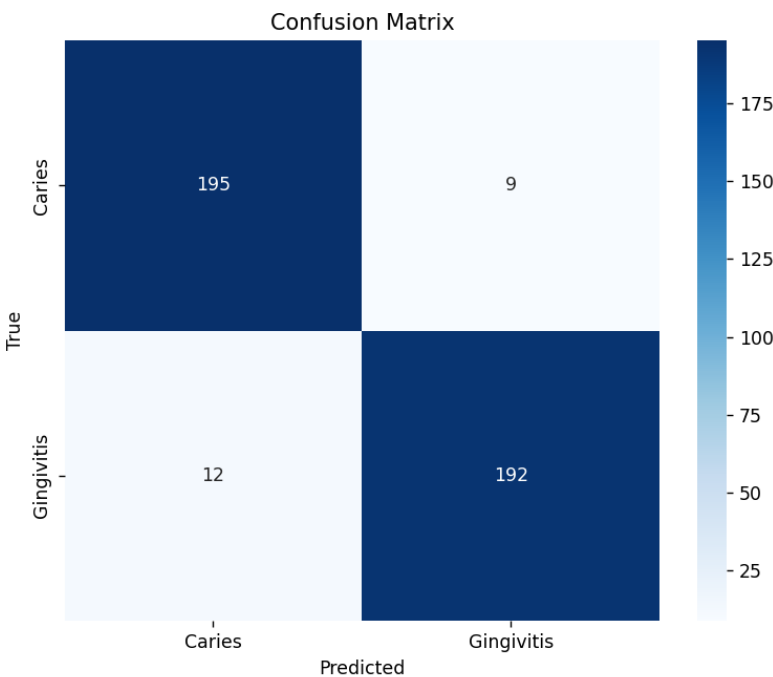
## 1.2 Model Description

The model uses MobileNetV2, trained for 10 epochs with a batch size of 32 using the Adam optimizer. Data augmentation (e.g., rotation, zoom) was used to improve performance.

### 2.1 Test Dataset Performance

Metric	Value
Accuracy	0.95
Precision	0.96
Recall	0.94
F1-Score	0.95

### 2.2 Confusion Matrix



*Analysis:* The model performs well overall, with higher recall **for Gingivitis (95%)** but some misclassifications of Caries as Gingivitis, possibly due to visual similarities.

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## 2.3 Metrics Interpretation

- **Accuracy (0.95):** Indicates strong overall performance.
  - **Precision (0.96):** Suggests high reliability when predicting Caries.
  - **Recall (0.94):** The model is sensitive to detecting Gingivitis.
  - **F1-Score (0.95):** Balances precision and recall well.
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## 3. Additional Insights and Model Improvements

### 3.1 Model Limitations

- **Class Imbalance:** More samples of Caries could improve performance.
- **Overfitting:** Regularization and more data could help.

### 3.2 Ideas for Improvement

- **Data Augmentation:** More varied transformations can increase robustness.
- **Transfer Learning:** Fine-tuning with a larger, diverse dataset could improve generalization.
- **Ensemble Methods:** Using multiple models could reduce errors.

### 3.3 Future Work

Future work includes expanding the dataset and exploring real-time deployment for clinical use.

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## 4. Conclusion

The model shows strong performance with high accuracy and recall. Further improvements, such as more data and model fine-tuning, could enhance its real-world applicability.

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## 5. Images /Data for References

Out of 204 Caries test images, the model correctly detected 194 images.

Out of 204 gingivitis test images, the model correctly detected 191 images.

