**Teeth Classification Model**

A deep learning model developed to classify teeth into 7 distinct categories, aimed at enhancing diagnostic precision in dental care. This project leverages TensorFlow and is deployed via a Streamlit web application.

**Introduction**

This project is part of Cellula Technologies' AI-driven dental solutions. It involves creating a comprehensive teeth classification model to assist in accurate teeth identification and diagnosis.

**Objective**

To preprocess, visualize, and train a robust computer vision model capable of classifying dental images into 7 categories. This model will be crucial in improving patient outcomes by supporting dental professionals in diagnosis.

**Dataset**

The dataset consists of dental images that have been preprocessed through normalization and augmentation. Visualization of class distribution was performed to ensure dataset balance.

* **Categories**: 7 distinct tooth classes.

**Preprocessing and Data Augmentation**

Dental images were preprocessed to ensure optimal model performance:

* **Normalization**: Adjusted pixel values for consistency.
* **Augmentation**: Applied transformations such as rotation, scaling, and flipping to increase dataset variety.

**Model Architecture**

The model was developed using TensorFlow, with a custom architecture designed for image classification. Key highlights include:

* **Layers**: Conv2D, MaxPooling
* **Optimizer**: Adam
* **Loss Function**: Categorical Crossentropy
* **Callbacks**:
  + ReduceLROnPlateau
  + EarlyStopping

**Training Process**

The model was trained with the following configuration:

* **Training Accuracy**: 94.5%
* **Validation Accuracy**: 99%
* **Test Accuracy**: 99.6%
* **Epochs**: 150
* **Batch Size**: 64

**Evaluation**

The model achieved high performance, with test accuracy reaching 99.6%. Below are some sample predictions and their corresponding true labels:

[Insert images and descriptions of model performance, confusion matrix, etc.]

**Deployment**

The model has been deployed using Streamlit. Users can upload dental images to receive real-time predictions.

To run the app locally:

1. Clone the repository.
2. Install the required dependencies: pip install -r requirements.txt.
3. Run the Streamlit app: streamlit run app.py.

**Usage**

1. Clone the repository.
2. Install the dependencies.
3. Use the provided Streamlit app to classify dental images.
4. Optionally, retrain the model with new data.

**Future Improvements**

* Expand the dataset to include more diverse dental images.
* Fine-tune the model for real-time deployment in dental clinics.
* Explore the use of advanced techniques like transfer learning to further enhance accuracy.

**Contributors**

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