Garbage Classification

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Learning Objectives

- To develop a deep learning model that classifies waste images into six categories: cardboard, glass, metal, paper, plastic, and trash.
- To use a pre-trained model (InceptionV3) and apply transfer learning to solve an image classification problem.
- To evaluate the model's performance using training, validation, and test datasets.

Tools and Technology Used

Programming Language

- Python

Libraries

- TensorFlow and Keras (for building the deep learning model)
- NumPy and Pandas (for data handling)
- Matplotlib (for plotting results)
- PIL (for image loading)
- Model Architecture: InceptionV3 (pre-trained on ImageNet)
- File Format for Model: .h5

Methodology

- **Dataset** : Organized into train, val, and test with six waste categories; processed into labeled dataframes.
- **Augmentation** : ImageDataGenerator resizes and augments (rotate, zoom, flip) images.
- **Model** : Uses InceptionV3 (without top) + custom layers (pooling, dense, dropout, batch norm). Only top layers are trained.
- **Training** : Trained with augmented data. ReduceLROnPlateau and EarlyStopping used.
- **Evaluation** : Accuracy/loss plotted. Final model (model231.h5) tested on new images.

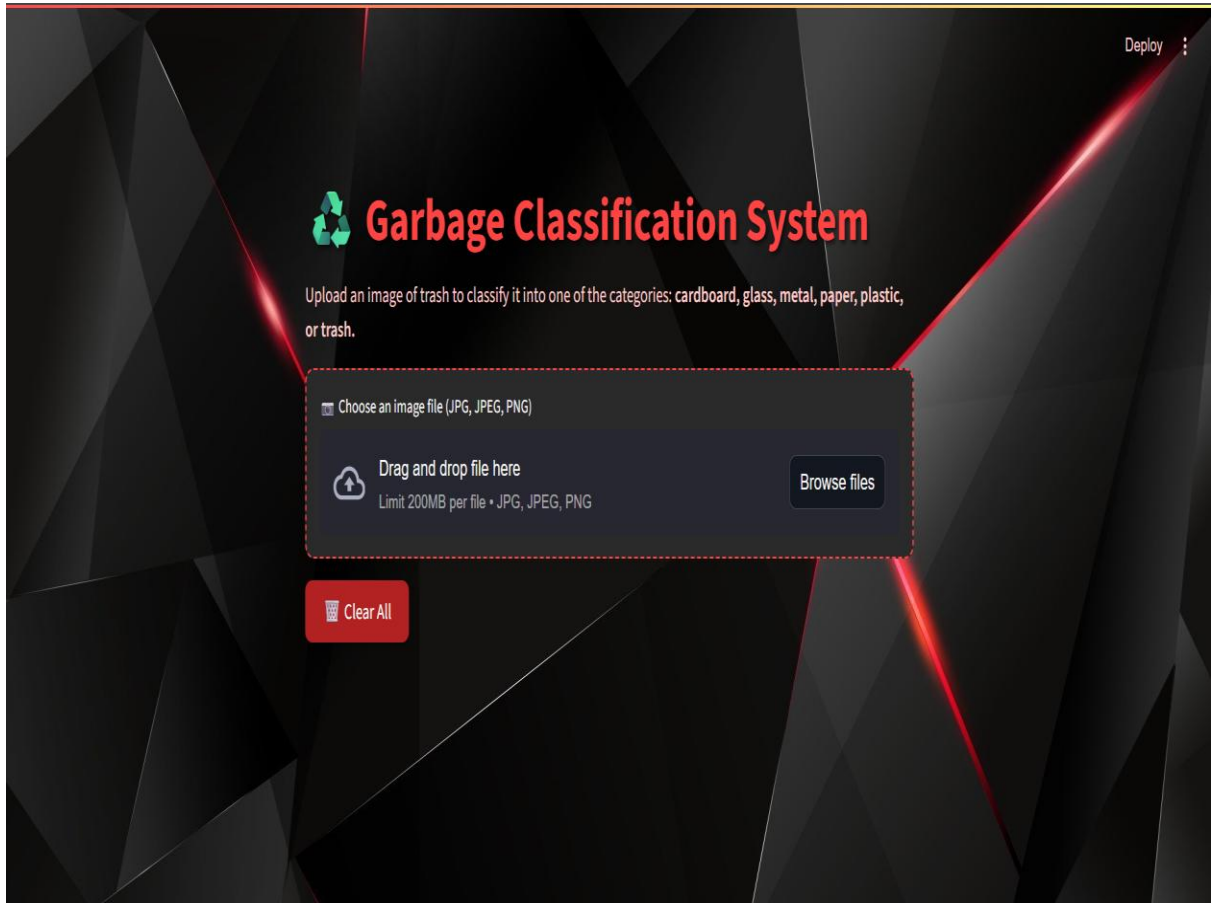
Problem Statement

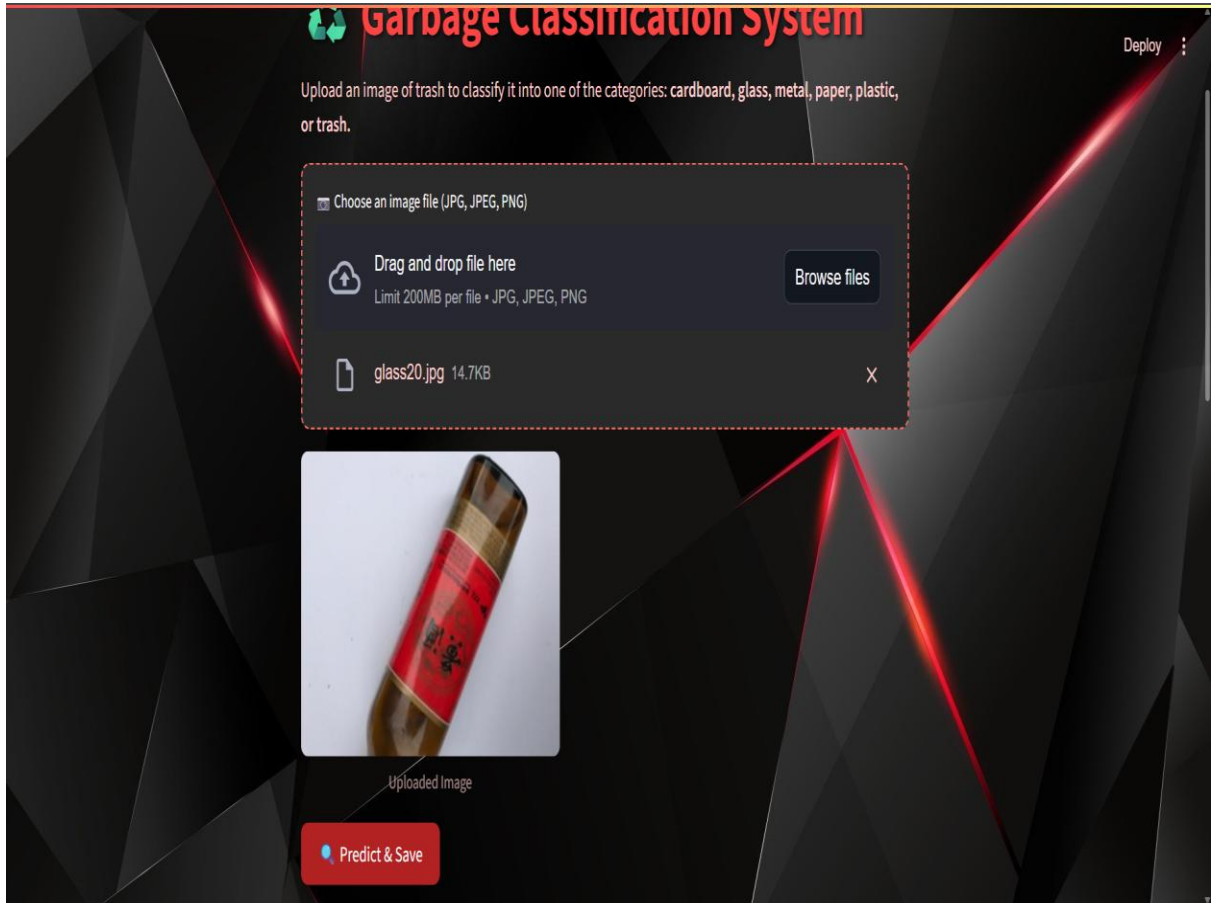
- To create a machine learning model that can automatically classify images of garbage into six correct categories — helping in waste management and recycling efforts.

Solution

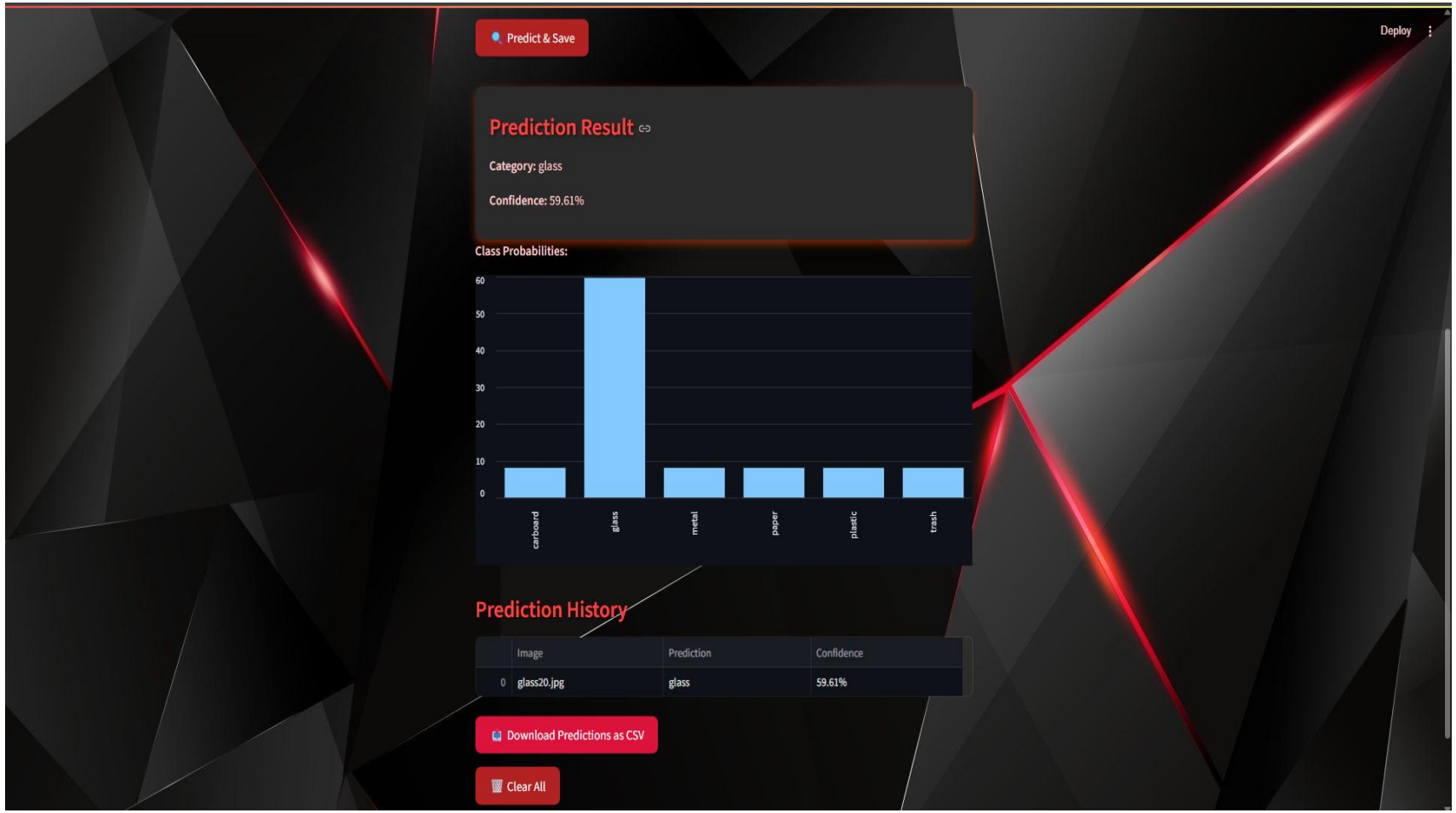
- A Convolutional Neural Network (CNN) model was developed using InceptionV3 (a well-known pre-trained model).
- The dataset was cleaned, augmented, and fed into the model to train it for classifying waste images.
- The final trained model was evaluated on test data to check its performance.

Screenshot of Output





Screenshot of Output



Conclusion

- The image classification model was successfully trained and tested.
- It was able to identify the type of waste (cardboard, glass, metal, paper, plastic, trash) with good accuracy.
- The model can be used to build applications that help in sorting waste effectively using image input.