LOGO DETECTION USING DEEP LEARNING

Submitted for

CSET344: Image and Video Processing

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Submitted to

ALOK KUMAR TIWARI

JUL-DEC 2025

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

BENNETT UNIVERSITY

THE TIMES GROUP

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Abstract

This project presents a Logo Detection System using Deep Learning and Flask, aimed at automating the identification of brand logos from images. The model is trained on the Flickr Logos 27 Dataset using Transfer Learning (Xception CNN) and deployed as a Flask web application where users upload an image and receive predictions in real time. The system outputs the predicted logo name, confidence percentage, and displays the uploaded image.

The training pipeline includes data preprocessing, bounding-box cropping, augmentation, and fine-tuning of the CNN model. The web interface provides clean UI interactions with dynamic rendering of predictions. The project demonstrates practical use of AI for brand recognition and image classification, showcasing both machine learning workflow and full-stack deployment.

Introduction

Brand recognition is an essential component in marketing, digital forensics, and content analysis. With the exponential growth of visual media on the internet, automating the detection of brand logos has become a valuable application of deep learning.

This project, Logo Detection using CNN and Flask, leverages the Flickr Logos 27 Dataset and applies Transfer Learning to build a robust classifier. The backend utilizes TensorFlow/Keras, while the frontend is created using HTML and CSS. The user uploads an image, and the system predicts the logo category.

The model is designed for strong generalization, trained through a structured ML pipeline involving augmentation and careful preprocessing. The integration with Flask ensures that users can interact with the model in an intuitive web interface.

Related Works

Several existing works explore logo recognition using machine learning:

- DeepLogo — CNN-based logo classification for marketing analytics.
- Flickr Logos Dataset Benchmarks — widely used dataset for academic research.
- OpenCV-based Template Matching — early classical technique but not robust.
- Transfer Learning with VGG, ResNet, Xception — current state-of-the-art models for image classification.
- Object Detection Models (YOLO, Faster R-CNN) — used for multi-logo detection and localization.

These works provided foundational techniques for building this project using deep learning and static image classification.

Problem Statement

To design and develop an AI-powered logo detection system that:

- Correctly identifies logos from various brands using deep learning.
- Classifies images into one of the 27 logo categories from the Flickr Logos dataset.
- Provides a simple and interactive web-based interface for uploading images.
- Ensures accurate logo prediction and high model performance.
- Integrates the ML model with a lightweight Flask backend.

Methodology

1. Data Collection & Preprocessing
   - Used Flickr Logos 27 Dataset.
   - Cropped bounding boxes from annotations.
   - Converted images to 224 × 224 RGB.
   - Applied data augmentation:
     - Rotation
     - Flipping
     - Zoom
     - Shear
     - Width/height shift

2. Model Architecture
- Based on Xception (Imagenet weights).
- Custom layers:
  - AveragePooling2D
  - Flatten
  - Dense(128, ReLU)
  - Dropout(0.5)
  - Dense(27, Softmax)

3. Training
- Optimizer: Adam
- Loss: Categorical Crossentropy
- Epochs: 100

4. Web Deployment (Flask)
- Backend loads `logo.h5` model.

- Routes:

  - / → Upload page
  - /predict ,Üí Returns prediction

- Saves images in static/uploads/
- Displays prediction + confidence + uploaded image

5. Web Deployment with Flask

- Python, TensorFlow, Keras
- OpenCV, NumPy, Pandas
- Flask, HTML, CSS

Contribution

This project contributes to the field in the following ways:

- A complete end-to-end ML pipeline for image classification.

- Use of Transfer Learning (Xception) for logo detection.
- A user-friendly Flask web interface for real-time predictions.

- Clean dataset preprocessing with bounding-box cropping.

- A reusable ML integration pattern for web applications.

Result & Conclusions

- Achieved high accuracy on validation data.

- Model successfully distinguishes between 27 different brand logos.

- Flask app provides seamless user experience.

- Handles varied lighting, orientations, and image quality.

- Predictions include both confidence score and class label.

The Logo Detection system successfully demonstrates the practical use of deep learning in image classification. Using the Flickr Logos dataset and Xception CNN architecture, the model achieves strong accuracy and robustness. Integration with Flask makes the application usable and accessible.

Future enhancements include:

- Real-time detection using a webcam
- Bounding box logo localization
- Multi-logo detection per image
- Deployment with TensorFlow Lite for performance optimization

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