Image-Based News Article Classification Using Deep Learning

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Abstract

This project presents an automated deep learning–based news article classification system that predicts the news category using only the associated image. Manual categorization of news articles is time-consuming, error-prone, and inconsistent, especially on large platforms where thousands of articles are published daily. Images play a crucial role in conveying context, making them suitable for classification tasks.

The project uses transfer learning with a MobileNetV2 backbone for feature extraction, trained on a custom dataset of six categories: Business, Crime, Entertainment, Politics, Sports, and Technology

. Data augmentation techniques were applied to improve generalization, and final deployment was achieved via a Streamlit web application for real-time predictions. The model achieved a high training accuracy of **98.33%**.

The system successfully demonstrates efficient image-based news classification and provides a foundation for future multimodal (text + image) news analysis systems.

Introduction

Background

With the exponential growth of digital journalism and social media, the volume of news shared globally has increased dramatically. Classifying and tagging news articles manually is no longer scalable, and inaccurate categorization can mislead users and hinder content discovery. Automating this process using machine learning ensures faster, consistent, and more accurate classification.

Traditional methods rely on text-based classification. However, images have become equally significant in modern journalism, often conveying the core idea of the news even without textual context. Using images for classification expands the system's versatility, enabling use cases such as photo-only news feeds or social media auto-tagging.

Problem Statement

Manual classification of news articles is slow, inconsistent, biased.

Meanwhile, misinformation spreads rapidly, and a properly categorized news ecosystem improves credibility and organization.
Therefore, the objective is to:

Develop an automated system that predicts the category of a news article using only the uploaded image.
This problem requires a robust feature extraction method capable of understanding visual patterns across diverse news types.

Objectives

The project aims to:

- Build a deep learning model for image-based news article classification.
- Use transfer learning for efficient training and improved accuracy.
- Create a Streamlit-based interactive web application for real-time predictions.
- Deploy the system online for public demonstration.
- Ensure generalization across visually diverse categories.

Dataset

Description Data

Source

The dataset used for training was manually curated from Google Images and organized into six categories:

- Business
- Crime
- Entertainment
- Politics
- Sports
- Technology

Each category contains approximately **100+ images**, stored in separate directory folders to support automated loading using Keras's `flow_from_directory()` method.

Dataset Distribution

Dataset Split

- **80% Training**
- **20% Validation**

Methodology

Data Preprocessing

As described in training script:

- Images were resized to **224 × 224 × 3**, matching MobileNetV2's input requirements.
- Pixel values were normalized to the **0–1** range.
- Data augmentation included:
    - Rotation
    - Zoom
    - Horizontal flipping
      These operations were implemented in the ImageDataGenerator section of `news_classification.py`

Transfer Learning approach

Transfer learning is used to reduce computation time and improve performance. As stated in the PPT, MobileNetV2 was chosen because:

- It is lightweight and optimized for mobile/real-time use.
- Pretrained on ImageNet, enabling strong feature extraction.
- Earlier layers could be frozen to retain general image features.

Base Model: MobileNetV2

```
include_top = False
weights = 'imagenet'
trainable = False
```

— as implemented in the training script

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Model Architecture configuration

The final architecture consists of:

1. **Input Layer** (224 × 224 × 3)
2. **MobileNetV2 Backbone** (frozen)
3. **Global Average Pooling Layer**
4. **Dense Layer** — 128 neurons, ReLU activation
5. **Dropout Layer** — rate 0.3
6. **Output Layer** — Softmax activation with 6 units (one per category)

This matches the structure described in both PPT and Python script.
Architecture summary was generated directly in the training script.

Model Training

Training Configuration

- **Optimizer:** Adam
- **Loss Function:** Categorical Crossentropy
- **Batch Size:** 32
- **Epochs:** 10
- **Metrics:** Accuracy

Training and validation accuracy curves showed consistent improvement, demonstrating good learning behavior. According to the saved metrics:

Final Training Accuracy:

98.33% (from metrics.json)

Experimental Results

Overall Performance Comparison

1. Prediction Performance

The model performed strongly across all categories, especially:

- Sports
- Business
- Technology

As noted in the PPT, even crime and political images were classified reliably.

2. Accuracy

From the metrics file:
Training Accuracy = 98.33%

metrics

3. Real-Time Application Performance

Using the Streamlit frontend, predictions occur instantly after uploading an image. The application demonstrates stable performance and clear UI feedback.

> But the model’s high accuracy indicates strong learning from the augmented dataset. Transfer learning significantly reduced computational requirements while achieving robust feature extraction. The system’s real-time performance validates its practicality for news organizations or media platforms.

However, the reliance on a relatively small dataset (≈600 images total) limits generalizability, although augmentation and transfer learning help overcome this constraint.

Discussion

The model’s high accuracy indicates strong learning from the augmented dataset. Transfer learning significantly reduced computational requirements while achieving robust feature extraction. The system’s real-time performance validates its practicality for news organizations or media platforms.

However, the reliance on a relatively small dataset (≈600 images total) limits generalizability, although augmentation and transfer learning help overcome this constraint.

Limitations

- Dataset size is limited; larger datasets would improve real-world accuracy.
- Only images are used for classification; incorporating text would improve reliability.
- Some overlapping visual themes (e.g., politics vs. crime) may cause confusion.
- Deployment speed depends on device and internet quality.

Conclusion

This project successfully developed an **automated deep learning system** for image-based news classification using MobileNetV2 and Streamlit. The process included dataset creation, preprocessing, transfer learning, model training, application development, and deployment.

The model achieved a high accuracy of **98.33%**, demonstrating strong performance and validating the choice of transfer learning. The real-time web application provides an intuitive platform for users to upload images and instantly receive predicted news categories.

The project represents a complete end-to-end machine learning pipeline and provides a strong foundation for future multimodal news analysis systems.

Future Work

Expand dataset size for greater robustness.

Combine text + image classification for higher accuracy.

Integrate with live news platforms for automated tagging.

Add real-time web scraping to categorize trending news automatically.

Fine-tune the MobileNetV2 layers for deeper feature learning.