NULLCLASS_TASK3 REPORT

Introduction

This project applies a Generative Adversarial Network (GAN) for colorizing grayscale images and integrates a timeline-based classification system to label historical images by their respective time periods. This dual-purpose model can be valuable for enhancing and categorizing archival or historical images according to specific eras or decades.

Background

Historical images serve as crucial records, and enhancing them through colorization can aid interpretation and visualization. A GAN is used to colorize grayscale images, making them more accessible and informative. After colorization, a classification model categorizes these images by historical periods, providing an organized, timeline-based archive.

Learning Objectives

The learning objectives for this project include:

1. Developing skills in GAN-based colorization for historical grayscale images.
2. Understanding timeline-based classification for historical content.
3. Building a combined system for colorization and classification to help users visualize and categorize historical images chronologically.

Activities and Tasks

- **Data Preprocessing**: Gathering historical images, resizing, converting to grayscale and RGB, and organizing them into labeled periods (e.g., "Ancient," "Medieval," "Renaissance," "Modern").
- **Model Architecture**:
    - **Generator**: Generates colorized versions of grayscale images.
    - **Discriminator**: Distinguishes between real and generated images to improve colorization quality.
    - **Classifier**: A CNN model trained to recognize and label images according to historical periods based on visual features.
- **Model Training and Evaluation**: Training the GAN for colorization and the classifier on labeled historical periods.

Skills and Competencies

- Advanced understanding of GANs and CNNs in image processing.
- Knowledge of historical aesthetics and features for timeline-based image classification.
- Image pre-processing and timeline-based categorization for archival images.

Feedback and Evidence

The effectiveness of the system can be demonstrated through:

1. **Colorization Results**: Evaluated by comparing generated images with existing colorized versions.
2. **Classification Accuracy**: The classifier's performance on the labeled timeline-based dataset, assessed through metrics like accuracy, precision, and recall.

Challenges and Solutions

- **Stabilizing GAN Training**: Ensuring reliable results through tuning.
- **Historical Classification**: Distinguishing fine details in historical periods required experimentation with image features, data augmentation, and leveraging historical knowledge in the classifier.

Outcomes and Impact

The model successfully colorizes and categorizes grayscale historical images by era, creating a valuable tool for archival management and educational resources. This approach is especially relevant for historians, educators, and archivists working with extensive historical image datasets.

Conclusion

This project demonstrates the potential of combining GAN-based colorization with timeline-based classification for historical images. Future improvements could include increasing the granularity of historical periods and training on more varied datasets to expand categorization.