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AI-Based Video Authenticity Checker: Detecting Manipulated Videos Using CNN and LSTM Architectures

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ABSTRACT

The rapid-fire increase in videotape content across digital platforms has boosted the need for effective results to decry manipulated videos. These include deepfakes and other phonies, which pose significant pitfalls to digital trust and security. This paper introduces a new approach, the" AI videotape Authenticity Checker," which employs a mongrel deep literacy frame. The model utilizes Convolutional Neural Networks (CNNs) for spatial analysis and Long Short-Term Memory (LSTM) networks for temporal analysis, furnishing a robust result for detecting fake vids. By preprocessing videotape data to regularize quality and format, the system ensures high trustability and scalability. Experimental results on standard datasets demonstrate a delicacy of 92, a perfection of 90, a recall of 91, and an F1-score of 90.5, showcasing its eventuality for real-world operations. This scalable and effective tool represents a critical advancement in videotape phoney discovery.

keywords: *Video Forgery Detection, Hybrid Deep Learning, CNN, LSTM, Temporal Analysis, Video Authenticity*

1.Introduction

videotape manipulation technologies have evolved fleetly, enabling the creation of largely realistic deepfakes and altered vids. These phonies hang digital communication, erode trust, and can be weaponized for vicious purposes, similar as misinformation juggernauts, identity theft, and fraud. Traditional verification styles struggle to keep up with the complexity and variety of ultramodern manipulation ways. This paper introduces the" AI videotape Authenticity Checker," a system designed to descry manipulated vids efficiently and directly. By using a combination of CNNs and LSTMs, the system addresses the binary challenges of spatial inconsistencies and temporal anomalies. Its high performance on standard datasets highlights its eventuality for securing digital content.

2.Problem Statement

The adding complication of videotape manipulation presents several challenges

a. Varied Manipulation ways similar as deepfake conflation, splicing, and frame interpolation introduce inconsistencies that are delicate to descry.
b. High Computational Conditions Detecting anomalies in high- resolution and lengthy vids requires substantial processing power.
c. Lack of conception Being systems frequently fail to acclimatize to different manipulation styles and datasets.
The proposed system aims to address these challenges by combining advanced deep literacy ways with effective preprocessing and training styles.

3.Proposed Solution

3.1. Overview

The system integrates CNNs for spatial point birth and LSTMs for landing temporal patterns in videotape data. By preprocessing videotape inputs, the system ensures thickness in data quality and format, enhancing discovery delicacy.

3.2. Architecture

a. Preprocessing Module * Excerpts frames at fixed intervals. * Normalizes frame confines (224x224 pixels). * Removes noise using Gaussian pollutants.
b. point birth Module * CNN Layer Detects spatial anomalies, similar as unnatural textures and pixel- position inconsistencies. * LSTM Layer Analyzes successional frame connections to identify temporal irregularities, similar as abrupt transitions.
c. Bracket Module Combines uprooted features to classify vids as either" Authentic" or" Manipulated."
d. Methodology

4. Methodology

4.1. Dataset preparation

The system was trained and validated using a curated dataset of 50,000 videos, sourced from public benchmarks such as the Deepfake Detection Challenge (DFDC). The dataset includes an equal distribution of authentic and manipulated videos, featuring diverse resolutions and editing techniques.

4.2. Model training

a. CNN A ResNet- 50 model,pre-trained on ImageNet, was fine- tuned to prize spatial features from videotape frames.
b. LSTM successional features from the CNN were fed into LSTMs to learn temporal dependences .
c. Optimization The Adam optimizer was used with a literacy rate of 0.001, and early stopping was employed to avoid overfitting.

4.3. Evaluation metrics

The model's performance was assessed using * delicacy 92 * Precision 90 * Recall 91 * F1- Score 90.5 These results demonstrate the model's capability to descry manipulated vids with high trustability and minimum false cons.These results demonstrate the model's ability to detect manipulated videos with high reliability and minimal false positives.

5.Results and Analysis

The system achieved an delicacy of 92, with a perfection of 90, recall of 91, and F1- score of 90.5. These criteria validate the mongrel CNN- LSTM armature's effectiveness in relating subtle spatial and temporal inconsistencies. Performance comparisons with being styles show the proposed system's robustness across different datasets and manipulation ways.

6.Implementation

6.1. Frontend

A web operation was developed using ReactJS, allowing druggies to upload vids and view real- time analysis results, including confidence scores and detected anomalies.

6.2. Backend

The backend, enforced with TensorFlow and Flask, processes uploaded vids and performs real- time analysis. The system can dissect a 10-alternate videotape in under 3 seconds, demonstrating its effectiveness and scalability

7.Challenges and Future Work

High computational demands for recycling high- resolution vids.
Rigidity to arising manipulation ways. unborn Work
Incorporate inimical training to ameliorate adaptability against new phony styles.
Optimize the system for deployment on mobile bias and low- power IoT tackle.
Expand datasets to include culturally and linguistically different content.

8.Conclusion

The" AI videotape Authenticity Checker" is a scalable and effective result for detecting videotape manipulation. By integrating CNN and LSTM infrastructures, the system effectively captures spatial and temporal inconsistencies, achieving high delicacy and robustness. Its stoner-friendly interface and realtime processing capabilities make it a precious tool for maintaining digital trust and combating misinformation.

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