Louis Savinien Dupuis Journal of Multidisciplinary Research, 2025: V(4) 33–35
DOI: 10.21839/lsdjmr.2025.v4.236

Research Article

MEDIA AUTHENTICATOR AI USING DEEP LEARNING

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(Received: 09-04-2025; Accepted 08-06-2025; Published Online 03-11-2025)

Abstract

With the rapid advancement of artificial intelligence, generating fake media such as deepfake images, videos, and audio has become easier, leading to misinformation and security threats. This research proposes a deep learning-based system called Media Authenticator AI to detect manipulated multimedia content. The system uses models like ResNet-50, EfficientNet, and Vision Transformers for visual analysis, along with MFCC and spectrogram techniques for audio verification. It also performs metadata analysis and temporal consistency checks for videos. The proposed system achieves an accuracy of 94–96% on benchmark datasets and provides explainable outputs such as heatmaps and confidence scores through a user-friendly web interface.

Keywords - Deep Learning, Deepfake Detection, Computer Vision, Audio Forensics, Media Authentication, Artificial Intelligence

INTRODUCTION

In the modern digital era, the rapid advancement of artificial intelligence has made it easier to create highly realistic manipulated media, commonly known as deepfakes. These fake images, videos, and audio clips are widely used for spreading misinformation, fraud, and cybercrime, making it difficult to trust digital content. Traditional methods of verifying media authenticity are no longer effective due to the large volume of data and advanced manipulation techniques. To address this issue, this research introduces a deep learning-based system called Media Authenticator AI, which automatically detects manipulated media and provides accurate results with confidence scores and visual explanations.

SYSTEM ARCHITECTURE

The proposed system follows a three-tier architecture The proposed system follows a three-tier architecture consisting of the presentation layer, application layer, and AI processing layer. The presentation layer is developed using React and provides a user-friendly interface for uploading media and viewing results. The application layer is built using Django, which handles user authentication, file processing, and communication between components. The AI layer uses deep learning models such as CNNs and transformers implemented in PyTorch to analyze images, videos, and audio. Additionally, a database is used to store user data and analysis results. This architecture ensures scalability, efficient processing, and accurate detection of manipulated media.

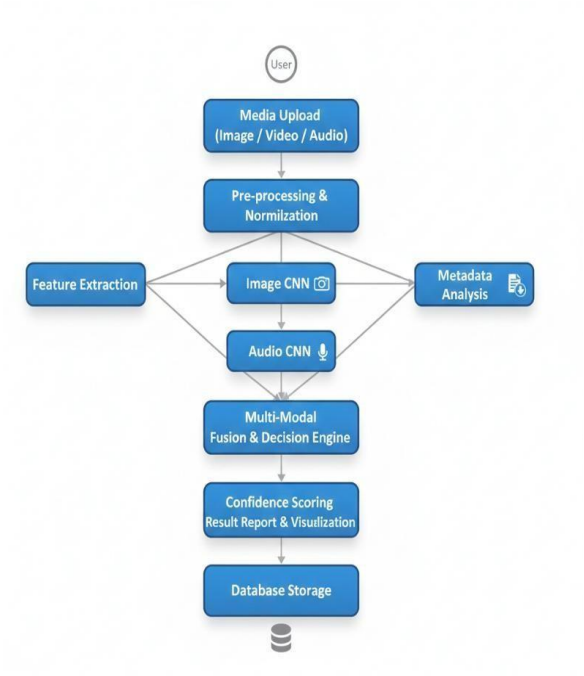
WORKING METHODOLOGY

The working methodology of the proposed system begins with the user uploading media files such as images, videos, or audio through the interface. The system performs pre-processing to clean and standardize the data. Next, feature extraction is carried out using deep learning techniques to identify important patterns. Images and videos are analyzed using CNN and transformer models, while audio is processed using MFCC and spectrogram analysis. Metadata such as timestamps and device details are also verified. For videos, temporal consistency checks are performed. Finally, all results are combined to generate an authenticity score along with visual outputs like heatmaps for easy understanding.

IMPLEMENTATION

The implementation of the proposed Media Authenticator AI system is carried out using a combination of modern web technologies and deep learning frameworks to ensure efficiency and scalability. The frontend is developed using React, providing an interactive and user-friendly interface for uploading media files and viewing results, while the backend is built using Django and Django REST Framework to handle user authentication, file processing, and API communication. The core detection process uses deep learning models such as convolutional neural networks and transformer-based architectures implemented in PyTorch to analyze images, videos, and audio for identifying manipulations. Audio analysis is performed using libraries like Librosa to extract features such as MFCC and spectrograms, while metadata verification checks EXIF data, timestamps, and

device information for authenticity. A database such as PostgreSQL or SQLite is used to store user details and analysis results. Additionally, background processing tools like Celery and Redis are integrated to manage large files and enable asynchronous processing, ensuring smooth performance and accurate detection results.



ROLE OF DEEP LEARNING

Deep learning plays a crucial role in the Media Authenticator AI system by enabling accurate detection of manipulated media through advanced pattern recognition techniques. It uses models such as convolutional neural networks (CNNs) and transformer-based architectures to analyze images and videos for visual inconsistencies like face distortions, unnatural textures, and lighting mismatches. In audio analysis, deep learning helps identify irregularities in voice patterns using features like MFCC and spectrograms. These models learn from large datasets and improve their performance over time, making the system more reliable in detecting deepfakes. Additionally, deep learning supports automated feature extraction and classification, reducing the need for manual analysis and ensuring faster, more efficient, and scalable media authentication.

ADVANTAGES

The proposed Media Authenticator AI system offers several important advantages in detecting manipulated media. It provides high accuracy in identifying fake images, videos, and audio using advanced deep learning techniques. The system supports multi-modal analysis, allowing it to handle different types of media in a single platform. It also offers explainable results through confidence scores and visual heatmaps, helping users understand the detection process. The user-friendly web interface makes it accessible even for non-technical users. Additionally, the system ensures fast processing with the help of background tasks and scalable architecture. Overall, it improves trust in digital content and helps prevent misinformation and fraud.

APPLICATIONS

The Media Authenticator AI system has wide applications across various fields. It can be used by journalists and media organizations to verify the authenticity of news content and prevent the spread of misinformation. Law enforcement agencies can utilize it for digital forensics and evidence verification. Social media platforms can integrate the system to detect and control fake or manipulated content. It is also useful for corporate organizations to prevent fraud and protect brand reputation. Educational institutions can use it to create awareness about deepfakes, while individuals can use it to verify media files, thereby improving trust and security in digital communication.

FUTURE ENHANCEMENTS

The Media Authenticator AI system can be further enhanced by incorporating advanced technologies to improve its performance and usability. Future improvements may include real-time detection of deepfake content in live video streams and social media platforms.

Integration of facial expression and emotion analysis can help in detecting more subtle manipulations. The system can also be extended to support multiple languages for wider accessibility. Developing a mobile application will make the system more convenient for users. Additionally, the use of more advanced deep learning models and larger datasets can further improve detection accuracy and efficiency in real-world scenarios.

CONCLUSION

The proposed Media Authenticator AI system provides an effective and reliable solution for detecting manipulated media using advanced deep learning techniques. By analyzing images, videos, and audio along with metadata, the system ensures accurate identification of fake content. It offers clear outputs such as confidence scores and visual explanations, making it easy for users to understand the results. The user-friendly interface and scalable architecture make it suitable for real-world applications. Overall, this system helps in reducing misinformation, preventing digital fraud, and improving trust in digital communication, making it a valuable tool in today's AI-driven world.

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