Chapter 15
A Deep Learning–Based Lip Reading Module Applied for Forensic Analysis and Silent Speech Decoding

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ABSTRACT

Machine learning and Deep learning algorithms in digital forensics play a significant role in crime detection aiding forensic analysis through identifying patterns, trends based on data. Audio and Video data serve as a great electronic evidence in digital forensics for investigation purpose. In forensic investigations, crucial video

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footage often lacks audio or suffers from poor sound quality, making it difficult for analysts to fully grasp the conversations that took place and traditional speech analysis methods depend on audio data, leaving a significant void when only silent footage is available. Several existing systems struggle with contextual understanding, that can lead to misinterpretations, and also raise privacy and ethical issues when applied in surveillance and forensic contexts. Thus chapter proposes to provide a solution employing advanced computer vision and deep learning methods called Lip reading module for forensic analysis and silent speech decoding that seeks to fill this void by offering a way to extract speech information from lip movements, potentially revealing insights that would otherwise remain hidden. The modular design of the project makes it a potential forensic analysis assistant tool for silent speech decoding.

1. INTRODUCTION

In the age of digitization, the society relies more on digital systems where most of the devices such as IoT devices, computer systems, mobile phones, tablets etc., are all cloud connected (Vermesan & Friess (Eds.), 2022) and three is rapid increase in the enormous amount of information flow (digital data) that is available to everyone. The digital era is witnessing a growth with the rapid increase in IoT devices such as smart cameras and edge computing systems and is also paving way to the expansion of digital forensics domain through the creation of crime scenes. These pose threats towards accessibility and ethical considerations and risks of data breaches, privacy and cyberattacks which needs to be taken care of.

Digital forensics involves acquisition, examination, analysis and interpretation of digital data using advanced tools and technologies and also preserving it in its original form as required to be submitted to the court of law.

Digital forensics could be any of these types (Jones & Winster, 2022 ; Irons & Lallie, 2014) as displayed in Figure 1.

Figure 1. Digital Forensics types