

Abstract

The Electronic Network Frequency (ENF) signal, a background signal present in many media recordings, can be used for a wide array of forensic applications. A major flaw in ENF-based forensic analysis designs however is the lack of ENF detection systems, thereby casting doubt on the results produced by all such systems. Further, the time-dependent nature of ENF signals has yet to be explored fully in ENF applications. We therefore present the first detailed examination of ENF detection and do so using Long Short-Term Memory networks (LSTMs) which exploit the time-correlated nature of ENF signals. To that end, we evaluate the possibility of detecting the presence of ENF in noisy audio signals. We additionally detail the performance of such a system across a wide array of different noise levels, providing quantitative metrics in a way that has never been done before. We evaluate further expansion and functionality of ENF-based detection models and propose the first-ever generalized model for detecting ENF presence in an unknown noisy environment, in a way that is applicable all digital media platforms and signals.