FORENSIC SPEAKER IDENTIFICATION IN NIGERIA: PROSPECTS, CHALLENGES, AND IMPLICATIONS FOR THE CRIMINAL JUSTICE SYSTEM

Olympian Dumebi Adigwe & Linda Chinelo Nkamigbo
Department of Linguistics
Nnamdi Azikiwe University, Awka

Abstract
Forensic speaker identification has emerged as a crucial component of forensic phonetics, providing scientific methods for identifying individuals through voice evidence in criminal investigations. In contemporary criminal investigations, voice recordings obtained through telephone conversations, surveillance devices, and digital communication platforms have become increasingly common forms of evidence. In many jurisdictions around the world, forensic phonetic analysis is used to authenticate recordings, identify speakers, and evaluate the evidential value of speech data in legal proceedings. In Nigeria, particularly in the South-Eastern region, the application of forensic phonetics remains relatively underdeveloped despite its potential to enhance criminal investigations and judicial processes. This paper examines the concept of forensic speaker identification, its theoretical foundations, and its relevance within the Nigerian criminal justice system. Drawing on existing literature and empirical observations from studies on forensic phonetics in Nigeria, the paper explores the role of acoustic and auditory analysis in identifying speakers and evaluating voice recordings used as legal evidence. The findings reveal that although awareness of forensic phonetics is gradually increasing among stakeholders, its practical application remains limited due to infrastructural deficiencies, lack of trained experts, limited institutional support, and legal uncertainties surrounding the admissibility of voice evidence. The paper concludes that the integration of forensic speaker identification into Nigeria's investigative and judicial processes could significantly improve the reliability of voice-based evidence, strengthen investigative accuracy, and reduce wrongful convictions.

Keywords: forensic phonetics, speaker identification, voice evidence, criminal investigation, Nigeria.

1. Introduction

The development of forensic science has profoundly changed the methods of investigation employed in criminal justice systems across the globe. In order to evaluate evidence and assist in judicial decision-making, modern forensic investigations increasingly rely on scientific techniques and technology instruments. Forensic phonetics, which examines speech and voice recordings for legal and investigative purposes, is a significant area of forensic science that has become more well-known in recent years (Coulthard & Johnson, 2007). In order to help law enforcement and courts analyse spoken evidence, forensic phonetics studies linguistic and acoustic aspects of speech.

Forensic phonetics encompasses several areas of investigation, including speaker identification, recording authentication, speech enhancement, transcription of spoken material, and the interpretation of disputed utterances. Among these areas, speaker identification remains one of the most widely used techniques in criminal investigations involving voice evidence (Rose, 2002). Speaker identification involves determining whether a particular individual is the source of a recorded voice in criminal evidence. This process relies on the comparison of speech samples, acoustic properties, and distinctive vocal characteristics.

Through such analyses, forensic experts can determine whether the voice in a questioned recording matches that of a suspect. In many criminal investigations, voice recordings are obtained from telephone threats, ransom negotiations, intercepted communications, or covert surveillance operations. These recordings can serve as critical pieces of evidence when properly analyzed using scientific techniques.

In many developed countries, forensic speaker identification plays a crucial role in criminal investigations involving threat calls, kidnapping negotiations, extortion cases, terrorism, and organized crime. Advanced forensic laboratories equipped with sophisticated audio analysis technologies are routinely used to evaluate voice evidence. In addition, trained forensic phoneticians provide expert testimony in court to explain the results of voice comparison analyses (Hollien, 2002).

However, the use of forensic phonetics is still in its infancy in Nigeria. The Nigerian criminal justice system has not yet fully incorporated voice analysis techniques, despite the growing use of mobile phones, digital communication platforms, and recorded conversations in criminal activities. Confessions, eyewitness accounts, and circumstantial evidence are frequently used by law enforcement organizations more frequently than

scientific voice analysis.

The growth of forensic speaker identification in Nigeria has been severely hampered by the lack of specialized forensic phonetics laboratories, low awareness among lawyers, and a lack of qualified forensic experts. Because of this, voice recordings that might be useful evidence are frequently neglected or little examined.

This paper therefore examines the concept of forensic speaker identification, its theoretical framework, and its relevance within the Nigerian context. It also explores the challenges hindering its adoption and suggests strategies for integrating forensic phonetics into Nigeria's criminal justice system.

2. Literature Review

Phonetics is the scientific study of speech sounds, including how they are produced, transmitted, and perceived. The discipline investigates articulatory mechanisms involved in speech production, acoustic patterns generated by vocal tract movements, and perceptual processes through which listeners interpret speech sounds (Ladefoged, 2025). These phonetic principles provide the scientific foundation for forensic phonetic investigations.

Phonetic analysis involves examining several properties of speech, including:

i. Pitch (fundamental frequency)
ii. Formant frequencies
iii. Intensity
iv. Speech rhythm
v. Articulation patterns
vi. Voice quality

These features are often unique to individual speakers and can therefore serve as identifying characteristics in forensic investigations.

Forensic phonetics refers to the application of phonetic and linguistic knowledge to legal contexts involving speech evidence. It involves activities such as speech enhancement, authentication of audio recordings, transcription of spoken material, interpretation of disputed utterances, and speaker identification (Sinha, 2015). Through these techniques, forensic phonetics helps law enforcement agencies analyse recorded speech and determine its evidential significance.

Speaker identification, also known as forensic voice comparison, is the process of determining whether two or more speech recordings originate from the same speaker. In forensic investigations, this technique is used when a recording of a suspect's voice is compared with a known voice sample. Distinctive characteristics such as accent, speech rhythm, pronunciation patterns, and acoustic measurements are examined to determine whether the recorded voices match (Rose, 2002).

Speaker identification typically involves two major approaches:

1. Auditory analysis, where trained experts listen to recordings and identify similarities and differences in speech characteristics.
2. Acoustic analysis, which involves the use of specialized software to measure acoustic properties such as pitch, formant frequencies, and temporal patterns.

These two methods are often used together in order to achieve reliable results.

In Nigeria, research on forensic phonetics is still developing. Studies conducted by Omozuwa (2008) and Oguejiofor and Evbuomwan (2022) indicate that forensic linguistic services remain largely underutilized in Nigerian policing and judicial processes. Although voice recordings are sometimes used in criminal investigations, systematic scientific analysis of speech evidence is rarely conducted.

3. Theoretical Framework

The study of forensic speaker identification is supported by several theoretical perspectives that explain how voice evidence can be scientifically evaluated and socially implemented.

One important theoretical perspective is Speaker Recognition Theory, which provides the scientific foundation for forensic voice comparison. This theory explains how individual speakers produce distinctive vocal characteristics due to physiological differences and learned speech habits. These characteristics create unique speech patterns that can be analysed for identification purposes (Rose, 2002).

A widely used method within this framework is the Likelihood Ratio Approach. This approach evaluates voice evidence by comparing two competing hypotheses:

i. The suspect is the speaker in the questioned recording.
ii. The suspect is not the speaker in the questioned recording.

By analysing the probability of each hypothesis, forensic experts can determine the strength of the voice evidence.

Another theoretical perspective is the Forensic Linguistic-Ecological Model, which explains how linguistic practices interact with social and institutional environments. According to this model, the effectiveness of forensic phonetics depends not only on scientific methods but also on institutional support, technological infrastructure, and professional expertise.

A third theoretical perspective is the Diffusion of Innovations Theory proposed by Rogers. This theory explains how new technologies or ideas spread within a society. Adoption typically occurs through stages such as:

1. Awareness
2. Persuasion
3. Decision
4. Implementation
5. Confirmation

In Nigeria, forensic phonetics appears to be in the early stages of diffusion, where awareness exists among some researchers and professionals, but widespread institutional implementation has not yet occurred.

4. Forensic Speaker Identification in Nigeria

The application of forensic speaker identification in Nigeria remains relatively limited despite the growing relevance of voice evidence in modern criminal investigations. In many criminal cases within the Nigerian criminal justice system, investigative procedures still rely heavily on traditional evidentiary approaches such as confessions, eyewitness testimony, and circumstantial evidence. Although these forms of evidence can be useful, they are often vulnerable to inaccuracies, manipulation, or human error. Consequently, the absence of advanced scientific techniques such as forensic speaker identification can reduce the reliability and objectivity of criminal investigations (Coulthard & Johnson, 2007).

In recent years, however, the rapid expansion of digital communication technologies has significantly transformed patterns of criminal activity in Nigeria. The widespread use of mobile phones, internet-based communication platforms, and voice messaging applications has created new forms of evidence that are increasingly relevant in criminal investigations. Criminal activities such as kidnapping, fraud, cybercrime, extortion, and organized criminal operations frequently involve recorded conversations, voice messages, or telephone calls that may serve as potential evidence in court. These recorded interactions often contain valuable linguistic and acoustic information that can assist investigators in identifying suspects.

Forensic speaker identification provides a scientific framework for analysing such voice recordings. Through systematic comparison of speech samples, forensic experts can evaluate similarities and differences between a questioned recording and a known sample from a suspect. This comparison involves examining several phonetic and acoustic features, including pitch patterns, speech rhythm, vowel quality, pronunciation habits, and voice quality characteristics (Rose, 2002). These features often reflect unique physiological and behavioural traits that distinguish one speaker from another.

In the Nigerian context, the relevance of forensic speaker identification is particularly evident in cases involving telephone-based criminal activities. One of the most prominent examples is kidnapping, which has become a serious security challenge in several parts of the country. Kidnappers often communicate with victims' families through telephone calls in order to negotiate ransom payments. These conversations are sometimes recorded by security agencies or by the victims' relatives. In such circumstances, forensic speaker identification could assist investigators in determining whether the voice in the ransom calls matches that of a suspected individual. By analysing the acoustic and phonetic features of the recorded speech, forensic experts can provide evidence regarding the likelihood that the suspect is the speaker in the recorded conversation.

Similarly, voice analysis could play a significant role in cases involving fraud and cybercrime. In many fraud schemes, perpetrators communicate with victims through telephone calls or voice messages to manipulate or deceive them. These recordings could serve as crucial evidence if properly analyzed using forensic phonetic techniques. Speaker identification could help determine whether a particular suspect is responsible for the fraudulent communication.

Another area in which forensic phonetics could be valuable in Nigeria is the analysis of disputed confessional statements. In some criminal cases, suspects claim that recorded confessions were either manipulated, edited, or falsely attributed to them. In such situations, forensic speaker identification could assist in verifying whether the recorded confession actually originated from the accused individual. By comparing the disputed recording with a verified voice sample from the suspect, forensic experts can determine whether the voices are consistent with being produced by the same speaker.

In addition, forensic speaker identification can contribute to the authentication of audio recordings used as legal evidence. Audio recordings presented in court may sometimes be challenged on the grounds that they have been altered, manipulated, or fabricated. Forensic phonetic analysis can help assess the integrity of such recordings by examining acoustic inconsistencies, background noise patterns, and speech continuity.
Despite these potential benefits, the practical application of forensic speaker identification in Nigeria remains limited. Studies on forensic linguistics and forensic phonetics in the Nigerian criminal justice system suggest that voice evidence is rarely subjected to systematic scientific analysis (Oguejiofor & Evbuomwan, 2022). In many cases, investigators may possess recorded conversations but lack the specialized expertise or technological resources required to analyse them properly.

Furthermore, institutional frameworks for integrating forensic phonetic analysis into criminal investigations are still underdeveloped. Unlike some advanced jurisdictions where forensic phonetic laboratories operate within national forensic institutes, Nigeria currently lacks a well-established infrastructure for conducting professional forensic voice analysis.

As a result, voice recordings that could potentially serve as important evidence often remain underutilized. Strengthening the role of forensic speaker identification in Nigeria would therefore require substantial improvements in technological infrastructure, professional training, and institutional support.

5. Challenges

Although forensic speaker identification offers significant potential for improving criminal investigations, several challenges continue to hinder its adoption and implementation in Nigeria. These challenges are primarily related to infrastructural limitations, shortage of trained experts, legal uncertainties, and limited awareness among criminal justice stakeholders.

5.1 Lack of Infrastructure

One of the most significant barriers to the development of forensic speaker identification in Nigeria is the absence of specialized forensic phonetics laboratories equipped with modern audio analysis technologies. Reliable forensic voice comparison requires advanced tools such as high-quality digital recording systems, acoustic analysis software, and specialized speech processing equipment. These tools enable experts to examine acoustic properties such as fundamental frequency, formant structures, spectral patterns, and temporal characteristics of speech.
In many developed countries, forensic phonetic laboratories are equipped with sophisticated software such as Praat, MATLAB-based speech analysis systems, and automated speaker recognition technologies. These tools allow investigators to perform detailed acoustic measurements and statistical comparisons between speech samples (Hollien, 2002). However, such technological infrastructure is largely unavailable in most Nigerian law enforcement agencies.

Without adequate equipment, investigators may find it difficult to conduct reliable voice comparisons or authenticate audio recordings. Consequently, even when voice evidence is available, the lack of technological resources limits its practical use in criminal investigations.

5.2 Shortage of Experts

Another major challenge facing forensic speaker identification in Nigeria is the shortage of trained forensic phoneticians. Forensic voice analysis requires specialized knowledge of phonetics, acoustics, linguistics, and signal processing. Professionals who conduct forensic voice comparison must be capable of identifying subtle speech characteristics and interpreting acoustic measurements accurately.

Currently, very few experts in Nigeria possess formal training in forensic phonetics. Most Nigerian universities offer courses in general linguistics and phonetics, but specialized programmes in forensic phonetics are rare. As a result, there is a limited pool of professionals who can provide expert analysis of voice recordings in legal contexts.

The shortage of trained experts also affects the ability of courts to rely on forensic phonetic evidence. In many cases, expert testimony is required to explain the scientific basis of voice comparison results. Without qualified forensic phonetic specialists, courts may be reluctant to accept voice evidence as reliable.

5.3 Legal and Institutional Barriers

Legal uncertainties regarding the admissibility of forensic voice evidence represent another significant obstacle. Although Nigerian courts have increasingly recognized the value of scientific evidence, clear legal guidelines for evaluating forensic phonetic evidence are still evolving.

Courts often require scientific evidence to meet certain standards of reliability before it can be admitted in legal proceedings. Forensic voice comparison techniques must therefore demonstrate methodological validity, accuracy, and reproducibility. In jurisdictions where forensic phonetics is well established, legal frameworks provide clear procedures for presenting and evaluating voice evidence in court.

In Nigeria, however, the legal status of forensic speaker identification remains somewhat ambiguous. Judges and legal practitioners may lack familiarity with the scientific principles underlying forensic phonetic analysis. This uncertainty may lead to reluctance in admitting voice comparison evidence in criminal trials.

5.4 Limited Awareness

Limited awareness among law enforcement officers, investigators, and legal practitioners also contributes to the underutilization of forensic speaker identification in Nigeria. Many police officers and criminal investigators are not familiar with the potential applications of forensic phonetics in analysing voice recordings.
As a result, voice recordings obtained during investigations may not be properly preserved or analysed. In some cases, investigators may not recognize that recorded speech could serve as valuable evidence for identifying suspects.

Similarly, legal practitioners and judges may have limited exposure to forensic phonetics, which can affect their ability to recognise the role of phonetic experts to evaluate voice evidence effectively. Increasing awareness of forensic phonetic methods through training programmes, workshops, and academic research could therefore play an important role in promoting the use of forensic speaker identification in Nigeria.

6. Prospects

Despite these challenges, the future of forensic phonetics in Nigeria is promising. Technological advancements in digital audio analysis, artificial intelligence, and speech recognition systems are making voice comparison techniques more accessible and reliable.
Increasing awareness of forensic science among law enforcement agencies and legal practitioners may also contribute to the adoption of forensic phonetic methods in criminal investigations.
The integration of forensic phonetics into Nigeria's criminal justice system could:

i. Improve the accuracy of criminal investigations
ii. Reduce wrongful convictions
iii. Enhance the credibility of voice evidence in court
iv. Support law enforcement agencies in solving complex crimes

7. Conclusion

Forensic speaker identification represents a valuable scientific tool for criminal investigations and judicial processes. Through the analysis of speech recordings, forensic experts can determine whether a suspect is likely to be the source of a questioned voice recording.
Although the application of forensic phonetics in Nigeria remains limited, the discipline has significant potential to strengthen the country's criminal justice system. Achieving this goal requires investment in training, technological infrastructure, and institutional support.

References

Aitken, C., & Taroni, F. (2004). *Statistics and the evaluation of evidence for forensic scientists*. Wiley.
Coulthard, M., & Johnson, A. (2007). *An introduction to forensic linguistics: Language in evidence*. Routledge.
Hollien, H. (2002). *Forensic voice identification*. Academic Press.
Jessen, M. (2009). Forensic phonetics and speech analysis.
Ladefoged, P. (2025). *A course in phonetics*. Oxford University Press.
Oguejiofor, N. E., & Evbuomwan, O. O. (2022). A survey of forensic linguistic services in Nigerian policing and judicial process.
Omozuwa, V. E. (2008). Issues in applied phonetics: The prospect of forensic voice investigation in Nigeria.
Rose, P. (2002). *Forensic speaker identification*. CRC Press.
Sinha, S. (2015). *Forensic linguistics and forensic phonetics: An introduction*