

# The Role of Generative Artificial Intelligence in Forensic Linguistic

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Publication Date: 2026/05/18

## Abstract

The fast development of generative artificial intelligence (AI), specifically large language models (LLMs), has dramatically altered the future of the field of forensic linguistics. Forensic linguistics has traditionally been built upon the premise that people have some unique linguistic patterns, or idiolects, which can be used to determine authorship, detect deception, and interpret evidence. In current times, the AI systems generate very advanced and human-like text casts doubt on the soundness of these core principles. This paper will critically look at the implication of generative AI in forensic linguistics and how it is transformative and what challenges it poses. On the one hand, AI technologies contribute to improving forensic examination based on automated stylometry, processing of vast corpus, and predictive linguistic modeling). Conversely, they make attributing authorship challenging by facilitating style imitating, scale-generating text, and obfuscating authorship. The paper adopts a qualitative research methodology which is based on recent literature review in fields such as methods of detecting AI-generated text, computer linguistics and law admissibility. Specific emphasis is placed on the drawbacks of the existing detection methods that are frequently characterized by a high rate of false-positives and are not very stable to adversarial interference. Algorithms bias, transparency, and Daubert standard concerns: The results indicate that forensic linguistics needs to change and address explainable AI models, hybrid human-computer analysis, and interdisciplinary partnerships. Although generative AI threatens traditional forensic practices to a large extent, it also gives ways to innovations and development. The paper concludes that, to ensure the integrity and viability of forensic linguistics in contemporary legal settings, it is crucial to adapt to these technological developments.

**Keywords:** *Artificial Intelligence, Authorship Attribution, Computational Linguistics, Forensic Linguistics, Large Language Models, Text Detection.*

## I. INTRODUCTION

Forensic linguistics is a discipline that uses linguistics to solve legal problems, such as authorship attribution, discourse analysis, and linguistic evidence in the criminal and civil court (Coulthard et al., 2016). It is based on the assumption that, people possess distinct dialects known as idiolects that could be used to tell who wrote something or to determine lying. Forensic linguistics has been instrumental in legal inquiries over the last several decades and has been instrumental in

solving cases of questionable authorship, threatening messages, and forged documents.

Nevertheless, the advent of generative artificial intelligence has posed challenges that have never been witnessed before in this sector. Generative AI, especially in the presence of LLMs, has shown the capacity to create extremely coherent as well as contextually suitable text that is strongly related to human writing (Brown et al., 2020). Trained on large quantities of data, these models are capable of reproducing different writing styles, tones, and linguistic structures with incredible

precision. Consequently, they subvert the old-time belief that linguistic patterns are distinctly linked to specific authors.

The effect of generative AI on the authorship attribution is one of the gravest issues. Conventional techniques are based on stylometric analysis, which analyzes word frequency, sentence structure, use of lexicon among other features to identify authorship (Stamatatos, 2009). But these features can be imitated by LLMs, and it is becoming more difficult to tell the difference between text generated by humans and that generated by AI. This is a very big issue concerning the reliability of linguistic evidence in legal matters.

In addition, generative AI is also applied in the generation of synthetic texts that can be leveraged to commit malicious acts such as phishing, misinformation and impersonation. AI-generated emails, counterfeiting confessions, and forged legal documents make it more difficult to investigate crimes in a forensic context and more prone to false attribution (Uchendu et al., 2020). These risks are further increased by the scalability of AI-generated content, which allows the creation of substantial amounts of misleading content in a short amount of time. Though these obstacles exist, generative AI can also bring important opportunities to forensic linguistics. AI-based tools can handle vast amounts of data and detect linguistic patterns, as well as help analyze complex cases. To illustrate, machine learning algorithms can be used to improve authorship attribution through the use of probabilistic models as well as pattern recognition techniques (Grieve, 2007). Also, AI will be able to assist with multilingual analysis and detect anomalies in language data more effectively.

Ethical and legal considerations are also crucial when it comes to the incorporation of AI into forensic linguistics. Many AI systems are not transparent (so-called black box problem) which makes them difficult to be legally admissible. The evidence presented before the courts must be reliable, valid and explainable as laid down in the Daubert standard (Smith, 2009). Nonetheless, most AI models fail to satisfy these requirements, casting doubt on their applicability in the legal system.

This study will examine how the relationship between forensic linguistics and generative AI has evolved by answering the listed research questions:

- What does generative AI do to conventional approaches to forensic linguistics?
- What are the uses of AI in improving forensic analysis?
- What should forensic linguistics do to be reliable and valid in the law?

In answering these questions, the study helps in the continued discussion of the intersection of language, technology, and law. It highlights the necessity of methodological innovation and interdisciplinary

cooperation in order to cope with the challenges of generative AI.

## II. LITERATURE REVIEW

### ➤ *Foundations of Forensic Linguistics*

Forensic linguistics is a cross-functional field that makes use of linguistic theory and methodology in legal settings, such as criminal investigations, courtroom speech and authorship identification (Coulthard et al., 2016). The science became well known with cases like the investigation of contentious confessions and ransom notes, where language patterns were presented in evidence. Idiolect is central to forensic linguistics and implies that everyone has his/her unique way of using language that is influenced by social, psychological and contextual factors (Grant, 2007).

Traditionally, authorship attribution has been based on stylometry that is a quantitative technique that investigates linguistic characteristics including word frequency, sentence length and syntactic structure, etc. (Stamatatos, 2009). Initial research has shown that these features were capable of reliably differentiating between authors, even in anonymous works. But the validity of such procedures is based on the premise that linguistic patterns are comparatively stable and hard to duplicate- a premise that is being undermined by new technologies.

### ➤ *Evolution of Computational Linguistics in Forensic Analysis*

The introduction of computational processes into the solution of forensic linguistics was a breakthrough of the field. The utilization of machine learning algorithms and statistical models has helped researchers to process large corpora and detect patterns that could not be easily detected by manual processes (Yu et al., 2011). The use of n-gram analysis, support vector machines (SVM) and neural networks have increased the accuracy of the authorship attribution and text classification. Latest innovations in natural language processing (NLP) have also enhanced forensic abilities.

Multilingual data and sentiment detection as well as discourse structures can be processed using NLP tools and are useful in analyzing multifaceted linguistic evidence (Grieve, 2007). Such developments have placed computational linguistics as a vital element of contemporary forensic investigations. Nevertheless, there is also the growing concern of interpretability and transparency due to the growing dependence on computational procedures. Most machine learning models are used as black boxes, and it is hard to understand how they are used to arrive at a conclusion. This inability to explain is problematic to legal admissibility, in which transparency is paramount (Rudin, 2019).

### ➤ *Emergence of Generative AI and Large Language Models*

Generative AI is an innovation in field of artificial intelligence, where machines create content that is highly similar to human language. The GPT-based systems and other LLMs are models that are proficient on big data volumes and utilize deep learning architectures to produce coherent and context-specific text (Brown et al., 2020). These models have revealed great potential in text generation, translation, summarization and conversation. Their mimicking human writing styles have profound implications on forensic linguistics.

As an example, the linguistic features can be copied by the LLMs, and it is hard to differentiate between the text written by machines and humans (Bender et al., 2021). The easy access to generative AI has made high-level text generation accessible to everyone. Although this has been used positively in education and content creation, it also poses threats of abuse such as production of false or malicious content.

### ➤ *AI-Generated Text Detection*

The rise of generative AI has led to increased research on detecting AI-generated text. Various There are several approaches that have been proposed such as statistical analysis, machine learning classifiers, and watermarking techniques. The linguistic properties of perplexity and burstiness are analyzed through statistical means to regulate the patterns of text production by AI (Gehrmann et al., 2019). Machine learning models are trained to compare human and AI-generated text, using datasets of human and AI-generated text (Uchendu et al., 2020). In spite of these developments, there is a lot of limitations in detection methods.

Research has demonstrated that AI-created text can be altered to avoid detection, which decreases the functionality of current tools (Mitchell et al., 2023). Also, the detection systems usually give false positives whereby human written text is detected as AI generated and this is problematic in the legal field where accuracy is paramount. One of the potential solutions is watermarking techniques, which add recognizable patterns to the text generated by AI (Kirschenbauer et al., 2023). Nevertheless, they are not the only techniques that can be avoided by paraphrasing or translation.

### ➤ *Challenges to Authorship Attribution*

Generative AI to its core undermines the idea of attributing authorship. Conventional approaches are based on the premise that linguistic characteristics are individual and uniform throughout the writing of an individual. Nevertheless, LLMs are capable of reproducing these characteristics very accurately, virtually obscuring the line between an author (Stamatatos, 2009).

This problem is complicated by authorship obfuscation techniques. People have an opportunity to adjust their writing style with AI tools and the author of the original writing can hardly be found. This means a lot

to the field of forensic investigations, especially where a threat is made anonymously or where it is a cybercrime case. Additionally, the collaborative aspect of the AI-generated text casts doubts on the ownership of authorship. Whenever a text is created or modified substantially by an AI system, it is not clear who should be the author of the text the human user, the AI system, or the combination of both. This uncertainty makes law interpretations more difficult and undermines current systems of authorship attribution.

### ➤ *Misinformation, Cybercrime, and Forensic Risks*

Generative AI has been generally linked with the proliferation of false information and cyber-crimes. Text generated by the AI can be utilized to create persuasive phishing messages, fictitious news, and impersonation messages, making it more challenging to detect malicious actors (Zellers et al., 2019). These threats are increased by the scalability of AI-generated content. As opposed to the conventional approaches that demand extensive resources to create false information. This poses new challenges to forensic linguists, who need to process even more challenging and large amounts of data. Moreover, AI-created materials can be utilized to create evidence, including forged confessions or falsified legal records. This poses some grave questions regarding the reliability of digital evidence and the possibility of wrong convictions.

### ➤ *Ethical Considerations*

Generative AI in field of forensic linguistics also brings about a number of ethical concerns. Algorithms bias is one of the major issues. The AI models are developed using datasets of large scale which can be biased in terms of language, culture, and demographics. Such biases may affect the work of the models and make incorrect or discriminatory conclusions (Bender et al., 2021). The second ethical concern is the absence of accountability. In cases of AI systems applied in forensic analysis, the question of who commits errors or misunderstandings is often an indistinct issue. This negligence can erode confidence in the forensic evidence and the courts. The issue of privacy also comes in the case of the AI tools processing personal communications. Linguistic data collection and processing should be performed with references to ethical standards and laws to provide the rights of the people with protection.

### ➤ *Legal Implications and Admissibility*

Applications of AI in forensic linguistics have profound consequences to the justice systems. Evidence must satisfy court standards of reliability, validity and relevance. The Daubert standard is used in the United States to regulate the admissibility of expert testimony on the basis of testability, peer review, error rates and general acceptance (Smith, 2009). Most AI-based approaches fail to comply with such requirements because of their inability to be transparent and explainable. Deep learning models are hard to comprehend how the decision is made, which can ruin the credibility of such models in court (Rudin, 2019). Moreover, the high rate of technological change has been

more than law, leading to the disconnect between innovation and regulation. New legal frameworks that can govern the application of AI-generated evidence and guarantee its credibility are needed.

#### ➤ *Research Gaps*

Although there is an increasing amount of literature on forensic linguistics and generative AI, some gaps still exist:

- Low accuracy of AI-generation text detection algorithms.
- Absence of explainable AI models that can be applied in a legal setting.
- Lack of legal regulations on AI-generated evidence.
- Ability to utilize standardized methodologies in AI-assisted forensic analysis is needed.
- Little cross-disciplinary cooperation among linguists, computer scientists and legal professionals.

It is important to fill these gaps in order to make the field further and guarantee the validity of forensic linguistic analysis in the era of generative AI.

### III. METHODOLOGY

#### ➤ *Research Layout*

The qualitative research design in this study is chosen based on a large and extensive review of the literature on forensic linguistics and generative artificial intelligence (AI). Qualitative research is particularly suitable in this study because they allow an in-depth analysis of theoretical progress, emerging problems and interdisciplinary perspectives (Creswell and Poth, 2016). The study will be focused on the analysis of the academic articles, conference papers and reports that will be released from 2018 to 2026. This is the time of rapid advancement of generative AI, particularly LLMs, and their growing impact on forensic linguistics.

#### ➤ *Data Collection*

In order to get an accurate picture of the data, a number of academic and scientific sources were used to collect the data for this research. These sources include:

The following are peer-reviewed articles in the fields of linguistics, AI and forensic science.

- Conference papers in NLP and computational linguistics.
- Legal case studies and policy documents.
- Research institution and AI reports.

Relevant literature was identified with the help of databases like Google Scholar, IEEE Xplore, SpringerLink, and ScienceDirect. The search keywords were:

- “Forensic linguistics”
- “Authorship attribution”
- “Generative AI”

- “Large language models”
- “AI-generated text detection”
- “Stylometry and machine learning”

The inclusion criteria were that the sources should be of interest to both forensic linguistics and AI technologies, and more specifically, the latest developments. The studies which did not have either empirical or theoretical rigor were eliminated to ensure quality in academics.

#### ➤ *Analytical Framework*

The thematic approach is used to analyze the data, and it includes the identification, analysis and interpretation of patterns in the literature that is gathered (Braun and Clarke, 2006). The thematic analysis enables the data to be systematically organized into major themes that can answer the research questions. The main themes were as follows:

- Conventional forensic linguistic techniques.
- Can Generative AI and LLMs capabilities.
- Difficulties to authorship attribution.
- Text detection methods using AI.
- Ethical and legal implications.

All themes were critically analyzed in order to detect similarities, inconsistencies and gaps in the literature.

#### ➤ *Comparative Analysis*

To compare the differences between traditional forensic linguistic approaches and AI-driven ones, a comparative approach was used. This includes comparing:

- Stylometric analysis by humans and the machine learning models.
- Conventional authorship attribution and AI-aided attribution.
- Text written by humans and texts written by AI.

This analogy shows how generative AI interferes with the established methodology and brings in new challenges to the forensic analysis (Stamatatos, 2009; Uchendu et al., 2020).

#### ➤ *Reliability and Validity*

A set of measures was undertaken so that the reliability and validity of the study can be guaranteed:

- Triangulation: Multiple sources of data were used in order to obtain balanced perspectives.
- Peer-reviewed sources: The credible academic publications were included only.
- Critical analysis: Sources were reviewed in terms of methodological rigor and relevance.

Moreover, the study also highlights the shortcomings of qualitative study such as possibility of bias in interpretation. Nonetheless, these drawbacks are

alleviated with the help of systematic examination and research methodologies (Creswell & Poth, 2016).

#### ➤ *Ethical Considerations*

The study is based on publicly available data. Thus, there are little issues of ethical concerns with regard to consent and confidentiality. But ethical considerations are addressed in terms of:

- Careful AI technologies
- Prevention of plagiarism and correct citation
- Critical analysis of biases within AI systems

These aspects fit into the general discourse of ethics in AI and forensic analysis (Bender et al., 2021).

### IV. ANALYSIS AND FINDINGS

#### ➤ *Impact of Generative AI on Authorship Attribution*

The results indicate that the use of generative AI poses a great threat to the conventional mode of attributing authorship. Stylometric methods, based on the repetitive patterns of language, are becoming less and less effective when they face AI-generated text, with the ability to imitate various styles of writing (Stamatatos, 2009). Research suggests that LLMs are accurate in the reproduction of lexical and syntactic aspects, and it is hard to tell the difference between the text created by humans and machines (Brown et al., 2020). This questions the premise of idiolect and puts doubt on the reliability of linguistic evidence.

#### ➤ *Effectiveness of AI-Generated Text Detection*

The results indicate that the existing detection techniques are constrained in their ability to work. Although statistical and machine learning methods can be utilized to detect some patterns, they are usually ineffective when texts are edited or rephrased (Gehrmann et al., 2019). Besides, AI-generated text is often labeled as a false positive by the detection systems, claiming that the text was created by humans. This is dangerous in legal terms, whereby such mistakes may cause false charges. Such a solution is provided by the methods of watermarking, but they are not applied everywhere and can be evaded (Kirschenbauer et al., 2023).

#### ➤ *AI to Improve Forensic Analysis*

Generative AI also improves forensic abilities despite the difficulties. Artificial intelligence is effective in processing massive data volumes and detecting patterns and assisting investigators in intricate cases (Grieve, 2007). For example:

- Text classification is automated and enhances efficiency
- Multilingual analysis is possible thanks to NLP tools
- Pattern recognition is improved through machine learning models

#### ➤ *Risks of Misinformation and Cybercrime*

This paper highlights the growing use of AI-generated text in cyber crime and disinformation. This enables the generation of large volumes of phishing emails, news and impersonation emails (Zellers et al., 2019). This makes forensic investigations more challenging as analysts.

#### ➤ *Ethical and Legal Issues*

Our findings reveal significant ethical and legal concerns:

- The AI systems may make erroneous conclusions due to bias (Bender et al., 2021).
- Insufficient transparency will lead to a decrease in trust in AI-based evidence (Rudin, 2019).
- Legal admissibility due to failure to meet legal standards (such as Daubert).

### V. DISCUSSION

The application of generative AI in forensic linguistics is a game-changer that challenges the traditional methods in the field, while offering a range of opportunities for improvement. This work has discussed the ever-evolving relationship between the two fields, and how large language models (LLMs) affect the process of authorship attribution, text analysis and admissibility in the court. The paper also draws on the previous studies to deliver a more comprehensive overview of the impact of generative AI to forensic linguistics. The findings confirm that generative AI is disruptive and an opportunity. It challenges the conventional wisdom on linguistic individuality and authorship. On the other hand, it mobilises the powerful data mining and pattern matching technologies. The major issue is that the notion of idiolect is threatened. When AI can generate the idiolect of a person, stylometric analysis is less accurate. The need for new approaches that go beyond the surface linguistic features arises (Stamatatos, 2009).

The other characteristic is explainable AI. Legal systems are built on transparency and accountability, which is not necessarily present in the current AI models. The researchers should be in the process of developing models that can explain their results (Rudin, 2019). There should be an interdisciplinary collaboration between computer scientists, linguists, legal experts and policy-makers to deal with the problems generative AI raises. Finally, the paper points out the need for new legal structures to address the use of AI evidence. Without them, the power and admissibility of forensic linguistic evidence will remain in question. One of the takeaways of this research is that generative AI completely disrupts the fundamental concept underlying forensic linguistics, i.e., that of idiolect. Traditional theories of authorship attribution assume humans have unique and static patterns. However, given that AI systems can mimic these patterns and reproduce them with a high degree of accuracy, this invalidates stylometric studies (Stamatatos, 2009; Brown et al., 2020). As a result, forensic linguistics

must reconsider the effectiveness of traditional approaches and develop more robust techniques that can apply to AI-generated text.

At the same time, the paper refers to the double-edged nature of generative AI as a threat and an opportunity. While AI complicates the process of identifying the author of a work and can facilitate the spread of false information, it also provides forensic linguists with improved data analysis, detection and automation. AI-powered tools can effectively process large amounts of data, identify linguistic irregularities, and help forensic linguists solve complex cases. This demonstrates that AI doesn't necessarily have to destroy forensic linguistics but it needs to be controlled and fine-tuned (Goodfellow et al., 2016). This work also demonstrates the major limitations of the current AI-based detection tools. Despite advances in statistical analysis, machine learning and watermarking, the detection systems remain vulnerable to tampering and are prone to generate false positives. These limitations are quite concerning in the legal field, as accuracy and reliability are critical. Potential mistaken authorship or inaccurate interpretation of evidence highlights the need for improved detection tools and techniques (OpenAI, 2023).

The ethical and legal implications are the main issues in the use of AI in forensic linguistics. AI-generated evidence is questioned by bias, lack of accountability and transparency in the algorithms (Bender et al., 2021; Rudin, 2019). Also, the existing legal framework, such as the Daubert standard, may not be able to cope with the complexity of AI evidence (Smith, 2009). This leads to technological development and legal regulation being in isolation, and requires new guidelines and policies. Generative AI is an issue that requires the collaboration of linguists, computer scientists, law experts, and policy makers to address. This effort may assist in the development of standard practices, ethics and regulations to facilitate the use of AI in crime scenes (Koppel et al., 2009).

## VI. CONCLUSION

In conclusion, generative AI is a challenge and development of forensic linguistics. It may be argued to be a disruption of traditional approaches and pose new risks, but it also has powerful tools for innovation and advancement. The key to the future of forensic linguistics is dealing with such shifts through embracing technological developments, managing ethical and legal challenges and promoting interdisciplinary collaboration. Only with these measures will it be relevant and valid in the age of generative AI.

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