



FEATURE

From Paper Fibers to Content Streams: Evolving FDE Methodology for the Digital Era

By Ron Lawrence

FHDE

As forensic document examiners, most of us built our careers on physical evidence: the weight and characteristics of paper stock, stroke dynamics and letter morphology, line quality under the stereomicroscope, indented writing revealed by an ESDA and the chemical differentiation of inks.

These traditional methods are far from obsolete.
They remain—and will remain for the foreseeable future—
the foundation of our discipline.

But the nature of the
questioned document
is changing rapidly.

Increasingly, the disputed signature, altered contract, or suspicious record arriving for examination is not an original piece of paper. It may be a digital PDF, an electronically generated document, or a file that has existed in multiple digital forms before it ever reaches our hands.

That presents us with a new question:

Are we prepared to examine the document beyond what our eyes can see on the page?

LOOKING BENEATH THE SURFACE



I recently attended a presentation by Celeste Makoff of DeepData Forensics on the examination of PDF “deep metadata.” Her presentation was, for me, an absolute wake-up call.

Like many in our field, I will readily admit that I am no computer scientist. The technical architecture hidden inside digital files has often seemed like a discipline best left to IT specialists. But watching Celeste unpack the hidden life of a PDF (examining software information, timestamps, modification information, embedded objects, and the underlying structure of the file), made something very clear to me:

The digital structure of a document can contain evidence about its history.

Continued on the next page.



FEATURE

From Paper Fibers to Content Streams: Evolving FDE Methodology for the Digital Era

By Ron Lawrence
FHDE

Continued from the previous page.

It is not identical to physical evidence such as paper fibers or ink, of course. But conceptually, the approach is familiar. We examine the characteristics that exist beneath the visible surface and ask what those characteristics can tell us about how a document came to exist in its present form.

And perhaps most importantly, we do not necessarily need to become programmers to begin doing that.

We learned to examine paper without becoming paper mill technicians. We learned to evaluate inks without becoming chemists. We learned to interpret microscopic characteristics without becoming optical engineers.

We can approach digital evidence in much the same way: learn what it is, understand its limitations, and develop a disciplined method for evaluating it.

Applying the Examiner's Mindset to Digital Evidence

The examination of digital documents can be approached with the same fundamental mindset that has served our profession for decades: observe, document, compare, evaluate, and reach conclusions based on demonstrable characteristics.

Object and Structure Examination

A PDF is not simply a picture of a page. It is a structured digital container composed of elements that may include text, images, fonts, annotations, form fields, and other objects.

Examining those underlying elements can sometimes reveal information that is not apparent from the visual appearance of the document. Differences in object structure, unexpected elements, or inconsistencies within the file *may* provide avenues for further examination.

Digital characteristics should not automatically be interpreted as proof of alteration. Rather, as with any forensic evidence, they are observations that must be considered within the context of the entire examination.

Font and Content Examination

Digital text can carry characteristics that are invisible in a printed representation. Font information, embedded subsets, content streams, and other structural elements may provide useful information when determining how portions of a document were created or subsequently modified.

A critical inquiry is whether visually uniform content shares a consistent digital origin and creation stream. That question may not always have a definitive answer. But it is a question worth asking.

Continued on the next page.

The important
word here is
may.



FEATURE

From Paper Fibers to Content Streams: Evolving FDE Methodology for the Digital Era

By Ron Lawrence
FHDE

Continued from the previous page.

Timestamps and Revision Information

Some PDF files retain information associated with their creation or subsequent modification. Certain PDF structures can also contain incremental updates rather than simply replacing everything that came before.

When available and properly interpreted, such information can provide another avenue for investigating a document's history.

Again, caution is essential. A timestamp is not necessarily proof of when a person created or modified a document, just as the presence of a particular ink does not, by itself, establish who wrote a signature.

Digital evidence requires interpretation, validation, and context—just like physical evidence.

AND THEN THERE IS AI

Digital document examination is only one part of the technological landscape facing our profession.

Artificial intelligence presents us with a particularly interesting, and potentially unsettling, development.

The Threat: AI-generated Signatures

We are entering an era in which artificial intelligence and related technologies can produce increasingly convincing simulations of handwriting and signatures.

That possibility deserves serious attention.

If an artificial system can reproduce some of the visual characteristics traditionally associated with natural handwriting—including variation in form and other characteristics that contribute to a convincing appearance—the examiner may eventually be confronted with questioned material that cannot be adequately evaluated by simply looking at a printed image.

This does not mean that our traditional methods suddenly become irrelevant.



Continued on the next page.



FEATURE

From Paper Fibers to Content Streams: Evolving FDE Methodology for the Digital Era

By Ron Lawrence
FHDE

Continued from the previous page.

Whether evaluating a cryptographically executed digital signature or a visually generated signature simulation, the questions we ask must evolve.

Was the questioned writing produced by a human writer? Was it electronically generated? Was an authentic signature digitally reproduced? Was an image manipulated before being incorporated into a document?

These are questions that may increasingly intersect with traditional handwriting and document examination.

The Opportunity: AI as a Tool

There is another side to this discussion, and it is one I believe deserves equal attention.

We should not allow fear of new technology, or skepticism about it, to prevent us from learning what these tools can actually do.

AI cannot replace the examiner, nor can it serve as an independent forensic authority.

Because AI models operate as predictive pattern-matching systems rather than deterministic analytical engines, final evaluation and opinion remain strictly with the human expert.

But AI can potentially serve as an extraordinarily useful tool. It can assist with organizing large quantities of information, identifying patterns in data, structuring preliminary drafts, proofreading reports, helping organize comparative material, and performing other administrative tasks. Used appropriately, these capabilities could save an examiner considerable time. And time saved on administrative work is time that can be devoted to what matters most: the examination itself.

The key is not to surrender our judgment to technology. The key is to understand the technology well enough to use it intelligently and to recognize when it should not be used.

Curiosity Is Part of Our Profession

This is precisely why the upcoming SAFE 2026 conference is so exciting. We have a lineup of expert presenters who will help demystify AI, explain what these technologies can and cannot do, and explore both the risks and opportunities they present.

For some of us, the terminology may initially sound intimidating. That's okay.

We have been here before.

Our profession has repeatedly incorporated new technologies and methodologies. The stereomicroscope, ESDA, video spectral comparison, digital imaging, specialized software, and other technologies were all, at one time, new tools that required examiners to learn something unfamiliar.

Continued on the next page.



FEATURE

From Paper Fibers to Content Streams: Evolving FDE Methodology for the Digital Era

By Ron Lawrence
FDE



Having spent most of his formative years abroad in non-English speaking countries, Ron developed an early fascination with foreign languages, scripts, and character forms. This global perspective led him to earn a Bachelor's degree with an emphasis in graphic design and typography, setting the foundation for a successful 30-year design career.

Seeking a new discipline that combined his love of typography with complex problem-solving, Ron completed Reed Hayes' *Training Course in Questioned Handwriting and Document Examination* in 2021.

In 2022, he joined SAFE and established his practice, Dubious Documents, in Oakland, California.

Continued from the previous page.

We didn't stop being forensic document examiners when those technologies arrived. We became better examiners because we learned how to use them.

I don't think this moment is any different.

Building our knowledge of digital metadata, artificial intelligence, and emerging technologies isn't about discarding the science that brought us here. It is about making sure our expertise remains relevant to the documents we are actually being asked to examine.

And there is something particularly encouraging about that. We don't have to know everything today. We don't have to become programmers. We don't have to understand every algorithm, every file structure, or every emerging AI model. We simply have to remain willing to learn.

Our greatest professional asset has never been a particular piece of equipment or software. It has been our ability to observe, question, investigate, and think critically. Those skills don't become less valuable in a digital environment. They become more valuable.

So the next time a PDF lands on your desk, perhaps ask yourself a slightly different question: ***What is this document telling me beyond the visible page?***

The answer may be worth investigating. And perhaps the most important thing we can bring to this new frontier is not technical expertise, but the same curiosity that has always driven good forensic examination.

**The documents are changing.
Our science is evolving.**

And our opportunity is to evolve with it.