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Human-AI Collaboration in Writing: A Multidimensional Framework for Creative and Intellectual Authorship

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Abstract: The integration of AI technologies into the writing process has significantly altered traditional notions of authorship, creativity, and intellectual labor. Historically, writing was seen as a human-driven cognitive and creative exercise, but with the rise of generative AI tools such as ChatGPT and Claude, the line between human and AI contributions has become increasingly ambiguous. This paper addresses the limitations of the current sliding scale model, which views AI involvement as ranging from "none" to "complete". In its place, we propose a new multidimensional framework that more accurately reflects the complexity of human-AI collaboration in writing. The model includes axes for content generation, structural assistance, creative input, and analytical contribution, emphasizing the varying degrees of interaction between human writers and AI tools. This framework highlights how AI can assist in different aspects of writing without fully replacing human agency, while also underscoring the importance of ethical and intellectual accountability. By providing a more comprehensive understanding of the collaborative dynamics between humans and AI, this paper offers a foundation for future research into optimizing these interactions in creative and academic contexts.

Keywords AI authorship, human-AI collaboration, generative writing, authorship ethics, writing frameworks

1. Introduction

Writing is a multifaceted process defined as the act of creating a persistent representation of language through a system of symbols, such as letters or characters, that allows thoughts and ideas to be communicated across time and space. Importantly, according to Merriam-Webster [1], writing is both an action ("the act or process of one who writes") as well as a product ("something written"). It serves as a method for translating spoken language into a visible form, thereby preserving communication in a more permanent medium compared to speech, which is ephemeral. This broad definition includes diverse forms of writing—from ancient inscriptions on clay tablets to modern-day word processing and digital text production. While speech and writing are both based on the structures of language, writing often adopts distinct forms and functions, offering new possibilities for creativity, analysis, and expression that transcend oral communication. These forms, shaped by cultural evolution, have led to sophisticated systems of cognitive engagement in writing, particularly in computer-assisted environments where both adolescents and adults alike demonstrate complex mental activities while composing texts [2].

The development of writing systems varies across cultures. Early forms, such as the cuneiform script of Mesopotamia, initially emerged for practical purposes like accounting and gradually evolved to more accurately reflect spoken language. This progression highlights the dynamic relationship between written and oral communication, where writing serves as both a representation of language and a tool for complex societal needs. Today, writing encompasses an extensive range of tools and formats, spanning manual handwriting and typewriting to advanced digital text generation supported by sophisticated AI technologies. These advancements not only transform the tools at our disposal but also significantly influence the cognitive processes underlying writing. For instance, collaborative learning in writing environments—particularly in second-language instruction—has been shown to reduce cognitive load and enhance the quality of written output [3]. In such contexts, students engage in shared efforts that foster deeper understanding and facilitate more effective writing practices. Consequently, writing transcends its utilitarian functions, such as record-keeping, to emerge as a vital medium for artistic and intellectual expression. Through its evolving forms, writing continues to contribute to fields as diverse as literature, science, and philosophy, underscoring its centrality in human creativity and knowledge dissemination.

In its essence, writing is not merely transcription; it enables deeper cognitive engagement, allowing individuals to externalize their thoughts for reflection and revision, which adds value to human expression and knowledge creation. This process is even more profound when we consider the social and affective dimensions of collaborative writing. Recent studies have demonstrated how social interaction during writing tasks can significantly influence the cognitive engagement of learners, enhancing both their learning experience and writing performance [4]. As writing systems continue to evolve, the intersection of technology, social collaboration,

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and cognitive engagement will further transform how we understand and engage with the writing process.

The rapid advances in AI and related technologies have necessitated a profound reevaluation of what is meant by writing as both a product and a process. Traditionally, writing was seen as a manual or cognitive effort undertaken by an individual or a group, involving tools such as quills, pens, typewriters, and eventually word processors. The human role was clear: it was the person who formulated ideas, structured them, and produced the text, be it a literary piece, legal document, or even a simple note. However, with the advent of AI, the boundaries between human-generated and machine-generated content have blurred. AI systems like ChatGPT, for instance, now assist in brainstorming, drafting, revising, and even producing entire compositions, shifting the role of the human author from that of a creator to an editor or supervisor of AI-generated drafts [5]. This new dynamic invites a reconsideration of the traditional framework of authorship, as technology transforms how text is conceived and produced.

This shift challenges the long-held notions of authorship and intellectual labor. Writing as a product is no longer solely the tangible result of human thought, time, and effort. The capacity of these tools to autonomously generate coherent and substantive texts forces us to reconsider the value of time-intensive work and the signals of labor traditionally embedded in the final product [6]. The distinction between "AI-written" and "human-written" text is becoming less about the origin of the content and more about how humans and machines collaborate to optimize the writing process. As a result, the notion of creative authorship is becoming increasingly complex, raising questions about the ethical and intellectual ownership of such hybrid works [7]. The implications of these changes extend beyond mere productivity and efficiency; they reshape the meaning of human contribution in creative and academic domains.

This situation requires a reconsideration of the frameworks used to teach writing. In educational environments, writing has traditionally been framed as an individual cognitive exercise aimed at developing students' critical thinking and expressive abilities. However, with AI tools playing a more prominent role in text generation and editing, educators and scholars must develop more nuanced approaches that incorporate AI as a collaborative partner. This includes rethinking the learning objectives for writing courses, focusing not only on developing personal writing skills but also on the capacity to critically engage with AI-generated content. The hybrid nature of modern writing presents both opportunities and challenges for educators seeking to balance the roles of human creativity and machine efficiency in their pedagogical practices [8].

Historically, English composition courses have played a crucial role in academia, based on the premise that writing is an extension of thinking [9–13]. These courses aimed to cultivate students' ability to express thoughts clearly and cohesively, thereby enhancing their critical thinking and analytical skills [14]. Writing assignments were fundamentally seen as reflections of students' intellectual engagement and understanding [15]. However, with the advent of generative AI, these traditional paradigms are being re-evaluated. The challenge of distinguishing between AI-generated and human-generated text complicates the ability to assess students' genuine capacity to express original ideas. This blurring of authorship roles directly impacts the pedagogical objectives of teaching writing and research, necessitating a shift in instructional approaches. Concerns continue to grow that students might rely excessively on AI for text generation, thereby diminishing opportunities to hone their analytical and writing skills and potentially undermining academic integrity [16].

The concept of the "author-function", famously articulated by Michel Foucault in response to Roland Barthes' seminal essay *The Death of the Author* [17], posits that the author is no longer the sole dictator of meaning, reception, and value in a text. This poststructuralist viewpoint, which gained traction in academia, suggests that meaning is constructed not exclusively by the author's intentions but also through readers' interpretations and the socio-cultural context of the text. Despite the acceptance of this academic position, society has largely retained a romantic notion of human exceptionalism, where creativity is regarded as an innately human attribute. This belief has long been central to traditional ideas of authorship and personal agency. However, the growing presence of AI in text production complicates this narrative, further challenging the long-standing notions of individual ownership and creativity in writing.

In contemporary discourse, the ambiguity surrounding authorship and authenticity persists, particularly as AI-driven technologies increasingly challenge traditional roles [18, 19]. Historically, technological advancements in writing tools—such as word processors and digital editing platforms like Grammarly—faced initial resistance within academia, especially from educators who feared these tools would obscure students' authentic voices and ideas [20]. Despite these concerns, tools like Grammarly became normalized, much like the broader acceptance of ghostwriters and speechwriters in political and professional realms, where the use of teleprompters and pre-written speeches has long been standard practice [21, 22]. This normalization of assistance, whether from human or machine, reflects a pragmatic understanding of authorship outside academia, as it is now seen as part of a broader communicative process, rather than the sole domain of individual authorship. The emergence of AI intensifies these discussions, as the line between "authorship" and "collaboration" grows ever more indistinct [23].

Now, generative AI tools like ChatGPT, Claude, and others complicate these dynamics further. We are witnessing the classification of writing into a sliding scale (Figure 1): human-only, human-AI collaboration, and fully automated content generation. English faculty, once resistant, are slowly acknowledging this tripartite framework, but even this framework is rapidly becoming outdated [24]. The distinctions between these categories are increasingly blurred, as collaborative processes evolve and require more complex language to describe the interplay between human agency and machine assistance in writing tasks. As our workflows change, a new lexicon will inevitably emerge to differentiate between varying levels of AI involvement in authorship.

This evolving landscape can be conceptualized as a spectrum of human-AI collaboration. At one end lies the human-driven process,

Figure 1
Types of writing in age of AI

where tools are employed merely to assist the writer within pre-existing human-organized workflows. At the other end, humans become operators of highly automated AI systems, where their role is reduced to ensuring that the tool functions effectively. In the middle lies the space of hybrid collaboration, where humans redesign their workflows and information systems to be compatible with these generative assistants, but still retain meaningful agency over tasks that cannot be fully automated without sacrificing their core value. As we move forward, the most productive and meaningful work will likely come from individuals who adapt their methods to work harmoniously with AI without relinquishing their essential role in the creative and intellectual process. This reconfiguration will necessitate new ways of thinking about writing, authorship, and creativity, urging us to reconsider how we define what it means to "write".

2. Defining Writing

Writing, as a concept, has long been intertwined with the idea of intellectual rigor and the transmission of knowledge across time. No less than Plato, in his dialogue *Phaedrus* (14, 274c–275b), recounts a discussion by Socrates concerning the invention of writing. In the myth, the Egyptian god Theuth presents writing as a gift, but the Pharaoh warns, "For this invention will produce forgetfulness in the minds of those who learn to use it, because they will not practice their memory. Their trust in writing... will discourage the use of their own memory within them. You have invented an elixir not of memory, but of reminding; and you offer your pupils the appearance of wisdom, not true wisdom..." (Plato, *Phaedrus*) [25]. This critique, presented thousands of years ago, remains relevant in today's discourse surrounding AI-generated writing, where the overreliance on external tools may erode the personal mental faculties traditionally exercised through the act of writing. Just as writing once threatened memory, AI now appears to challenge the cognitive and creative tasks long associated with human intellect.

The definition of "writing" from Merriam-Webster [1] offers a broad and flexible understanding of writing as both a process and a product. As a process, writing involves activities like physically inscribing characters, composing texts, or organizing ideas into coherent linguistic systems. This can range from traditional manual acts such as handwriting to the digital production of text using computers or AI. The historical evolution of writing technologies—starting from inscriptions on stone and clay to the current use of AI writing tools—demonstrates an ongoing transformation in how writing is understood [26]. Writing as a product, therefore, encompasses not only the final text but also contracts, legal documents, and even computer programs. These varied forms reflect an expanded definition of writing that transcends earlier conceptions of authorship and manual labor, illustrating that writing as an intellectual process has always adapted to technological advancements.

Historically, the human role in writing was manual and labor-intensive. Writers physically inscribed texts with tools like quills or styluses on surfaces such as clay or paper, a practice that required considerable time and effort [27]. The advent of the typewriter and later word processors allowed for more efficient text production, while still keeping humans in the central role of idea generator and text composer [28]. However, with the development of AI-driven writing assistants, the nature of writing has expanded further to include multiple forms of mediation in text production. AI tools like ChatGPT and Claude now enable writers to accelerate their processes, drafting, editing, and iterating faster than ever before. While previously, a writer might be constrained by their individual skills, modern writing technologies facilitate interactions between human creativity and machine efficiency. As a result, AI serves not only as an enhancement to productivity but also as a collaborator, thereby challenging the traditional notion of writing as a strictly human endeavor.

In light of these changes, writing as a product now includes a wider array of outputs, from traditional literary works to AI-generated summaries, business contracts, and even software code [29]. The evolution of writing tools has gradually altered the relationship between writer and text, shifting from the author being a central agent of creativity to becoming a collaborator with machines that can independently generate content. As AI increasingly takes on roles in brainstorming, drafting, and revising texts, the role of the human writer evolves from creator to supervisor or editor, thus challenging long-held ideas about creativity and authorship. This shift complicates the distinction between human and machine contributions to writing, leading to a reevaluation of what authorship means in an age where AI tools can independently create coherent and meaningful texts.

The redefinition of authorship and the role of AI in writing directly relates to the Foucauldian notion of the "author-function". Foucault [17] argued that the identity of the author is not necessarily tied to the creation of meaning in a text. Instead, he saw the author as a function that emerges from the social and historical conditions surrounding a work. In contrast to earlier views that elevated the author as the sole origin of meaning, Foucault positioned the author as a construct whose purpose is to regulate meaning, categorization, and the circulation of texts in society. In the context of AI-generated writing, this perspective becomes even more salient. When AI contributes significantly to the creation of a text, the "author-function" shifts from being tied solely to human creators to encompassing the technological processes that mediate the text's production and reception.

Foucault's intervention was crucial in undermining the myth of human exceptionalism in authorship. He challenged the romanticized notion of the solitary genius author and suggested that meaning is generated by complex interactions between the text, the reader, and the broader socio-cultural context. This perspective resonates today, especially as AI-generated content becomes increasingly indistinguishable from human-written text. The ongoing debate around AI tools like ChatGPT reflects a need to reconsider not only the function of the author but also the boundaries between human creativity, technological assistance, and authorship. AI challenges the long-held belief that the author is the sole agent of creation, prompting us to rethink what it means to be an "author" in an age where machines can autonomously create content.

As AI technologies become integral to writing processes, the distinction between human-generated and AI-generated text becomes less significant, necessitating new frameworks for understanding authorship. The line between human and machine contributions continues to blur, making it increasingly difficult—and perhaps unnecessary—to draw clear boundaries between the two. Instead of focusing on the origin of a text, the emphasis is likely to shift toward evaluating the effectiveness of collaboration between humans and machines in producing coherent, creative, and purposeful works. This evolution requires a fundamental reexamination of traditional authorship norms and the adoption of ethical frameworks that transparently acknowledge the contributions of both human and AI agents. As writing processes evolve, the very concept of what it means to "write" will transform, prompting ongoing reflection on the balance between human creativity and machine-assisted efficiency.

The landscape of AI writing tools reflects a diverse range of functionalities and impacts, each contributing uniquely to the

writing process. For instance, ChatGPT and Claude are advanced generative AI platforms designed to assist with tasks such as brainstorming ideas, drafting text, and refining arguments. These tools are particularly adept at generating coherent, contextually relevant content from minimal prompts, making them invaluable for tackling complex writing projects or overcoming writer's block. In contrast, tools like Grammarly focus on editing and proofreading, providing immediate feedback on grammar, syntax, and style while enhancing the clarity and readability of text. Grammarly's strength lies in its ability to identify mechanical issues and suggest improvements without altering the creative essence of the writing. Together, these tools highlight the spectrum of AI functionalities—from idea generation to detailed refinement—allowing users to tailor their writing processes to specific needs and objectives.

The varying impacts of these tools also underscore the collaborative potential between humans and AI in shaping the final output. While generative tools such as ChatGPT and Claude actively contribute to content creation, Grammarly and similar platforms excel at enhancing the technical quality of text. This differentiation suggests that integrating multiple AI tools into a single workflow can maximize their collective strengths, offering a more comprehensive approach to writing. For example, a writer might use ChatGPT to generate a first draft, refine its structure with Claude, and finalize the text with Grammarly's stylistic and grammatical suggestions. Such an approach exemplifies the multidimensional collaboration between human creativity and AI capabilities, underscoring the need to explore these tools' roles in redefining writing processes and authorship in a machine-assisted world.

3. Writing as Process and Product

The standard writing process as taught in secondary and postsecondary composition classes is generally structured around a series of iterative stages, each building on the previous one to guide students toward producing polished and coherent texts (Table 1) [30]. This process begins with prewriting, where students engage in brainstorming, research, and outlining. This stage is crucial for idea generation and organization before any formal writing takes place. Next is drafting, where students start composing the first version of their text, focusing on developing their ideas rather than worrying about perfection. Revising comes after drafting, during which students critically evaluate the structure, clarity, and coherence of their work, often making substantial changes to improve the flow and argument.

Following this is the editing stage, which focuses on refining the mechanics of writing—grammar, punctuation, and style. Finally, publishing or submitting the final draft concludes the process, representing the polished product that incorporates all the previous steps. Feedback loops are also emphasized, particularly in postsecondary education, where peer review and instructor feedback play an important role in revision and improvement. This process highlights that writing is not a linear activity but a dynamic and recursive one. It emphasizes that good writing emerges from rethinking and revising, not from the perfection of a single draft. As writing instruction has evolved, there has been increasing emphasis on the rhetorical nature of writing, encouraging students to consider audience, purpose, and genre at every stage.

In the writing process, the role of the instructor and the student is dynamic and varies across each stage, particularly in how it influences authorship [31]. During prewriting, the instructor helps students generate ideas, guiding them toward considering audience, purpose, and genre, which are essential to shaping the author's voice. In this stage, the student acts as the primary creator of content, exploring ideas and organizing them based on personal insights. As the process moves to drafting, the student remains central to authorship, developing arguments and ideas into structured text. The instructor's role becomes more advisory, offering frameworks or models for structuring writing but allowing the student to own the initial articulation of ideas.

In revising and editing, the instructor plays a crucial role in providing feedback on coherence, clarity, and grammatical accuracy. Here, the instructor acts as a collaborator, encouraging students to view writing as a recursive process. The student must balance this feedback with their original intent, making revisions while retaining a sense of authorship over the work. In this phase, the student navigates the tension between external critique and personal voice. By the time of publishing, the student's sense of authorship is solidified, as they integrate feedback and present the final product. Authorship in the writing process, therefore, is co-constructed between instructor guidance and student agency.

When integrating AI tools like ChatGPT or Claude into the writing process, the workflow fundamentally shifts from the traditional model to one that emphasizes augmentation, co-intelligence, and collaboration (Table 2). In the standard writing process, the student remains the primary author, responsible for drafting, revising, and refining content based on feedback from instructors. However, with AI tools, certain stages of this process, particularly drafting and revising, become collaborative efforts between the student and the AI. AI tools can assist students in brainstorming, drafting, and even revising content by generating ideas, suggesting improvements, and correcting grammar in real-time. This augmented writing process allows students to rapidly produce and iterate on text, leveraging AI's ability to generate drafts based on prompts or enhance the quality of their writing with refined suggestions. Unlike the traditional writing process, where instructors often serve as the sole source of guidance and feedback, AI becomes an intermediary, providing instant feedback and content generation that augments the student's efforts.

The role of the instructor also evolves. Instead of focusing exclusively on guiding students through each stage of the writing process, instructors now emphasize teaching students how to effectively collaborate with AI tools. This includes guiding students in refining their prompts, critically evaluating AI-generated text, and integrating AI suggestions while maintaining their original voice and intent. The instructor's role shifts toward helping students develop discernment in using AI, ensuring that the tools enhance their creativity and critical thinking rather than replace them. This AI-assisted process is more efficient but also raises questions about authorship. Whereas students in the traditional process own the entirety of their work, the involvement of AI introduces a collaborative aspect that complicates traditional notions of sole authorship. This evolving dynamic requires both students and instructors to rethink what it means to "write" in the age of AI.

In such a process, the tripartite divisions in Figure 1 can be further elaborated on in Table 3. In the context of Human-only writing, content generation, structural assistance, and creative input are all human-driven, with authors fully responsible for their ideas, structure, and style. The interpretive and analytical work, too, is solely carried out by humans, ensuring that ethical and intellectual accountability remains entirely on the individual writer. This traditional form of writing places complete control in the hands of the author, who must handle all aspects of the process. In Human-AI collaboration, the boundaries between human and AI input become fluid. AI tools contribute to content generation, offering drafts or text suggestions that the human author refines or edits. Structural assistance also becomes a shared responsibility, as AI might

Table 1
Traditional writing process: Roles and stages in secondary and postsecondary composition

Stage	Description	Key activities	Focus
Prewriting	Brainstorming, researching, and outlining ideas before formal writing begins.	Idea generation, organizing thoughts, creating outlines.	Developing concepts, identifying purpose and audience.
Drafting	Writing the first version of the text, concentrating on getting ideas onto paper without worrying about perfection.	Composing paragraphs, developing arguments, and expanding on ideas.	Content creation, structuring main points.
Revising	Critically evaluating the draft for clarity, structure, and coherence; making significant changes to improve the text.	Reorganizing content, strengthening arguments, and reworking sections.	Improving logical flow, coherence, and clarity.
Editing	Refining the mechanics of the text, focusing on grammar, punctuation, and style corrections.	Proofreading, correcting errors, refining language.	Polishing language, ensuring grammatical accuracy.
Publishing	Finalizing and submitting the polished text, either for feedback or final assessment.	Submitting the final draft and sharing with audience.	Presentation and dissemination of the final product.
Feedback	Peer and instructor feedback is often incorporated during the revision and editing stages.	Reviewing and incorporating suggestions.	Enhancing quality based on external input.

Table 2
AI-Augmented writing process: roles of author, AI, and instructor

Stage	Author's Role	AI's Role	Instructor's Role
Prewriting	Brainstorming, generating ideas, outlining concepts, and identifying key arguments.	Assists with idea generation, provides outlines based on prompts, and suggests related topics.	Guides students on how to effectively use AI for brainstorming and organizing ideas, focusing on maintaining original thought and intent.
Drafting	Writing the first draft, expanding on ideas and arguments.	Generates drafts based on detailed prompts, suggests sentence structures, and provides content to fill gaps.	Teaches students how to engage critically with AI-generated drafts and ensure their original voice remains intact. May review and provide feedback on the student's use of AI tools.
Revising	Reviewing and improving content for clarity, coherence, and structure.	Offers suggestions for rephrasing, reorganizing text, and improving grammar and style. Can suggest alternate ways to express ideas.	Encourages students to integrate AI suggestions while ensuring the revision aligns with the assignment's goals. Provides higher-level feedback on argument strength and clarity.
Editing	Polishing language, correcting grammar, punctuation, and formatting.	Provides real-time grammar and punctuation corrections, style adjustments, and formatting suggestions.	Reviews final drafts, ensuring accuracy and proper language use. Guides students in using AI tools responsibly and accurately.
Publishing	Finalizes the document for submission or presentation.	Can help with formatting and ensuring the final draft meets stylistic requirements.	Assesses the final product for both content and adherence to academic standards. May provide feedback on the student's use of AI during the process.
Feedback Loop	Reflects on feedback from AI and instructor, incorporating revisions and improvements.	Provides instant feedback on text structure, style, and grammar during revisions.	Offers deeper, contextual feedback, helping students improve critical thinking and analytical skills.

suggest ways to organize arguments or maintain coherence, while the human adjusts these suggestions to fit their vision. Similarly, the tools may enhance creative input by proposing stylistic revisions or word choices, but the final decisions on tone and narrative remain with the human author. This dynamic extends to the analytical and interpretive dimension, where AI can assist in processing data or critiquing text, but humans retain ultimate control over interpreting results. Ethical and intellectual accountability in this collaborative space requires transparency about the extent of involvement with different tools, while human authors remain responsible for the final product.

In the AI-only writing mode, AI takes the lead in generating content, organizing structure, and even influencing creative elements with little human intervention. Here, AI autonomously

Table 3
Alignment of human-AI collaboration in writing

Writing Mode	Content Generation	Structural Assistance	Creative Input	Analytical & Interpretive Contribution	Ethical & Intellectual Accountability
Human-only Writing	All original text is produced by the human author, with no AI intervention. The human is responsible for developing ideas, creating drafts, and refining content.	The human author organizes ideas, structures arguments, and ensures logical flow and coherence without AI assistance.	All stylistic choices, tone, and narrative decisions are made by the human author, relying entirely on human creativity and insight.	All analysis, data interpretation, and critiques are performed by the human author, without any AI involvement.	Full ethical and intellectual responsibility lies with the human author, who is accountable for originality, accuracy, and adherence to ethical standards.
Human-AI Collaboration	AI generates portions of the text or provides suggestions for content generation, but the human refines, edits, or augments the material to fit their overall vision.	AI assists by suggesting ways to organize the text, improve flow, or structure arguments, while the human author oversees and adjusts these suggestions.	AI may offer stylistic recommendations or alternative phrasing, but the human ultimately decides on tone, voice, and creative direction to maintain originality.	AI may assist in analyzing data or offering critiques, but the human author interprets the data and finalizes the conclusions.	Responsibility is shared; AI's role must be transparently disclosed, but the human author remains accountable for ensuring the final content adheres to ethical and intellectual standards.
AI-only Writing	AI takes the lead in generating most or all content based on human prompts. The human may have minimal input beyond providing initial guidance.	AI autonomously organizes ideas and structures the text with little to no human intervention.	AI-driven creative decisions dominate, including narrative flow and stylistic elements, with minimal to no human oversight.	AI conducts the majority of analytical tasks and data interpretation with minimal human input, especially in fields that rely on data processing and factual outputs.	Human oversight is still required for ensuring the ethical and intellectual validity of the AI's output, particularly regarding transparency, originality, and professional standards.

handles most aspects of the writing process, producing text based on prompts with minimal oversight. The AI may also analyze data or contribute interpretive insights, especially in specialized fields, though humans may be involved only in reviewing or fine-tuning the final output. Despite AI's predominant role, ethical and intellectual accountability still lies with human supervisors, who must ensure the material meets academic, ethical, or professional standards. This model emphasizes the importance of human oversight in ensuring the transparency and accuracy of AI-generated content, even when AI assumes most of the work.

The integration of AI tools such as ChatGPT and Claude in academic writing is reshaping how authorship is understood within scholarship. Academic publishers are now establishing explicit guidelines to regulate the use of these AI tools in the writing process. Journals like Nature and publishers like *Taylor & Francis* emphasize that while AI can assist in drafting or editing content, the final responsibility for the work remains with the human author. AI cannot be credited as an author; instead, any use of AI must be transparently disclosed, typically in sections like the methodology or acknowledgments, depending on the contribution it made to the research or writing process [32]. This reflects an in-between phase in scholarship, where AI's role is increasingly acknowledged but carefully managed to preserve the perceived value of human expertise. For example, publishers have clarified that the use of AI for tasks such as generating summaries or organizing data should be disclosed, as these tasks affect the interpretation of scholarly work. The guidelines vary across disciplines, with fields like STEM often being more receptive to AI involvement in technical aspects of writing, while the humanities still place a strong emphasis on human authorship and creativity. This distinction highlights how academia values human agency and critical thinking, particularly in areas where interpretive work and subjective insights are central to scholarship.

Academic publishers are increasingly acknowledging the dynamic and complex roles that generative AI tools and human authors play in the writing process [33]. As AI technologies such as ChatGPT, Claude, and similar models continue to evolve, publishers have begun to differentiate between the types of contributions these tools make—whether assisting with drafting, improving grammar, or organizing data. The human author remains accountable for the final content, but the use of AI tools must be disclosed, ensuring transparency and maintaining the integrity of academic work. This evolving relationship between AI and human authorship highlights the need for better frameworks to understand the nature of these collaborations. As generative AI tools become more advanced and integrated into academic writing, scholars and institutions will need to explore more nuanced models to classify the contributions of AI and to determine how credit is assigned. These frameworks

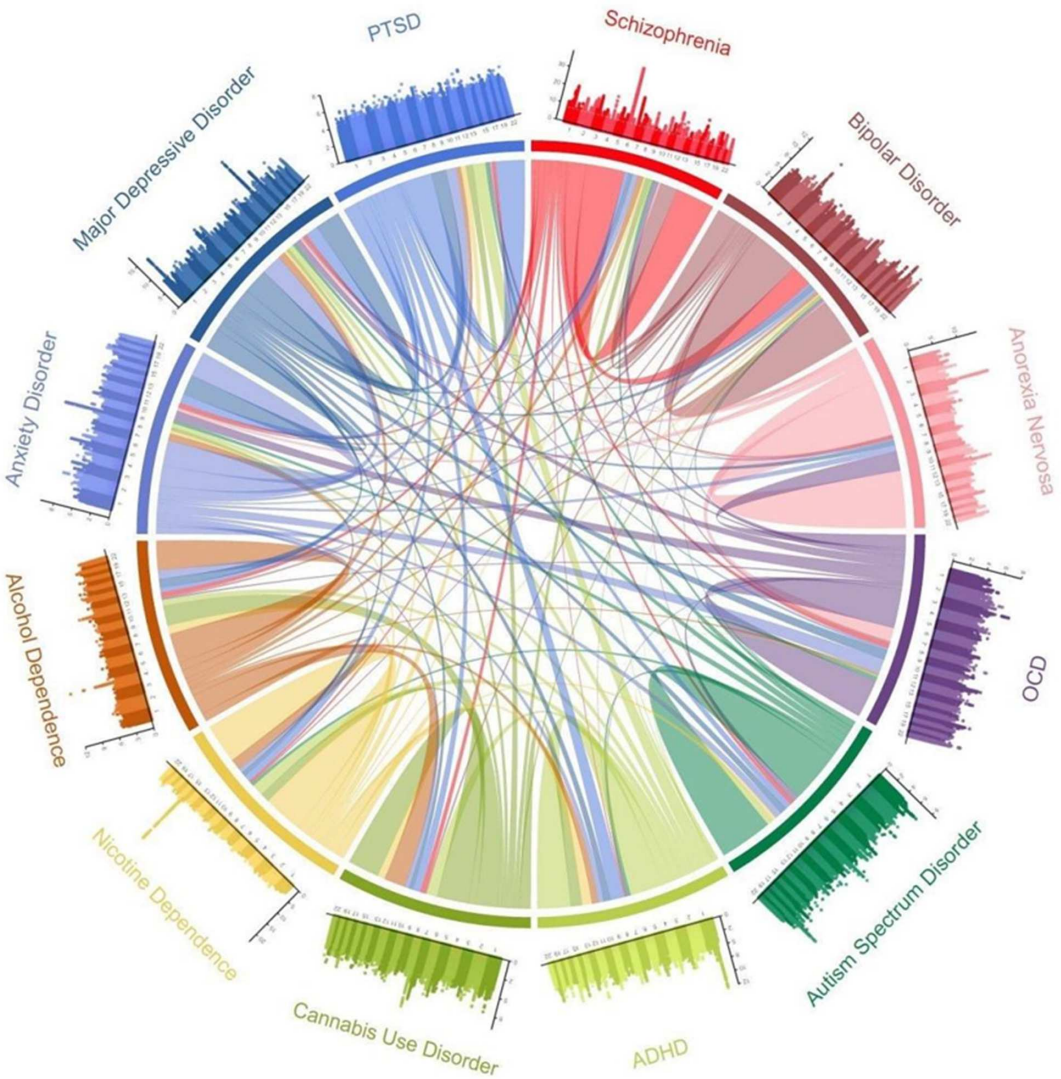
must reflect not only the increasing sophistication of AI but also the unique interpretive and critical roles that human authors play in producing meaningful, contextually accurate scholarship. Understanding this dynamic will be essential for moving past this phase we are currently in and accepting the process for creating new knowledge in a field that has fundamentally changed.

4. Theorizing a New Framework for AI-Assisted Writing

As it stands, the current model of AI-assisted writing operates along a sliding scale, ranging from human-only content creation to fully automated AI-generated text. At one end of the spectrum, we have human-only writing, in which the author is solely responsible for generating, editing, and refining the text, using traditional tools like word processors. At the other end, we encounter fully automated writing, where AI tools generate entire bodies of text with minimal human intervention—often based on a prompt. Between these two poles lies human-AI collaboration, where AI functions as an assistant that helps the author with tasks such as drafting, rephrasing, brainstorming, or grammar correction. However, this sliding scale, while useful for understanding basic interactions between humans and AI in writing, is becoming insufficient for capturing the intricacies of this evolving process. AI tools like ChatGPT, Claude, and others are no longer just assisting with mechanical tasks; they are becoming more embedded in the creative, analytical, and structural aspects of writing. The roles AI can play—such as generating ideas, enhancing narrative cohesion, or even shaping arguments—are far more nuanced and diverse than the current models suggest. As a result, a new framework is required to better conceptualize the collaborative dynamic between AI tools and human authorship, one that recognizes the fluidity and complexity of these relationships.

Another way to understand the more nuanced understanding of writing with AI is to relate it to neurodiversity studies. Figure 2, for instance, presents a circular chord diagram that illustrates the interconnectedness and comorbidities between various neurodevelopmental and psychological disorders. Each disorder is represented around the circumference, such as schizophrenia, bipolar disorder, autism spectrum disorder (ASD), ADHD, OCD, and others like PTSD and alcohol/nicotine dependence.The colored lines or

Figure 2
Chord diagram of neurodevelopmental and psychological disorders



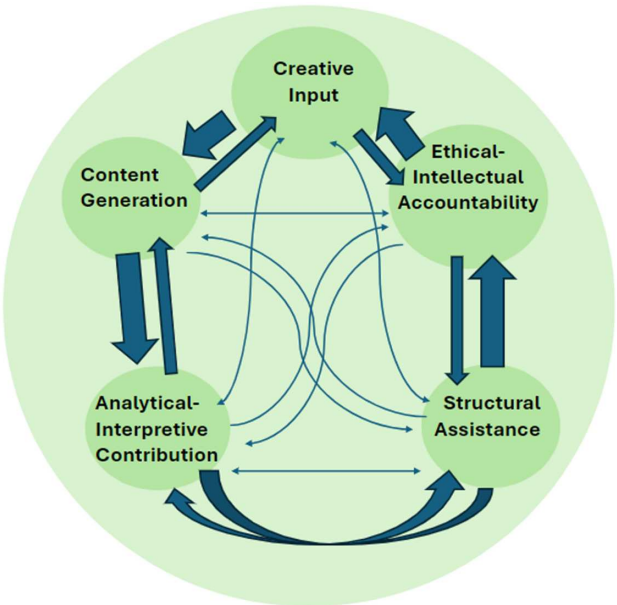
chords flowing between these conditions signify their comorbid relationships, showing how individuals diagnosed with one condition frequently also experience symptoms or diagnoses of another. For example, there are connections between ASD and ADHD, as well as relationships between anxiety disorders, major depressive disorder, and other conditions [34].

This diagram reflects a more nuanced understanding of neurodiversity than previously recognized. Historically, diagnoses like autism were conceptualized linearly, often categorized using a scale from 1 to 3—ranging from non-verbal to "high functioning" individuals (previously termed Asperger's Syndrome). This older model of understanding largely emphasized a single diagnosis approach without giving weight to the high likelihood of comorbidities. Now, it is widely acknowledged that most individuals diagnosed with autism are also likely to have co-occurring conditions, such as ADHD, as indicated by the high number of intersecting lines between these two disorders [35]. This more comprehensive model reflects the increasing recognition that neurodiversity is not just a matter of isolated conditions but an interconnected web of biological, psychological, and environmental factors.

Theorizing a new framework for AI-assisted writing (Figure 3) requires a departure from the simplistic, linear models that currently dominate discussions around AI in writing. Much like the evolving understanding of neurodiversity, which now recognizes the complex interrelationships between different cognitive conditions, the collaboration between humans and AI in writing must also be conceptualized in a multidimensional manner. Traditional frameworks often view AI involvement as existing on a scale from "none" to "complete", but this fails to capture the nuanced ways in which human creativity and AI-generated assistance interweave throughout the writing process. In a multidimensional model, each axis represents a different aspect of the writing process, reflecting the variability of human-AI collaboration.

On the content generation axis, AI tools like ChatGPT and Claude might generate text to varying degrees, offering anything from simple prompts or suggestions to drafting entire sections of a document. This mirrors the coexistence of primary and secondary diagnoses in neurodiversity, where different conditions overlap and interact, shaping an individual's cognitive experience. In writing, AI can augment human ideas by offering alternative perspectives or refining already drafted content. Yet, the human author remains a crucial arbiter, determining which AI-generated suggestions to incorporate into the final product. This interplay between human input and AI assistance challenges the traditional notion of the writer as a solitary creator, offering a more fluid and collaborative approach to authorship.

Figure 3
Multimodal model for human-AI collaboration in writing



The structural assistance axis further exemplifies the collaborative nature of AI-assisted writing. Much like environmental and physiological factors influence how neurodiverse individuals navigate the world, AI can serve as a structuring tool, helping writers organize ideas and maintain coherence in their work. AI might suggest logical progressions in an argument, identify potential gaps in reasoning, or offer suggestions for reorganizing sections to improve clarity and flow. However, this structuring is not entirely autonomous. The human author still plays a vital role in evaluating and implementing these suggestions, ensuring that the final structure aligns with their overall intent. As with content generation, this axis highlights the reciprocal nature of the collaboration, where AI acts as a guide rather than a replacement for human authorship.

The multidimensional model also includes axes for creative input and analytical contribution, which represent the ways AI and humans collaborate in more subjective and interpretive aspects of writing. On the creative axis, AI can suggest stylistic revisions, offer alternative phrasings, or even generate metaphors and narrative elements that enhance the aesthetic quality of the text. However, the human writer retains control over the tone, voice, and overall creative direction, ensuring that the final product reflects a balance of machine-generated innovation and human intentionality. Similarly, on the analytical axis, AI tools can assist with data analysis, provide critical feedback, and even generate interpretive insights based on textual patterns. Still, the human author interprets these findings and applies them to the broader intellectual framework of the writing project, ensuring that AI's analytical contributions support rather than overshadow human expertise.

This multidimensional framework not only reflects the complexity of human-AI collaboration in writing but also emphasizes the importance of ethical and intellectual accountability. In the same way that neurodiverse individuals must navigate overlapping conditions within specific societal and cultural contexts, writers must navigate the ethical implications of using AI tools. Transparency about AI's contributions is essential, as is the need for humans to remain accountable for the final product. Whether AI assists with content generation, structural improvements, or creative enhancements, the human author must ensure that the final work meets ethical standards, particularly in academic or professional contexts. This new framework offers a more holistic understanding of writing in the age of AI, where the boundaries between human creativity and machine assistance blur, and where authorship becomes a shared, multidimensional process.

The multidimensional framework for human-AI collaboration offers valuable opportunities for practical application in various writing contexts, including education, professional environments, and academic research. In university-level writing courses, instructors can use AI tools like ChatGPT and Claude to demonstrate how content generation, structural assistance, creative input, and analytical contributions can enrich the writing process. For instance, students might utilize AI to generate outlines or explore potential counterarguments for essays, while instructors guide them in critically evaluating and refining the AI-generated content. This approach not only highlights the collaborative potential of AI but

also develops students' critical thinking and ethical awareness in leveraging these tools effectively.

In professional writing contexts, the framework can enhance team-based content creation by optimizing workflows and improving efficiency. Marketing teams, for example, might employ AI to draft initial blog posts or social media campaigns, with human collaborators refining and personalizing the content to align with brand messaging. AI tools can assist with generating ideas, structuring arguments, and even suggesting stylistic improvements, while human authors ensure the final output meets ethical and creative standards. This dynamic collaboration allows organizations to meet demanding deadlines without sacrificing originality or strategic goals, offering a clear example of how the framework supports productivity in real-world applications.

The framework also holds significant potential for advancing research and scholarship, particularly in tasks that require synthesizing large amounts of information. Scholars conducting meta-analyses or literature reviews might use AI to organize data, identify key themes, and propose research gaps. For instance, AI tools could help researchers analyze trends in studies on second-language writing, enabling them to generate insights more efficiently. While AI assists with these preliminary tasks, researchers maintain control over interpretation and final analysis, ensuring academic rigor and intellectual accountability. By offering these practical applications, the multidimensional framework provides a comprehensive pathway to integrate AI into writing practices across diverse fields, fostering innovation while preserving the integrity of human creativity.

5. Conclusion

The evolution of writing, from its origins in manual inscription to the current integration of AI-driven tools, represents a significant shift in how we understand both the process and product of writing. Historically, writing has been viewed as a fundamentally human activity, closely tied to cognitive and creative functions that reflect the intellectual engagement of the author. However, as AI technologies like ChatGPT and Claude become more embedded in the writing process, the boundaries between human and machine contributions have become increasingly blurred. The need for a new theoretical framework that accounts for this complexity has never been more urgent. This paper has aimed to provide such a framework by moving beyond outdated linear models of AI involvement and proposing a multidimensional approach that reflects the collaborative, dynamic nature of human-AI interaction in writing.

The significance of this model lies in its ability to capture the nuanced roles that AI and humans play across different stages of the writing process—content generation, structural assistance, creative input, and analytical contribution—while also emphasizing the ethical and intellectual accountability that remains firmly in human hands. This framework offers a more comprehensive understanding of writing as a shared endeavor, where AI assists but does not entirely replace the human author. As writing technologies continue to evolve, this model will help educators, researchers, and practitioners rethink traditional conceptions of authorship, creativity, and intellectual labor, ensuring that human agency remains central even as AI capabilities expand.

Future research should explore how humans and AI can best collaborate in writing tasks without compromising the core values of creativity and intellectual rigor. As we move into an era where AI-generated content becomes more prevalent, the most productive and meaningful work will likely come from individuals who are flexible in reorganizing their workflows to be AI-compatible. However, it is critical that humans retain agency over tasks that cannot be adapted without sacrificing the fundamental purpose of writing—whether that purpose is artistic, academic, or communicative. By embracing AI as a collaborative partner while maintaining control over key aspects of the writing process, future writers and scholars can ensure that their work remains both innovative and authentically human.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by the author.

Conflicts of Interest

The author declares that he has no conflicts of interest to this work.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Author Contribution Statement

James Hutson: Conceptualization, Methodology, Validation, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization.

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