ktu faculty of social sciences, arts and humanities 1922

48/2026
Research Journal
Studies about Languages
pp. 20-38
ISSN 1648-2824 (print)
ISSN 2029-7203 (online)
DOI 10.5755/j01.sal.1.48.44000

LINGUISTICS / KALBOTYRA

From perceptual gating to attention decay: Sense-making in human language processing and large language models

Received 01/2026 | Accepted 07/2026

HOW TO CITE: Dovhan, O. (2026). From perceptual gating to attention decay: Sense-making in human language processing and large language models. *Studies about Languages / Kalbų studijos*, 48, 20–38. https://doi.org/10.5755/j01.sal.1.48.44000

From perceptual gating to attention decay: Sense-making in human language processing and large language models

Nuo percepcinio filtravimo iki dėmesio silpnėjimo: prasmės kūrimas žmogaus kalbos apdorojimo ir didžiųjų kalbos modelių kontekste

OLEKSII DOVHAN, Dragomanov Ukrainian State University, Ukraine.

Abstract This article examines sense-making in human language processing and transformer-based large language models (LLMs) through a qualitative comparative analysis of perceptual gating and attention decay as regulatory mechanisms mediating the transition from signal registration to sense integration. The study synthesizes selected research on perceptual gating, attentional filtering, predictive processing, and documented coherence failures in LLMs, and complements this synthesis with an illustrative comparative analysis of human and LLM cases. The comparison is structured around five analytical dimensions: signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity.

The analysis demonstrates that the presence of a linguistic or perceptual stimulus does not in itself guarantee its integration into sense. Instead, sense is treated as a processual achievement dependent on attentional selection, temporal maintenance, contextual integration, and prior interpretive frameworks. On this basis, the article identifies a functional-structural parallel between perceptual gating in human cognition and attention decay in LLMs: in both cases, failures of sustained integration may leave signals formally available but functionally weakened, resulting in delayed, fragmented, or unstable sense construction. The study further argues that coherence breakdown in LLMs is more productively understood not merely as a technical output error, but as a disruption of contextual sense integration under limited attentional resources.

The article makes three main contributions. First, it proposes a five-level comparative model of sense-making regulation in human and LLM language processing, spanning signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity. Second, it clarifies the distinction between meaning as a property of linguistic form and sense as an event- and context-dependent result of

interpretation. Third, it reframes coherence failures in LLMs within a broader digital-humanities perspective as manifestations of a general structural problem of maintaining sense continuity over time rather than as exclusively engineering deficiencies. These findings contribute to interdisciplinary research on human language processing, LLM interpretability, and the limits of coherent sense construction in biological and artificial systems.

KEYWORDS: perceptual gating, sense-making, attentional filtering, predictive processing, large language models (LLMs), semantic coherence, digital humanities.

Introduction

Information and its perception, processing, and transmission are inherently complex because they depend on mechanisms of sensory and cognitive integration. Such mechanisms characterize both human cognition, where language processing depends on cognitive resources, perceptual state, and attention, and machine language systems, particularly large language models (LLMs) (Information, 2025; Dürr, Segessenmann & Steinmann, 2023). In the latter, semantic saturation, contextual limitations, and predictive data interpretation become especially relevant (Gebendorfer, 2025). At a functional level, the informational bandwidth of LLMs resembles human attentional overload: a signal may be registered yet fail to reach coherent processing (Ahn, 2025; Morcillo, 2025). Likewise, an input token may receive insufficient attention to remain relevant to the current task. This functional similarity enables comparison without collapsing the ontological distinction between biological and artificial systems.

This comparison highlights language processing as a zone of tension between the presence of a perceptual signal and its transformation into sense (Boyle, 2025; Flatley IV, 2025). The tension becomes apparent when a registered stimulus fails to acquire a stable interpretive form. A word may be heard but not understood, a smell perceived but not identified, or a contextual cue noticed but not integrated into an utterance or event (Clarke, 2025). What remains is awareness of something without its full interpretation. The same principle applies to machine language processing: formally available input does not automatically become part of a stable sense configuration.

These observations point to a fundamental distinction between perception and sense-making. Perception is understood here as the registration of a stimulus, whereas sense-making is a selective and temporally extended process of interpretation. Information may be treated as data or knowledge available to a system (Information, 2025), yet sense cannot be reduced to its mere presence. Instead, sense emerges as a dynamic, hierarchical achievement dependent on attention, context, prior experience, and temporal continuity (Gebendorfer, 2025; Morcillo, 2025). Thus, receiving a linguistic or sensory signal does not guarantee understanding; what matters is whether it is admitted to processing, maintained within attention, and integrated into a broader contextual and discursive structure.

Within the humanities, particularly in the cognitive and linguistic sciences, these regulatory processes are commonly described using several interrelated concepts (Ahn, 2025; Dürr, Segessenmann & Steinmann, 2023).

1. Perceptual gating is understood as a mechanism regulating sensory and linguistic input and determining its cognitive fate: whether it undergoes deeper processing or is suppressed, delayed, or remains without sense integration. Importantly, perceptual gating should not be reduced to a purely physiological filter. It is shaped by context, prior experience, attentional state, and the stimulus's relevance to the ongoing activity. In the case of linguistic data, perceptual gating determines whether a unit reaches the level of sense-making or remains merely registered. In this study, perceptual gating is treated as a regulative threshold between fixation and sense integration rather than as a peripheral mechanism.
2. Attentional filtering refers to the distribution of limited processing resources in biological organisms and neural network models – among competing stimuli, thereby determining their degree of cognitive integration. Unlike perceptual gating, which regulates access to the signal, attentional filtering operates at a subsequent stage of processing, where some elements are amplified while others are weakened. In linguistic processing, this mechanism is crucial for maintaining selected parts of an utterance within interpretive focus and preserving sense coherence across a sequence.

3 Predictive processing is a theoretical model in which linguistic and perceptual experience relies on the continuous generation of expectations about incoming data and their adjustment to prior experience. In this perspective, sensory and linguistic input is not simply processed "from the bottom up"; rather, it is evaluated against existing models of the world, discourse, and language. Predictive processing is therefore particularly relevant for understanding how sense is maintained under conditions of incomplete signals, ambiguous stimuli, or discrepancies between expectation and actual data.

Together, these concepts make it possible to conceptualize sense not as something extracted directly from linguistic material, but as the result of a dynamic interaction between stimulus, attention, prior experience, and situational relevance. This process is vulnerable to fatigue, sensory overload, cognitive competition, and failures of temporal integration. Consequently, a signal may be registered without being properly processed, resulting in a state of "knowledge without awareness" or "feeling without understanding" (Ahn, 2025; Morcillo, 2025). This structural break between fixation and integration is central to the present study.

A comparable problem can be observed in LLMs. These models process large volumes of textual data, identify recurrent patterns, and generate formally coherent text. At the same time, they exhibit failures comparable to disturbances in human sense-making: locally coordinated tokens may fail to form a stable interpretation, contextual cues may be weakened or suppressed, and attention may disperse across long sequences, producing semantic drift or loss of coherence (Suh et al., 2023; Schmidt et al., 2025). Such effects are usually described in technical terms, for example through context-window size, attention mechanisms, or training-data distribution. Yet reducing LLM behavior exclusively to engineering parameters narrows the analytical horizon of the problem (Dürr, Segessenmann & Steinmann, 2023; Angelini et al., 2025). In both humans and LLMs, sense is not guaranteed by data alone; it emerges only when attention, selection, and contextual integration remain sufficiently stable over time.

This perspective has broader philosophical and cultural implications, particularly within digital humanities, where questions of sense increasingly intersect with AI, language technologies, and interpretability. Sense should be treated not as a static property of linguistic forms, but as a procedural achievement vulnerable to gaps, interruptions, overload, and contextual destabilization. In human cognition, this vulnerability is linked to attentional fatigue and perceptual oversaturation; in LLMs, it manifests through context fragmentation, attention decay, and the loss of narrative or semantic continuity (Gebendorfer, 2025; Chen et al., 2025). Therefore, comparison between human and artificial sense-making systems remains analytically productive despite their different ontological status, as both confront the structural problem of maintaining sense continuity under limited attentional resources.

The relevance of this comparison is reinforced by current scholarship. Existing studies examine sense-making from philosophical and theoretical perspectives; narrative, environmental, and perceptual approaches to parameterizing experience; analyses of LLM interfaces, scaling, and interpretability; and research on attention, trust, and sense control in human–LLM interaction. However, these discussions are rarely integrated into a comparative framework explaining the regulatory mechanisms that mediate the transition from signal registration to sense integration. Consequently, the relationship between signal registration and sense construction remains insufficiently theorized, particularly in comparative studies of human and artificial language processing.

Against this background, the present study offers a comparative approach to perceptual gating in human language processing and attention decay in LLMs, treating both as elements of a broader structural problem of sense-making. The article integrates linguistic and cognitive insights with machine learning and digital humanities to move beyond superficial analogies and localize the gap between signal availability and its integration into sense. Accordingly, it addresses the following research question: how can perceptual gating in human language processing and attention decay in LLMs be compared as functionally related mechanisms regulating sense-making?

The aim of the article is to develop a comparative account of sense-making in human language processing and LLMs by examining how signals are registered, selectively admitted to attention, maintained across time, integrated into context, and either sustained or disrupted at the level of sense continuity.

The study makes three main contributions. First, it proposes a five-level comparative model of sense-making regulation in human and LLM language processing, structured around signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity. Second, it clarifies the distinction between meaning as a property of linguistic form and sense as an event- and context-dependent result of interpretation, refining the conceptual vocabulary for comparing biological and artificial language systems. Third, it reframes coherence failures in LLMs from a broader digital-humanities perspective as manifestations of a general structural problem of maintaining sense continuity over time rather than as exclusively engineering deficiencies.

The article is structured as follows. The next section reviews the theoretical background relevant to sense-making, perceptual regulation, LLM coherence, and trust. The Methods section outlines the qualitative comparative design and analytical dimensions. The Results and Discussion section presents the comparative analysis and the proposed five-level model of sense-making regulation. The article concludes by discussing the implications of this framework for language processing, LLM interpretability, and coherent sense construction in biological and artificial systems.

Theoretical Background and/or Literature Overview

Sense-making occupies an intersectional position in contemporary scholarship because it cannot be reduced either to technical data processing or to an abstract theory of meaning. Within digital humanities, language processing is best understood as a phenomenon emerging at the intersection of philosophy of language, cognitive linguistics, psycholinguistics, discourse studies, and artificial intelligence research. This heterogeneity is methodologically necessary because the transition from signal registration to sense integration involves interconnected dimensions: the status of sense as an interpretive achievement; cognitive mechanisms that regulate access to stimuli; the technological conditions of LLM context processing; and interpretive practices through which users make sense of model outputs.

Accordingly, the literature relevant to this study is organized into four interrelated blocks: a) foundational and contemporary theories of sense, meaning, and interpretation; b) cognitive and perceptual models of attention, gating, and predictive processing; c) sense-making in digital environments and LLM-mediated interaction; and d) attention, coherence, trust, and control in human–LLM systems. This structure demonstrates that the problem examined here predates LLMs. Rather, LLMs render visible a longstanding theoretical tension among the formal availability of linguistic material, selective mechanisms of perception and attention, and the fragile continuity of sense.

Foundational and Contemporary Theories of Sense, Meaning, and Interpretation

The distinction between linguistic form, meaning, and sense has a long theoretical history. Across philosophy of language, hermeneutics, and cognitive theories, sense is treated not as a stable property of a sign but as the result of contextualization, inference, and active organization of experience. This tradition is crucial because it prevents the analysis of LLM outputs from being reduced to technical questions of text generation and instead situates coherence in machine language processing within a broader inquiry: under what conditions does formally available linguistic material become integrated into sense?

This insight is further developed in recent studies addressing the instability and limits of sense. Ahn (2025) explores the boundary between nonsense and sensation through Deleuze and Zhuangzi, showing that sense may arise at the unstable threshold between perceptual experience and conceptual articulation. Dürr, Segessenmann, and Steinmann (2023) analyze anthropological assumptions in debates on natural language processing and AI, contrasting informational views of language with holistic and enactivist approaches. Their work shows that language cannot be described solely as information transfer or symbolic manipulation but is inseparable from the embodied, contextual, and interpretive dimensions of sense.

Gebendorfer (2025) conceptualizes sense as a dynamic and unstable phenomenon shaped by systemic interactions rather than fixed semantic structures. Morcillo (2025) likewise highlights the fragility of sense structures and the speed with which concepts synchronize or destabilize across collective contexts. Despite

their disciplinary differences, both studies treat sense not as a static semantic residue of language but as a process vulnerable to overload, disruption, and contextual fracture. They therefore frame LLM coherence failures as one manifestation of the broader problem of unstable sense under conditions of excessive informational density and weakened integrative control.

Collectively, foundational and contemporary theories of sense converge on one point: sense is not identical with linguistic form, nor is it guaranteed by access to information alone. It is an event-like, selective, and temporally organized achievement of interpretation. This principle underpins the distinction between signal registration and sense integration and supports comparison of human and machine language processing within a shared analytical framework.

Cognitive and Perceptual Models of Attention, Gating, and Predictive Processing

Whereas the first block explains why sense cannot be reduced to information, the second explains how the transition from stimulus to sense is cognitively regulated. Research in cognitive science, psycholinguistics, and perceptual theory shows that attention is a limited resource and that signal registration does not automatically entail successful integration into a broader interpretive structure. This distinction is central because it distinguishes perception from sense-making while allowing integration failures to be conceptualized without equating them with absent input.

One of the key concepts in this regard is perceptual gating. In the present context, perceptual gating is understood as a mechanism that regulates sensory and linguistic input by determining whether a signal proceeds to deeper processing or remains suppressed, delayed, or fixed without further integration into the sense. Perceptual gating is not merely a physiological filter. It is conditioned by context, relevance, prior experience, attentional state, and task environment. In linguistic processing, perceptual gating functions as a threshold between stimulus fixation and interpretation.

A related concept is attentional filtering, the allocation of limited processing resources among competing stimuli. Unlike gating, which determines signal access, attentional filtering operates at a subsequent stage, amplifying certain elements and attenuating others within the ongoing processing field. In discourse and language comprehension, this mechanism is especially important for preserving selected parts of an utterance within interpretive focus and across a sequence.

These processes fall within predictive processing, where perception and comprehension rely not on passive data reception but on continuously generated and revised expectations. Foundational work by Friston conceptualizes cognition through the free-energy principle, arguing that perception depends on minimizing prediction error in an organism's engagement with the environment (Friston, 2010). Clark similarly describes the brain as a predictive system in which top-down expectations are continuously adjusted to incoming data (Clark, 2013). This framework explains why the presence of a stimulus does not guarantee interpretation: signals are evaluated against prior models, expectations, and contextual assumptions and may therefore be registered without successful integration into sense.

Recent studies extend these mechanisms to language and multimodal perception. S. Clarke's work on acoustic perception shows that sensory objects emerge through complex relations between physical input, modeling, and multimodal learning (Clarke, 2025). S. Boyle treats sense-making as a narrative and situational practice, emphasizing embodied and environmental conditions in organizing experience (Boyle, 2025). Flatley IV's concepts of transmodality and metacomposition show that sense may emerge across heterogeneous perceptual and technological channels rather than within a single linguistic stream (Flatley IV, 2025). Together, these studies reinforce the view that sense is not extracted directly from data; it is assembled through a layered interaction of perceptual access, attentional selection, expectation, contextual anchoring, and temporal integration.

This literature provides the basis for comparing human perceptual gating with attention-related failures in LLMs. If sense in human cognition depends on a signal passing through several regulatory thresholds, then failures in artificial language systems may also be analyzed not merely as output errors but as breakdowns in analogous processes of contextual maintenance and selective integration.

Sense-making in Digital Environments and LLM-mediated Interaction

The third block shifts the focus from human cognition to technologically mediated sense-making in digital environments. The question is no longer only how humans transform signals into sense, but also how LLMs participate in, support, distort, or complicate that process. This research shows that LLM-mediated sense-making is not exhausted by model output; it also involves interface design, user navigation, comparative evaluation of outputs, and the interpretive work required to make generated text coherent and usable.

Any discussion of LLMs requires acknowledging the architectural role of attention. Vaswani et al.'s (2017) transformer model is foundational because it redefined sequence processing by introducing attention mechanisms that model relations between tokens without relying on recurrent architectures. This shift is directly relevant to this study. Although attention in LLMs is not ontologically equivalent to human attention, transformer architectures nonetheless permit a functional comparison of the selective weighting and preservation of contextual elements across sequences. In this sense, the architecture of LLMs embeds a structural analogy to maintaining interpretive continuity.

Recent work approaches this issue from complementary angles. Suh et al. (2023) propose Sensecape, an interactive system for multilevel exploration and sense-making with LLMs, showing that LLM outputs often require nonlinear navigation, summarization, abstraction, and reorganization rather than simple reading. Gero et al. (2024) examine how users make sense of multiple LLM outputs at scale and demonstrate that comparison, clustering, and iterative evaluation are essential for interpreting model-generated alternatives. Together, these studies locate sense-making not solely within the model but within the interaction among generated text, interface affordances, and user interpretation.

Coherent interpretation becomes especially challenging in work on complex corpora and narrative extraction. Schmidt et al. (2025) compare expert analysis and LLM-based extraction of economic narratives, revealing the strengths and limitations of model-driven synthesis in contexts requiring semantic nuance, contextual sensitivity, and expert judgment. Their findings show that formally coherent output does not necessarily amount to stable or reliable sense. Liang et al. (2025) extend this analysis to generative augmented reality, where sense-making is distributed across textual, perceptual, and augmented environments rather than confined to a single linguistic channel. This work shows that maintaining sense continuity is not confined to static text generation; it intensifies in multimodal and technologically layered environments.

Collectively, these studies show that increasing computational scale does not eliminate the problem of coherent sense. As tasks become longer, denser, and more contextually demanding, maintaining relevance and interpretive continuity becomes increasingly fragile. This supports the argument that coherence failures in LLMs should not be treated merely as local technical errors but as symptoms of a broader problem of sustaining contextual integration over time.

Attention, Coherence, Trust, and Control in Human–LLM Systems

The fourth block examines attention, coherence, trust, and control in human–LLM interaction. It connects model behavior with the user's interpretive position, showing that sense-making in AI-mediated environments depends not only on model output but also on how it is inspected, stabilized, evaluated, and trusted.

Angelini et al. (2025) examine tangible approaches to LLMs and argue that visualization, embodied interaction, and interface design may improve trust, transparency, and user control over generated content. This work shows that users often need external support to make sense of model outputs: sense does not arise automatically from fluent text but frequently requires tools for inspecting, organizing, and regulating interpretation. Chen et al. (2025) analyze subjective trust in LLMs and demonstrate that trust is dynamic, multidimensional, and closely tied to perceived reliability, uncertainty, openness, and the user's ability to orient themselves within the generated response space. Trust depends not only on local fluency but on the user's capacity to integrate output into a coherent interpretive frame.

A related line of inquiry focuses on user attempts to regulate model behavior more directly. Gmeiner et al. (2025) examine micro-prompting and granular human–GenAI co-creation workflows, showing how

users try to stabilize model behavior through increasingly precise instructions and iterative intervention. Zhang and Magerko (2025), in turn, discuss generative AI literacy as a condition for critical and effective interaction with AI systems, emphasizing that users must develop skills not only for operating models but for interpreting, questioning, and contextualizing their outputs. These studies confirm that coherence and trust are inseparable from the regulation of attention and interpretive control. When contextual integration breaks down, output may remain fluent yet become increasingly difficult to evaluate, verify, or rely on.

From the perspective of this study, sense in human–LLM systems is not an automatic product of generation but a fragile effect of continuous regulation. Coherence must be maintained by both the model and the user's interpretive practices. Trust is therefore not merely an affective or ethical supplement to language technology but structurally bound to the problem of sense continuity.

Synthesis and Research Gap

The literature reviewed above converges on several points. First, foundational theories of sense and interpretation show that sense is an event-like, context-dependent, and temporally organized achievement rather than a property automatically attached to linguistic form. Second, cognitive and perceptual models explain how attention, gating, and prediction regulate the passage from stimulus registration to interpretation. Third, studies of LLM-mediated interaction demonstrate that LLM outputs do not guarantee coherent sense and often require additional interpretive labor, interface support, and comparative evaluation. Finally, research on trust and control confirms that coherence in human–LLM systems depends on maintaining interpretive stability across interactions.

At the same time, an important gap remains. Existing scholarship rarely compares the regulatory mechanisms mediating the transition from signal registration to sense integration in human and artificial language processing. Human perceptual gating is usually studied within frameworks of cognition, perception, and language comprehension; LLM attention decay and coherence failure are typically examined through architecture, context windows, prompt design, or output quality. As a result, the functional-structural relation between these mechanisms remains insufficiently theorized.

This article addresses this gap by comparing perceptual gating in human language processing and attention decay in transformer-based LLMs as distinct yet functionally related mechanisms regulating sense-making. This comparison does not imply ontological equivalence between biological and artificial systems. Rather, it provides an analytical framework for examining how signals become available, are selected and maintained, integrated into context, and ultimately sustain or disrupt sense continuity. In this way, the article moves beyond a purely engineering understanding of LLM coherence failures by placing them within a broader interdisciplinary discussion of the conditions under which sense can emerge, persist, or collapse.

Methods

The present study is non-experimental and employs a qualitative comparative conceptual design. Rather than measuring the frequency of linguistic or cognitive phenomena, it reconstructs the structural mechanisms by which a signal, stimulus, or irritant is integrated into sense or remains only partially processed. The study assumes that sense-making is a discrete, processual, and context-dependent achievement emerging through the interaction of perceptual access, attentional regulation, temporal maintenance, and contextual integration. Accordingly, it identifies and compares the regulatory thresholds at which this process continues or breaks down in human language processing and transformer-based large language models (LLMs).

For this reason, the study combines theoretical analysis, comparative interpretation, and qualitative discursive comparison (Boyle, 2025; Flatley IV, 2025) with a structured examination of selected human and LLM cases described in the relevant literature. The methodological framework also draws on sense-making theory (Weick, 1995), cognitive and predictive models of perception and interpretation (Friston, 2010; Clark, 2013), and recent work on LLM coherence, trust, and interaction (Gero et al., 2024; Suh et al., 2023; Angelini et al., 2025; Chen et al., 2025). Within this framework, perceptual gating and attention decay are

treated not as identical processes but as functionally related regulatory mechanisms for comparing how biological and artificial systems handle the transition from signal registration to sense integration.

Study Design and Analytical Orientation

The study employs a comparative conceptual analysis with an illustrative comparative layer. Its analytical logic assumes that the difficulties observed in human speech perception and in LLM-generated discourse can be compared not at the level of ontology, but at the level of functional-structural constraints. The study does not claim that human cognition and LLMs process language similarly. Rather, it examines whether both systems exhibit comparable points of instability at the stage where a formally available signal must be selected, maintained, and integrated into a coherent interpretive structure.

This design avoids two opposite methodological reductions. It neither reduces LLM behavior to a purely engineering description of output generation nor anthropomorphizes artificial systems by equating token-level attention with human consciousness or intentionality. Instead, the comparison is limited to the regulatory functions involved in maintaining or disrupting sense continuity. Accordingly, the study is positioned within digital humanities as an attempt to combine conceptual rigor with analytical sensitivity to the technical and discursive conditions of machine language processing.

Analytical Material

The analytical material consists of three interrelated source corpora selected to address the research question.

1. Foundational and contemporary theoretical works on sense, interpretation, and perceptual regulation

   This group includes studies conceptualizing sense as a dynamic, selective, and context-dependent process rather than a stable property of linguistic form. It includes foundational work on sense-making and predictive processing (Weick, 1995; Friston, 2010; Clark, 2013) and more recent studies addressing the instability of sense, perceptual thresholds, and interpretive fragility in linguistic, philosophical, and digital-humanities contexts (Ahn, 2025; Boyle, 2025; Dürr et al., 2023; Gebendorfer, 2025; Morcillo, 2025; Flatley IV, 2025).

2. Studies describing human cases of delayed, disrupted, or incomplete sense integration

   The second group consists of studies on perception, linguistic comprehension, and multimodal interpretation that identify situations in which a registered stimulus fails to achieve stable sense integration. These include discussions of sensory recognition, narrative and situational sense-making, and the interaction between perceptual input and interpretive framing (Clarke, 2025; Boyle, 2025; Flatley IV, 2025). These cases are treated as analytically significant manifestations of a break between fixation and integration rather than isolated anomalies.

3. Studies describing coherence failures, attention-related limitations, and interpretive challenges in LLMs

   The third group includes recent scholarship on LLM interfaces, large-scale sense-making, narrative extraction, trust, interpretability, and human–LLM interaction (Suh et al., 2023; Gero et al., 2024; Angelini et al., 2025; Chen et al., 2025; Schmidt et al., 2025; Liang et al., 2025; Gmeiner et al., 2025; Zhang & Magerko, 2025). These studies were used to identify recurrent patterns of semantic drift, loss of long-range coherence, contextual weakening, interpretive overload, and instability of output evaluation. The present study neither reproduces these experiments nor claims to improve or replicate their empirical results. Instead, it uses their published findings and documented observations as secondary material for comparative interpretation.

Selection Criteria

The sources and cases were selected according to three criteria:

1. Each source had to address, explicitly or implicitly, the gap between signal presence and successful sense integration. In human-oriented literature, this meant cases of delayed comprehension, unstable perception, partial recognition, or interpretive suspension. In LLM-related literature, it meant coherence failure, contextual weakening, semantic drift, or instability of long-range relevance.

2. The selected material had to provide sufficient conceptual or descriptive detail for comparison across the article's analytical dimensions. Sources had to offer more than general statements such as "comprehension is difficult" or "LLMs make errors" by revealing the roles of attention, context, temporal maintenance, prediction, or coherence.
3. These materials had to support the article's interdisciplinary objective of comparing human language processing and LLM-mediated language generation within a shared framework of sense-making regulation. Accordingly, the corpus combines work from cognitive linguistics, philosophy of language, psycholinguistics, digital humanities, and AI studies. The aim was not to construct a homogeneous dataset but to identify conceptual invariants across heterogeneous materials.

Analytical Dimensions

To avoid a purely metaphorical comparison, the study is organized around five analytical dimensions. These dimensions provide the basis for the comparative analysis and the five-level model presented later in the article.

1. Signal registration

   This dimension concerns the initial fixation or localization of a linguistic, sensory, or textual unit within the system. In human cognition, this may involve hearing a word, noticing a smell, or recognizing a cue. In LLMs, it corresponds to the formal presence of a token in the input sequence.

2. Selective gating

   This dimension concerns the threshold at which a signal either enters deeper processing or remains only formally present. In the human case, it is linked to perceptual gating and to the stimulus's relevance within the current attentional and situational frame. In the LLM case, the question is whether a contextual element remains sufficiently weighted to affect subsequent generation.

3. Attentional maintenance

   This dimension concerns preserving selected material over time. In human language processing, it refers to maintaining a stimulus or interpretive cue within ongoing comprehension. In LLMs, it concerns maintaining contextual relevance across longer sequences, especially under increasing token competition.

4. Contextual integration

   This dimension concerns whether the registered and maintained signal is incorporated into a larger discursive, semantic, or situational structure. A signal may be noticed and temporarily preserved, yet fail to become part of a coherent interpretation. This stage distinguishes mere presence from meaningful participation in sense-making.

5. Sense continuity

   This final dimension concerns interpretive stability over time. It examines whether the system preserves a coherent line of sense rather than isolated local correspondences. In human cognition, this involves maintaining understanding as an utterance or situation unfolds. In LLMs, it concerns maintaining global coherence across extended output rather than local fluency alone.

These five dimensions reflect the sequence of sense-making assumed throughout the article, from the appearance of a signal to its stabilization within an ongoing interpretive whole. They also enable comparison of human and artificial language processing without claiming identity between them. The comparison is based not on shared substance but on functionally analogous thresholds at which integration succeeds or fails.

Procedure of Analysis

The study proceeded in three analytical stages.

Stage 1 Theoretical and historiographical reconstruction of the problem. First, the literature on sense-making, perceptual regulation, predictive processing, and LLM-mediated interpretation was systematized to establish the study's conceptual coordinates. This stage identified recurring invariants across the

literature: the processuality of sense, its contextual dependence, vulnerability to attentional disruption, and the non-identity between signal registration and successful interpretation. It also provided the theoretical basis for treating perceptual gating and attention decay as comparable regulatory mechanisms.

Stage 2 Qualitative analysis of human cases of incomplete or disrupted sense integration. At the second stage, the study examined human perceptual and linguistic situations in which a registered signal failed to achieve stable sense integration. These cases were interpreted through the five analytical dimensions of signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity. The purpose was not to catalogue anomalies but to demonstrate that the break between perception and sense-making is structurally possible even when the signal is present.

Stage 3 Comparative analysis of LLM-related cases and synthesis of the model. At the third stage, the study examined reported LLM behavior in recent studies on long-range coherence, interpretability, trust, interface-supported sense-making, and narrative extraction (Suh et al., 2023; Gero et al., 2024; Angelini et al., 2025; Chen et al., 2025; Schmidt et al., 2025). These cases were analyzed using the same five dimensions to assess whether LLM failures are structurally comparable to disruptions in human sense integration. On this basis, the study develops a five-level comparative model of sense-making regulation that identifies the points at which sense continuity is maintained, weakened, or lost in both systems.

Status of the Evidence and Limitations of the Study

The present study does not claim experimental validation across all LLM architectures or provide a corpus-based statistical account of sense-making failures. First, it provides a qualitative comparative reconstruction of regulatory mechanisms discussed in the literature. Second, it uses published descriptions and findings as secondary analytical material rather than generating a new experimental dataset. Third, it compares human cognition and LLMs in terms of functional-structural constraints on sense continuity rather than treating them as ontologically equivalent systems.

These limitations follow directly from the study's purpose. The study clarifies how the relation between signal fixation and sense integration can be theorized across biological and artificial language systems without collapsing their differences. Accordingly, the findings should be understood as a comparative conceptual framework grounded in selected human and LLM cases rather than a universal empirical account of language processing.

At the same time, this design preserves the study's central methodological premise: the treatment of sense not as a fixed semantic property, but as a fragile and temporally organized achievement whose continuity depends on selective access, attentional stability, and contextual integration. This premise allows perceptual gating in human language processing and attention decay in LLMs to be compared as different manifestations of a broader structural problem of sense-making.

Results and Discussion

The comparative analysis demonstrates that the transition from signal registration to sense integration is not automatic in either human language processing or transformer-based LLMs. In both systems, the presence of a signal – acoustic, lexical, perceptual, or tokenized – does not guarantee its integration into a coherent interpretive structure. Instead, sense emerges through a sequence of regulatory operations: the signal must be registered, admitted to deeper processing, maintained within an attentional frame, integrated into context, and preserved across time as part of a stable line of interpretation. When this sequence is disrupted, sense is weakened, suspended, or fragmented rather than lost altogether.

The analysis further shows that perceptual gating in human language processing and attention decay in LLMs are not identical mechanisms but functionally related constraints operating at different stages of

sense-making. In the human case, the central problem concerns whether a perceptually available stimulus enters the interpretive field and remains there long enough to participate in sense construction. In the LLM case, the corresponding problem concerns whether a formally present contextual element retains sufficient relevance within the model's processing dynamics to influence subsequent generation coherently. This comparison does not imply anthropomorphic equivalence but supports a comparative analysis of the regulatory fragility of sense continuity in both systems.

For analytical clarity, the discussion below is organized according to the five dimensions established in the Methods section: signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity. This structure highlights both the convergences and the differences between human and artificial language processing.

Signal Registration: Presence without Guaranteed Integration

The first result concerns the distinction between the presence of a signal and its interpretive activation. In human cognition, the registration of a stimulus does not automatically entail understanding. A word may be acoustically perceived, a lexical unit recognized, or a smell detected, while still failing to acquire stable interpretive status. In such cases, the signal is not absent; rather, it remains at the level of fixation without full articulation. The studies reviewed above identify such situations as structurally significant rather than merely anecdotal. What they reveal is a zone in which a stimulus is available to perception, yet does not enter the next stage of sense-making in a sufficiently stable way (Clarke, 2025; Boyle, 2025).

The issue is not simply whether the subject correctly or incorrectly identifies an object. The more relevant question is whether the signal becomes part of a broader interpretive configuration. A word may be "heard" in a physiological or formal sense without becoming integrated into the utterance as a sense-bearing element; an environmental cue may be noticed without being assigned a stable place within the subject's situational understanding. In this respect, signal registration must be treated as a necessary but insufficient condition of sense.

A structurally comparable situation can be observed in LLMs. In transformer-based models, an input token or contextual fragment may be present within the prompt or context window and thus available to the system. Yet its presence does not guarantee that it will remain functionally active during subsequent processing. A token may enter the model, but its relevance can later be weakened by the redistribution of attention across a long or semantically dense sequence. Thus, the LLM analogue of signal registration is likewise a threshold condition: it marks availability, not effective participation in sense construction.

In both human and machine language processing, the mere presence of information is not equivalent to its interpretive realization. Sense begins not at the moment when a signal appears, but at the point where the signal enters a chain of selective and temporally sustained integration.

Selective Gating: The Threshold between Fixation and Admission to Processing

The second analytical result concerns selective gating. In the human case, perceptual gating functions as a threshold between the fixation of a signal and its admission to deeper processing. This threshold is not purely sensory. It is shaped by relevance, prior experience, attentional load, situational expectations, and the broader context in which the signal appears. Perceptual gating should not be reduced to a simple filter that either admits or blocks information. Rather, it serves as a regulative threshold that determines whether a stimulus becomes available for further interpretive work.

When a word is heard but not understood, or when a perceptual cue remains strangely familiar yet semantically ungrasped, the problem may lie not in the absence of the signal itself, but in the fact that the signal has not passed through the relevant threshold of gating strongly enough to support stable sense integration. The stimulus remains suspended between presence and interpretation. It has entered the perceptual field, but not yet the full architecture of sense.

A functionally related problem appears in LLMs. Here, the analogue of selective gating lies not in conscious attention, but in the model's ability to preserve the salience of particular contextual elements within the

attention structure. Some signals remain influential and shape the generation process; others, although still formally available, become attenuated as the sequence unfolds. In long prompts or conceptually rich contexts, this weakening may occur even when the relevant information is explicitly present. What is lost is not the token itself, but its operative relevance for ongoing generation.

Perceptual gating and attention decay do not designate the same mechanism, but they do illuminate a common structural problem: the signal must cross a threshold of effective availability in order to participate in sense-making. If it fails to do so, the result is not absolute absence, but a suspended or weakened status of information. Accordingly, gating is treated not merely as filtering, but as a condition for admission into the economy of sense.

Attentional Maintenance: From Local Activation to Temporal Preservation

The third result concerns attentional maintenance – the preservation of a selected signal across time. In human language processing, the difficulty lies not only in noticing a stimulus but also in keeping it within the active field of interpretation long enough for it to be integrated with subsequent cues. A signal may be registered and even initially selected, yet fail to remain stable under conditions of cognitive overload, fatigue, competing stimuli, or delayed processing. In such cases, the problem is not one of raw perception, but of temporal maintenance: the signal cannot hold its place in the unfolding structure of sense.

A lexical unit may be recognized correctly and still lose its interpretive force if the listener fails to preserve its relevance while processing the remainder of the utterance. In other words, successful registration does not guarantee successful continuity. The act of understanding depends on whether the signal can remain available within a developing interpretive trajectory rather than as an isolated perceptual event.

The LLM case illustrates this clearly. Contemporary models often preserve local coherence quite effectively: they can continue a sentence, imitate a style, or maintain a short-range topical relation. The difficulty becomes more apparent when the model must preserve global coherence across long, semantically dense, or multi-part sequences. At this point, previously relevant contextual elements may remain formally present but lose their functional load. The result may be semantic drift, thematic displacement, superficial repetition, or an answer that remains grammatically fluent while no longer fully oriented to the initial task (Suh et al., 2023; Schmidt et al., 2025).

This does not mean that the model “forgets” in a human sense. The more precise point is that attentional maintenance in LLMs is structurally vulnerable to dilution across extended sequences. Relevance becomes distributed unevenly; some contextual elements retain influence, while others weaken despite their continued formal presence. In both systems, the transition from local activation to temporally sustained relevance is a decisive condition of coherent sense-making.

Contextual Integration: Why Formally Available Signals May Still Fail to Become Meaningful

The fourth result concerns contextual integration, which proved to be the decisive stage at which many signals fail to become part of a coherent sense structure. A signal may be registered, admitted to processing, and even temporarily maintained, yet still fail to enter a larger interpretive whole. In human language processing, this occurs when a perceptual or linguistic element is isolated from the broader context, discourse, or expectation frame in which it should acquire sense. A subject may recognize the form of a word while failing to connect it to the pragmatic logic of the utterance; a perceptual cue may be noticed without being successfully located within the event that gives it significance.

This distinction clarifies the difference between meaning and **sense**. At the level of form, the linguistic unit may remain correct, recognizable, and semantically interpretable in isolation. Yet sense requires more than isolated semantic availability: it requires the successful actualization of the unit within a specific attentional and **contextual configuration**. In this respect, contextual integration is the stage at which meaning either becomes eventfully realized as sense or remains suspended as latent potential.

The same problem is evident in LLM behavior, especially when the output remains locally fluent yet globally unstable. A model may continue to generate text that is grammatically acceptable and even topically adja-

cent, while failing to preserve the prompt's larger contextual architecture. What is lost in such cases is not formal language competence, but the integration of relevant elements into a stable interpretive frame. LLM coherence failures should therefore not be described only as technical output errors. They are also failures of contextual integration: the model continues to produce language, but the language ceases to participate fully in the intended sense trajectory.

The comparison shifts the focus from correctness to integration. The central question becomes not whether a system has "understood" in a strong philosophical sense, but whether it has preserved the contextual relations necessary for coherent sense-making. In both human and machine cases, the breakdown often occurs not at the level of signal presence or formal linguisticity, but at the point where a signal must become structurally relevant to the whole.

Sense Continuity: Fragmentation, Drift, and the Instability of Interpretive Wholes

The fifth and most important result concerns sense continuity. The comparative analysis shows that sense should not be treated as the cumulative sum of correctly processed units. Rather, it depends on the system's ability to preserve relevant connections across time and to maintain a sufficiently stable interpretive trajectory. Once this continuity is weakened, the result is not necessarily total incoherence. More often, the result is fragmentation: isolated elements remain meaningful, but their relations become unstable, delayed, or mutually discrediting.

In human cognition, this may take the form of partial understanding, suspended interpretation, or the feeling that a signal is "there" without becoming fully articulable. The subject may retain the impression of presence, familiarity, or semantic pressure without being able to stabilize the relevant sense in the current context. Accordingly, perceptual gating is treated not only as filtering. It can also be understood as a condition under which sense remains latent, not absent, suspended rather than fully integrated.

In LLMs, the corresponding phenomenon is the loss of global coherence while local coherence remains intact. The model may continue to produce syntactically plausible, semantically adjacent, or rhetorically smooth sequences, yet the larger sense trajectory becomes unstable. Relevant earlier elements are no longer sufficiently integrated into the current output; thematic priorities shift; explanatory chains become thinner; or the response begins to circle around surface similarity rather than genuine contextual continuity. The result is not "nonsense" in the trivial sense, but rather a form of attenuated sense: a text that remains readable while losing interpretive depth and structural fidelity to its own earlier conditions.

This finding reinforces the study's digital-humanities framework. It suggests that coherence failures in LLMs should not be treated solely as technical malfunctions to be corrected by better prompting or larger context windows. They also reveal something more general about the fragility of sense under conditions of limited attentional resources, whether biological or artificial. In both cases, the problem is not the total absence of semantic material, but the difficulty of maintaining continuity across time.

Illustrative Comparative Cases

The comparative logic of the study can be illustrated through two case types – one human-oriented and one LLM-oriented.

- Human-oriented case type: registered but unintegrated signal. A listener hears a word or short phrase within a broader utterance. The lexical form is acoustically registered and may even be recognized as familiar, yet under conditions of distraction, fatigue, overload, or competing stimuli, it does not become fully integrated into the utterance as a coherent element of sense. What remains is not pure absence, but a suspended state: the listener may know that "something was said," may even partially recall its sound pattern, yet fail to actualize its role within the current communicative event. In the model, the signal reaches the registration level but becomes unstable during gating, maintenance, or contextual integration. The result is a weakening of sense continuity rather than a total disappearance of linguistic form.
- LLM-oriented case type: globally weakened contextual cue. A transformer-based LLM receives a long prompt containing a key instruction or conceptual constraint introduced early in the sequence. The model initially

responds in alignment with that instruction, but as the response unfolds – especially under the pressure of multiple contextual elements, thematic branching, or explanatory expansion – the early constraint loses functional salience. The later output remains grammatically coherent and superficially relevant, yet no longer fully respects the original interpretive frame. In the model, the contextual element is registered and initially participates in selective gating, but its influence weakens during attentional maintenance and therefore fails to secure stable contextual integration and sense continuity.

These case types are deliberately modest in epistemic scope. They are not presented as empirical proof, but as analytically condensed examples of the structural break explored throughout the article. Their function is to illustrate the comparative mechanism underlying the five-level model rather than replace the broader theoretical argument.

The Five-level Model of Sense-making Regulation

Based on the analysis, the article proposes a five-level comparative model of sense-making regulation in human language processing and LLMs. This model is not intended as a universal cognitive architecture or a formal engineering scheme. Rather, it functions as a comparative framework for describing the stages at which sense may be stabilized or disrupted.

Level 1 – Signal registration. A linguistic, sensory, or tokenized element becomes formally available to the system. At this level, presence is established, but interpretation is not yet guaranteed.

Level 2 – Selective gating. The system determines whether the signal will be admitted to deeper processing or remain marginal, weakly activated, or suspended at the threshold of relevance.

Level 3 – Attentional maintenance. The selected signal must remain active across time rather than disappear under the pressure of competing stimuli or contextual dilution.

Level 4 – Contextual integration. The signal must be incorporated into a larger discursive, semantic, or situational structure. At this stage, isolated meaning either becomes eventfully realized as sense or remains merely latent.

Level 5 – Sense continuity. The interpretive line must remain sufficiently stable for the system to preserve coherence throughout the unfolding sequence, rather than collapsing into fragmentation, drift, or disconnected local correspondences.

Table 1 Regulatory mechanisms of sense-making in human cognition and LLMs

Processing level	Human language processing	LLMs	Typical disruption
Signal registration	Sensory or linguistic stimulus is physiologically registered	Token or input sequence is formally received	No disruption at this level
Perceptual gating	Selective admission of stimuli into attentional processing	Differential preservation or attenuation of contextual elements within the model's attention structure	Over-admission or premature exclusion of signals
Attentional maintenance	Sustained attention enables temporal integration of linguistic material	Attention weights maintain contextual relevance across token sequences	Attention decay; loss of long-range dependencies
Contextual integration	Prior knowledge, situational context, and expectations shape sense construction	Context window and internal representations constrain coherence	Context fragmentation; semantic drift
Sense continuity	Sense emerges as a dynamic, processual achievement	Locally coherent output is generated under probabilistic constraints	Apparent coherence without stable sense integration / fluent but hollow output

This model clarifies why the comparison proposed in the article is not reducible to a metaphor. It does not claim that human cognition and LLMs are "the same," but it shows that both systems may be analyzed through a sequence of regulatory thresholds at which sense can weaken without fully disappearing. In this respect, the model also explains why failures of interpretation should not automatically be treated as defects. In many cases, they reveal the constitutive limits of systems that must maintain coherence under conditions of incomplete information, overload, or competition for attentional resources.

The comparative analysis yields a layered model of sense-making regulation in human cognition and LLM architectures, summarized in **Table 1**.

Discussion: From Coherence Failure to a Broader Theory of Sense Fragility

The results of the study support three broader claims.

First, they confirm the productivity of distinguishing meaning from sense. Formally correct linguistic units do not necessarily produce a stable sense, either in human cognition or in LLM outputs. Meaning may remain available as a systemic property of linguistic form, while sense depends on the event of contextual actualization under specific attentional and temporal conditions. This distinction is central to the article because it allows failures of interpretation to be analyzed without collapsing them into simple semantic absence.

Second, the results support the claim that coherence failures in LLMs are not exhausted by engineering vocabulary alone. Context windows, token weighting, and architectural constraints are obviously relevant, but they do not fully capture what is at stake when a model remains locally fluent while losing continuity in a global sense. The present analysis suggests that such failures are more productively interpreted as disruptions of contextual integration under limited attentional resources. This reframing does not reject technical explanation; rather, it situates it within a broader theory of sense fragility.

Third, the study shows that the comparison between human perceptual gating and LLM attention decay is methodologically productive precisely because it remains limited. The article does not claim equivalence between biological and artificial systems. What it does claim is that both systems expose a common formal-structural problem: the difficulty of preserving the relevant integration of signals over time. In this respect, the comparison becomes useful not because it erases differences, but because it localizes a shared zone of vulnerability within language processing.

Implications of the Findings

The implications of this study are relevant at several levels. For cognitive and linguistic research, the article highlights the need to treat sense-making not as a passive effect of data reception but as a fragile process of selective integration. For digital humanities, it provides a vocabulary for discussing LLM coherence in terms that do not reduce interpretation to engineering metrics alone. Research on AI literacy, trust, and human–LLM interaction suggests that fluent output should not be equated with stable sense, and that interpretive support remains essential wherever long-range contextual coherence matters.

The broader implication is methodological. If sense is indeed a process that depends on the continuity of attention, contextual relevance, and temporal maintenance, then the study of LLMs must engage more seriously with traditions that have long examined the fragility of interpretation in human cognition. Conversely, research on human language processing may benefit from LLM-related cases insofar as they externalize and sharpen the structural limits of coherence that are often harder to isolate in everyday human communication.

Conclusions

This article has examined sense-making in human language processing and transformer-based large language models through a qualitative comparative analysis of perceptual gating and attention decay as regulatory mechanisms mediating the transition from signal registration to sense integration. The study proceeded on the premise that the presence of a

linguistic or perceptual stimulus does not, in itself, guarantee its integration into a coherent interpretive structure. Instead, sense was treated as a processual, selective, and temporally extended achievement dependent on attentional regulation, contextual integration, prior interpretive frameworks, and the maintenance of continuity over time.

The comparative analysis has demonstrated that, despite the ontological differences between biological and artificial systems, human language processing and LLM-based text generation can be productively compared in terms of functional-structural constraints on sense continuity. In both cases, the central difficulty lies not simply in the presence or absence of information, but in whether a registered signal remains sufficiently salient, is preserved within an attentional frame, and becomes integrated into a larger discursive or interpretive whole. From this perspective, perceptual gating in human cognition and attention decay in LLMs should not be understood as identical mechanisms, but as functionally related points of vulnerability within the broader architecture of sense-making.

On this basis, the article makes three main contributions.

First, it proposes a five-level comparative model of sense-making regulation in human language processing and LLMs, structured around signal registration, selective gating, attentional maintenance, contextual integration, and sense continuity. This model provides a framework for describing not only how sense may be stabilized, but also how it may weaken, fragment, or remain suspended even when linguistic or perceptual material is formally available.

Second, the study clarifies the distinction between meaning and sense. Meaning is treated here as a property or semantic potential of linguistic form, whereas sense is understood as an event- and context-dependent result of interpretation that emerges only when a unit is successfully actualized within a broader attentional, temporal, and discursive configuration. This distinction is essential for the present comparison because it enables analysis of failures of interpretation without reducing them either to semantic absence or to purely technical malfunction.

Third, the article reframes coherence failures in LLMs within a broader digital-humanities perspective. Rather than interpreting such failures exclusively through engineering vocabulary – for example, in terms of context-window limitations, token weighting, or prompt design – the study argues that they can also be understood as manifestations of a more general structural problem: the difficulty of maintaining sense continuity under conditions of limited attentional resources and contextual overload. This reframing does not reject technical explanation, but situates it within a wider interdisciplinary account of how coherence is sustained, weakened, or lost.

The findings also have broader implications. For research on human language processing, they reinforce the need to treat sense not as a passive effect of stimulus reception but as a fragile outcome of selective integration. For LLM studies and AI interpretability research, they suggest that fluent output should not be automatically equated with stable sense, and that local coherence may coexist with weakened global integration. For digital humanities, the proposed framework offers a vocabulary for discussing LLM-generated discourse not only in terms of output quality or usability, but also in terms of the structural conditions under which interpretive continuity becomes possible or collapses.

At the same time, the study remains deliberately limited in scope. It does not claim empirical validation of all LLM architectures, nor does it propose an experimentally verified cognitive model of human language processing. Its contribution is more specific: it offers a comparative conceptual framework grounded in selected human and LLM cases, designed to clarify how the relationship between signal fixation and sense integration can be theorized across biological and artificial systems without collapsing their differences. Future research may extend this framework through corpus-based analyses of coherence breakdown, experimental studies of human attentional disruption in language processing, or targeted comparisons of how different LLM architectures preserve or lose contextual continuity in extended discourse.

In sum, the article argues that the central problem shared by human and machine language systems is not simply the handling of information, but the maintenance of sense under conditions of competition, overload,

and temporal fragility. It is precisely at this point – between the formal availability of a signal and its successful integration into an ongoing interpretive whole – that perceptual gating and attention decay become analytically comparable and theoretically productive for contemporary interdisciplinary research on language, cognition, and artificial intelligence.

Conflict of Interest

The author declares no conflict of interest regarding the publication of this article.

Acknowledgments

The author gratefully acknowledges the support of the Centre for Collective Use of Scientific Equipment "Digital Technologies in the Humanities", where the research presented in this article was conducted.

Declaration on the Use of AI

During the preparation of this manuscript, the author used ChatGPT (OpenAI) solely to improve the clarity, grammar, style, and fluency of the English language. All scientific ideas, research design, analysis, interpretation of the results, and conclusions were developed exclusively by the author. All AI-assisted suggestions were carefully reviewed and edited by the author, who assumes full responsibility for the content of the manuscript.

References

1 Ahn, K. (2025). Nonsense and sensation: Deleuze, Zhuangzi, and aesthetics. Comparative and Continental Philosophy, 1-19. https://doi.org/10.1080/17570638.2025.2502327

2 Angelini, L., Klumbyte, G., Daniel, M., Couture, N., Mugellini, E., & Draude, C. (2025). Tangible LLMs: Tangible sense-making for trustworthy Large Language Models. In Proceedings of the Nineteenth International Conference on Tangible, Embedded, and Embodied Interaction (pp. 1-5). https://doi.org/10.1145/3689050.3708338

3 Bian, Y., Song, Y., Ma, G., Zhu, R., & Cai, Z. (2025). DroidRetriever: An autonomous navigation and information integration system facilitating mobile sensemaking. arXiv [Preprint]. https://doi.org/10.48550/arXiv.2505.03364

4 Boyle, S. (2025). The research setting: A narrative of a building in the making. In Sense-Making (pp. 54-94). Routledge. Retrieved December 31, 2025, from https://doi.org/10.4324/9781003564461-7

5 Chen, Z., Zhao, C., Zhao, M., Zhan, Q., Dong, Y., Zhao, S., Yu, S., Yao, C., Xie, Y., Dong, Z., Sun, Q., Liu, Y., Yu, C.-H., Yang, H., & Wang, G. (2025). Rethinking subjective trust in LLM: Actualizing tangibility from uncertainty. Authorea Preprints. Retrieved July 9, 2026, from https://doi.org/10.36227/techrxiv.176463545.53813864/v1

6 Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. Behavioral and Brain Sciences, 36(3), 181-204. https://doi.org/10.1017/S0140525X12000477

7 Clarke, S. (2025). Understanding Everyday Objects and Environments Through Acoustic Perception (Doctoral dissertation, Stanford University). Retrieved July 9, 2026, from https://purl.stanford.edu/mt372cq6483

8 Dürr, O., Segessenmann, J., & Steinmann, J. J. (2023). Meaning, form and the limits of natural language processing. Philosophy, Theology and the Sciences, 10(1), 42-72. https://doi.org/10.1628/ptsc-2023-0005

9 Flatley IV, D. J. (2025). Metacomposition and Transmodality (Doctoral dissertation, University of California, Santa Barbara). Retrieved July 9, 2026, from https://escholarship.org/uc/item/4978w3vf#main

10 Friston, K. (2010). The free-energy principle: a unified brain theory? Nat Rev Neurosci, 11, 127-138. https://doi.org/10.1038/nrn2787

11 Gebendorfer, J. J. (2025). Semantic Physics: the Fundamental Framework. https://doi.org/10.5281/zenodo.17488974

12 Gero, K. I., Swoopes, C., Gu, Z., Kummerfeld, J. K., & Glassman, E. L. (2024). Supporting sensemaking of large language model outputs at scale. In Proceedings of the 2024 CHI Conference on Human Factors

in Computing Systems (pp. 1-21). https://doi.org/10.1145/3613904.3642139

13 Gmeiner, F., Marquardt, N., Bentley, M., Romat, H., Pahud, M., Brown, D., Roseway, A., Martelaro, N., Holstein, K., Hinckley, K., & Riche, N. (2025). Intent Tagging: Exploring Micro-Prompting Interactions for Supporting Granular Human-GenAI Co-Creation Workflows. In Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (pp. 1-31). https://doi.org/10.1145/3706598.3713861

14 Information. Cambridge Dictionary. Retrieved July 9, 2026, from https://dictionary.cambridge.org/dictionary/english/information

15 Kosmeda, T., & Kovtun, O. (2025). Interpretation of the phenomenon of anglicisation of the Ukrainian language. Studies about Languages / Kalbų studijos, 47, 108-122. https://doi.org/10.5755/j01.sal.47.1.40637

16 Liang, C., Zheng, J., Zeng, Y., Tan, Y., Lyu, H., Zheng, Y., Li, Z., Weng, Y., Shi, J., & Zhang, H. (2025). Generative augmented reality: Paradigms, technologies, and future applications. arXiv [Preprint]. https://doi.org/10.48550/arXiv.2511.16783

17 Morcillo, P. (2025). Humanity is dying of fear: Synchronic resonance, fractal consciousness, and the collapse of resilience. Fractal Consciousness, and the Collapse of Resilience (August 27, 2025). https://doi.org/10.2139/ssrn.5410582

18 Motiejūnienė, J., & Danilavičienė, G. (2025). Media accessibility through audiovisual representation of culture-specific references in regard to their subtitled translation. Studies about Languages / Kalbų studijos, 46, 5-16. https://doi.org/10.5755/j01.sal.1.46.38345

19 Schmidt, T., Lange, K. R., Reccius, M., Müller, H., Roos, M., & Jentsch, C. (2025). Identifying economic narratives in large text corpora - An integrated approach using Large Language Models. arXiv [Preprint]. https://doi.org/10.48550/arXiv.2506.15041

20 Suh, S., Min, B., Palani, S., & Xia, H. (2023). Sensecape: Enabling multilevel exploration and sensemaking with large language models. In Proceedings of the 36th annual ACM symposium on user interface software and technology (pp. 1-18). https://doi.org/10.1145/3586183.3606756

21 Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, L., & Polosukhin, I. (2017). Attention Is All You Need. arXiv [Preprint]. https://doi.org/10.48550/arXiv.1706.03762

22 Weick, K. E. (1995). Sensemaking in Organizations. Retrieved July 9, 2026, from https://archive.org/details/trent_0116403577194

23 Zhang, C., & Magerko, B. (2025). Generative AI Literacy: A Comprehensive Framework for Literacy and Responsible Use. arXiv [Preprint]. https://doi.org/10.48550/arXiv.2504.19038

Santrauka

Oleksii Dovhan.

Nuo percepcinio filtravimo iki dėmesio silpnėjimo: prasmės kūrimas žmogaus kalbos apdorojimo ir didžiųjų kalbos modelių kontekste

Šiame straipsnyje nagrinėjamas prasmės kūrimas žmogaus kalbos apdorojimo procese ir transformatorių architektūra grįstuose didžiuosiuose kalbos modeliuose (DKM), atliekant kokybinę lyginamąją percepcinio filtravimo ir dėmesio silpnėjimo kaip reguliacinių mechanizmų tarpininkaujančių perėjimuose nuo signalo registravimo prie prasmės integravimo analizę. Tyrime apibendrinami atrinkti moksliniai darbai apie percepcinį filtravimą, dėmesio filtravimą, prognozuojamąjį apdorojimą ir užfiksuotus DKM nuoseklumo sutrikimus. Šis teorinis apibendrinimas papildomas iliustratyvia lyginamąja žmogaus ir DKM veikimo atvejų analize. Lyginimas skirstomas pagal penkis analitinius aspektus: signalo registravimą, selektyvųjį filtravimą, dėmesio išlaikymą, kontekstinę integraciją ir prasmės tęstinumą.

Analizė rodo, kad kalbinio ar percepcinio stimulo buvimas savaime negarantuoja jo integravimo į prasmę. Priešingai, prasmė traktuojama kaip procesinis rezultatas, priklausantis nuo dėmesio atrankos, jo išlaikymo laike, kontekstinės integracijos ir ankstesnių interpretacinių sistemų. Remiantis tuo, straipsnyje nustatomas funkcinis ir struktūrinis paraleliškumas tarp percepcinio filtravimo žmogaus pažinime ir dėmesio silpnėjimo DKM. Abiem atvejais nesėkminga ilgalaikė integracija gali lemti tai, kad signalai, nors formaliai išlieka priein-

ami, bet funkciškai susilpnėja, todėl prasmės konstravimas tampa uždelstas, fragmentiškas arba nestabilus. Tyrime taip pat teigiama, kad DKM nuoseklumo sutrikimus produktyviau suprasti ne tik kaip techninę išvesties klaidą, bet kaip kontekstinės prasmės integracijos sutrikimą esant ribotiems dėmesio ištekliams.

Straipsnyje pateikiami trys pagrindiniai mokslo rezultatai. Pirma, siūlomas penkių lygių lyginamasis prasmės kūrimo reguliavimo modelis žmogaus ir DKM kalbos apdorojimo procesuose, apimant signalų registravimą, selektyvų filtravimą, dėmesio išlaikymą, kontekstinę integraciją ir prasmės tęstinumą. Antra, paaiškinamas skirtumas tarp reikšmės kaip kalbinės formos savybės ir prasmės kaip nuo įvykio ir konteksto priklausančio interpretacijos rezultato. Trečia, DKM nuoseklumo sutrikimai interpretuojami iš platesnės skaitmeninių humanitarinių mokslų perspektyvos kaip bendros struktūrinės prasmės tęstinumo išlaikymo laike problemos apraiškos, o ne vien tik inžinerinių trūkumų pasekmės. Šie rezultatai prisideda prie tarpdisciplininių tyrimų apie žmogaus kalbos apdorojimą, DKM interpretuojamumą ir nuoseklios prasmių konstrukcijos ribas biologinėse ir dirbtinėse sistemose.

About the Author

OLEKSII DOVHAN

Senior Lecturer, Dragomanov Ukrainian State University, Faculty of Foreign Languages, Ukraine

Research interests

Sense-making, large language models (LLMs), language processing, Digital Humanities, Cognitive Linguistics

Address

8–14 Oleksandra Konyskoho str., Kyiv, 01601, Ukraine

E-mail

o.v.dovhan@udu.edu.ua

ORCID iD

0000-0002-6728-818X