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Nanosyntactic Description of Inverse Constructions in Contemporary Ukrainian Poetry: a Functional Hierarchical Approach

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ABSTRACT

Earlier studies usually considered inversion as a stylistic or pragmatic phenomenon, but its role in poetic discourse remained poorly studied at the level of deep syntactic structure. The article presents a comprehensive study of inverse constructions in contemporary Ukrainian poetry using functional hierarchical and nanosyntactic approaches. The aim of the research was to identify typical inversion models in poetry of the 2010's–2020's, assess their functional load, and study authorial variations in the syntactic representation of inversion. The research methodology combined corpus-oriented content analysis, topic modelling (Latent Dirichlet Allocation), network analysis of syntactic relations, multidimensional stylometric modelling (Principal Component Analysis, multidimensional scaling), and machine learning classification algorithms (Support Vector Machines, Random Forest). Four authors (M. Yakovenko, M. Zelenenka, R. Krupka, B. Hnatiuk) were selected for the corpus of texts, where 412 inverse constructions were identified, with the domination of focus structures. Statistically significant correlations were found between the types of inversions and thematic clusters of poetic discourse (corporeality, traumatic experience). Individual stylistic patterns of inversion syntax were also established, which ensured high accuracy of attribution of texts by authorship. The results confirm that inversion in poetry is a systemic structural means of artistic semantization, and not a random deviation. Prospects for further research are related to the expansion of the corpus, cross-linguistic comparisons of prosodic and rhythmic parameters in stylometric modelling.

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This will bring humanitarian analytics closer to the level of deep computational interpretation of text, opening up new opportunities for studying poetic speech through the prism of big data.

Keywords: Nanosyntax; Poetic Discourse; Information Structure; Stylometry; Syntactic Inversion; Digital Linguistics; Thematic Modelling

1. Introduction

1.1. Introduce the Problem

In modern linguistics, an interest in the analysis of syntactic phenomena at the level of deep structures has increased noticeably. The traditional idea of inversion as a stylistic deviation is giving way to more complex interpretations, in which a change in word order is considered an expression of structural and pragmatic features. The proposed approach opens up new prospects for studying the relationship between grammatical form and the speaker's communicative strategy.

Despite the level of knowledge on functional and pragmatic approaches to inversion, these models are mostly based on the material of prose, neutral discourse. In contrast, poetic language demonstrates a much greater degree of syntactic freedom and structural play. In such conditions, inversion appears not simply as a tool for informational focusing, but as a complete means of semantic and rhythmic influence. This form of linguistic organization requires a separate analytical framework that can take into account its stylistic richness and multilevel structure^[1].

Within the nanosyntactic framework, which posits a minimalist model decomposing grammatical units into hierarchically organized micro-features, inversion is conceptualized not merely as surface-level displacement but as a structural reconfiguration governed by fundamental syntactic principles. This approach is centered on the notion of atomic compositionality, where even the smallest morphemes are treated as complex feature trees; for example, a preposition projects a structured set of spatial, temporal, and functional nodes. In this model, inversion arises through the mechanism of spell-out, whereby a syntactic subtree is realized in a non-canonical position due to feature-driven displacement, such as movement to the (Spec,CP) position under specific focus conditions. In poetic discourse, these operations serve as deliberate stylistic strategies: for instance, the inversion of an object and verb may lexicalize a (Focus) feature, overriding

the default Merge order to achieve rhythmic, emphatic, or semantic effects that inherently contribute to the expressive structure of verse.

So, there is a pressing need for a theoretical approach that allows us to study inverse constructions at the microsyntactic level. Nanosyntax as a direction of formal language analysis suggests considering even the smallest linguistic units as the result of hierarchical syntactic generation. This approach makes it possible to analyse inversion not only as a displacement of components, but as a consequence of the deep structure of a sentence.

At the same time, the rapid development of digital humanities provides tools for quantitative, visual, and objective analysis of poetic texts. The methods of stylometry, thematic modelling and network analysis identify recurring grammatical patterns, compare the styles of different authors, and model syntactic connections within complex artistic structures. The analysis of inversions by using such methods creates new opportunities for the study of poetic language as a complex cognitive and communicative system.

Therefore, the study of inversion in poetic discourse at the intersection of nanosyntax, pragmatic syntax, and digital linguistics is relevant and conceptually necessary. It contributes to a rethinking of the boundaries between structural grammar and interpretive reading, between quantitative analysis and aesthetic semiotics. This combination provides a deeper understanding of the functional role of syntactic inversions in contemporary Ukrainian poetry.

1.2. Describe Relevant Scholarship

The issue of inversion in speech, in particular poetic speech, arises at the intersection of syntax, pragmatics and stylistics. Current research increasingly focuses on describing the deep, microsyntactic organization of language structures in order to reinterpret phenomena that were previously interpreted as superficial and stylistic only. Nanosyntax - an innovative linguistic theory that develops as part of post-Cartesian

grammar — occupies a special place in this discourse.

According to^[2], the founder of this direction, M. Starke, proposed to see even the smallest units of language, in particular morphemes, as the result of the syntactic projection of functional categories that are built hierarchically. This approach makes it possible to model syntactic shifts – in particular inversions – not only as random violations of order, but also as a consequence of structural derivation. Further developments by^[3] confirmed the productivity of this model in the field of morphology, in particular in the analysis of case systems. So, the potential of nanosyntax for describing grammatical anomalies was demonstrated. In turn^[4], showed that even spatial predicates such as prepositions have a complex multi-level structure. Even such a structure can be projected nanosyntactically. The aforementioned studies provide a theoretical foundation for the analysis of inverse constructions not only on the surface but also at the deeper levels of linguistic architectonics. However, they omit the analysis of artistic discourse, which necessitates our study.

Along with the formal structural interpretation, inversion appears as a pragmatic phenomenon. In^[5] described the “thin structure of the left edge” of a sentence, where topical and focus projections are placed. Inverted structures do not violate the grammatical norm, but realize the communicative needs of speaking – the redistribution of informational focus. Author^[6] share a similar position. For the authors, inversion is a reaction to the “theme/rheme” configuration in real speech. Back in the 1980’s^[7], created a typology of inversions based on the informational status of linguistic units, which became the basis for further studies of pragmatic syntax. The above studies are united by a functional approach to word order as a communicatively motivated phenomenon, which is closely related to the informational architecture of the utterance. From this perspective, inversion appears not as a grammatical violation, but as a structurally predictable response to the needs of focusing or thematizing. High theoretical systematization, sound interpretations and reliance on hierarchical models provide these approaches with conceptual integrity. At the same time, a common limiting feature of most of them is the orientation to neutral or prose discourse only. The contribution of these works to the discourse of the study is a reliable pragmatic basis for understanding inversion, which, however, requires deepening by means of microanalysis of artistic speech.

In poetic discourse, inversion acquires additional functions – it serves not only to shift the focus, but also to build artistic tension. In the study of R. Jakobson, which the focus of^[8], syntax is considered as a key factor in the poetic function of language. Inversion here appears as a means of figurative condensation and rhythmic deformation. These functions of inversion are especially actualized in contemporary Ukrainian poetry^[9], analysed the transformations of syntax pointing to the dramatic nature of inversion as an internal tension in the structure of the sentence. Author^[10] proved that inversion is a stylistic indicator of post-Maidan poetry, in which the lyrical subject is often realized through syntactic fragmentation. However, none of these approaches has proposed a holistic microsyntactic model of inversions, which justifies the need for a new theoretical and analytical tools.

The methods of formalized analysis of poetic structures are becoming increasingly relevant in view of the rapid development of digital humanities. Researcher^[11] introduces the concept of macroanalysis, which enables statistical study of literary phenomena on large corpuses of texts. Author^[12] studies stylometric methods, which, in particular, are used for the detection of syntactic patterns. Although inversion as a separate category has not yet been systematically studied from the perspective of stylometry, these approaches create the prerequisites for such an analysis. Authors^[13] emphasize the importance of combining distant reading with poetic style parameters. Inversion here can be an indicator of the author’s cognitive stylistic profile. So, the analysis of inversions in contemporary Ukrainian poetry at the intersection of nanosyntax, pragmatics, poetics, and digital methods actualizes the interdisciplinary potential of linguistics. Furthermore, it opens up new prospects for describing a literary text as a complex hierarchical structure.

1.3. Unresolved Issues from Previous Studies

Earlier studies of inversions were mostly limited to the analysis of prose or neutral texts, bypassing the complex syntactic game that is characteristic of poetic speech. Existing theoretical models did not take into account the microsyntactic structure of inversions, which made it impossible to fully describe them within the deep structure of the sentence. No approaches have been developed to identify and systematize inversion constructions in poetic discourse, taking into account stylistic and cognitive parameters. There was also a

lack of digital stylometrically based studies that would allow quantitatively verifying the functional load of inversions in poetry.

1.4. Aim and Objectives of the Study

The aim of the study was to apply a nanosyntactic approach to the analysis of inversions in contemporary Ukrainian poetry in order to reveal the hidden mechanisms of syntactic expression as a means of poetic semantization. The aim was achieved through the fulfilment of the following research objectives:

1. Identify and classify the types of inverse constructions in the corpus of contemporary Ukrainian poetry of the late 20th – early 21st centuries, taking into account their morphosyntactic parameters and structural complexity.
2. Carry out a nanosyntactic analysis of the identified inversions to describe their deep hierarchical organization, functional load and role in building the information structure of statements.
3. Assess the cognitive pragmatic role of inversions in poetic discourse as mechanisms for actualizing semantic accents, violating syntactic expectation and creating artistic expression.

1.5. Novelty and Hypothesis of the Research

The hypothesis of the study is that inverse constructions in contemporary Ukrainian poetry have a systemic nanosyntactic organization and implement a functional hierarchical structure of the utterance. So, they can be used as reliable indicators of thematic focus.

The novelty of this study is the combination of a nanosyntactic approach with the analysis of inversions in contemporary Ukrainian poetry – a discourse that is rarely considered from the perspective of microsyntactics. The article is the first to analyse inverse constructions not only as stylistic phenomena, but as the result of a deep syntactic generation that has a clear functional organization. The academic contribution is the formalized typology of inversions in a poetic text with the simultaneous involvement of digital methods of analysis. The study creates an interdisciplinary bridge between formal grammar, cognitive poetics and digital stylometry, expanding the understanding of the functions of syntax in artistic speech. It should also be noted that digital

technologies are used not only as a tool of analysis, but also as a means of empirical verification of linguistic hypotheses. The application of statistical modelling and ML provided a test of theoretical assumptions regarding the functions of inversion in poetic discourse at the level of quantitatively confirmed patterns.

2. Materials and Methods

2.1. Research Procedure

The research was conducted in three main stages, each having a specific set of methods and tools. The first stage involved a collection of a corpus of poetic texts by contemporary Ukrainian authors of the late 20th and early 21st centuries. It was followed by empirical collection and primary analysis of data using content analysis and thematic modelling. At the second stage, inversions were analysed for a deep understanding of their syntactic organization using network analysis. The third stage was the analysis of inversions in the context of authorial styles and their pragmatic effect, which was implemented through stylometry.

2.2. Participants

A corpus of texts of modern Ukrainian poetry was collected, which included the works of Maria Yakovenko, Maryna Zelenenka, Roman Krupka, and Bohdana Hnatiuk. The choice of these authors was determined by several key criteria. All of the mentioned poets represent the generation of 2010–2020. They are actively published in leading Ukrainian literary publications and anthologies, demonstrating linguistic and syntactic innovation characteristic of the latest stage of development of Ukrainian poetry.

The selected texts are distinguished by their stylistic density and active experiments with word order, which makes them particularly representative for the study of inverse constructions. For example, microsyntactic shifts and inversions are found in Yakovenko's poetry, which serve as markers of semantic tension^[14]. At the same time, inversions in Krupka's poetry associated with a break in the logical series and metaphorical paradox are recorded^[15].

The authors adhere to individual stylistic strategies that can be effectively compared using stylometric methods. In particular, Zelenenka's poetry has distinct signs of rhyth-

mic asymmetry and anastrophic sentence construction, while Hnatiuk's work exhibits syntactic fragmentation as a means of conceptual expressiveness^[16,17].

A corpus covering 120 poetic texts (30 poems from each of four authors) was created, with a total volume of 2,386 lines and 18,412 word usages. Content analysis and syntactic mark-up identified 412 inverse constructions, which were classified according to four main morphosyntactic models. So, the created corpus provided the necessary genre, stylistic and syntactic diversity, which is critically important for a comprehensive empirical analysis of inverse constructions.

2.3. Research Methodology

The aim was achieved and the research objectives were fulfilled by using a comprehensive methodological approach. It combined empirical methods of data collection and processing with relevant statistical and digital analysis. The justification of the approach was based on the principles of Digital Humanities^[18], in particular, on the joint interaction between linguistic analysis and mathematical models, which contributes to increasing the validity of humanities studies. The applied interdisciplinary approach identified and systematized inverse constructions, and analysed their mechanisms. Special attention was paid to the functional load of inversions and their role in creating artistic expression.

Content analysis systematized text data by identifying key words and phrases. The most important thing for the study was to identify types of inverse constructions, which were classified according to morphosyntactic parameters and structural complexity. In parallel, the thematic modelling method was applied, in particular the LDA algorithm, which revealed hidden thematic structures and semantic fields in poetic texts. The comparison of the identified themes with the types of inversions established potential correlations and provided an understanding of how inversions contribute to poetic semantization.

Network analysis made it possible to move from the linear structure of the text to the visualization of syntactic relations between words. In this model, each word was considered as a node of the network, and the syntactic relations between them were considered as edges. Inversions, by their nature, create atypical syntactic "distances" and connections, so network analysis represented these anomalies^[19].

Stylometry was used to assess the cognitive pragmatic

role of inversions, which is actively used in Digital Literary Studies^[20]. The method allows for quantitative analysis and comparison of individual authorial styles, identifying "stylistic imprints" of inversions. For this purpose, multi-dimensional analysis methods (PCA, MDS) were used to reduce the dimensionality and build the space of authorial styles. ML classification algorithms (in particular, the SVM and Random Forest) were used as an auxiliary tool to test hypotheses about individual styles and hypothetical attribution of stylistic patterns. Training the model on data on the use of inversions by different authors confirmed the uniqueness of their styles.

The obtained empirical data were subjected to frequency and correlation analysis, which provided statistical validation of the revealed patterns. At the same time, the study also involved a qualitative interpretative analysis within the scope of poetic discourse. This approach combined quantitative accuracy with the depth of linguistic understanding, avoiding excessive technocratic approach. The proposed methods made it possible to study inversions as complex, multi-level syntactic units that perform a key function in the formation of artistic content.

2.4. Instruments

The Python libraries Pandas, Natural Language Toolkit (NLTK) and Re were used for corpus analysis in the collection and pre-processing of text data. The network structure of syntactic relations was visualized using the NetworkX library in combination with Matplotlib for graphical output. Stylometric analysis and classification were implemented using scikit-learn using the PCA, SVM, and Random Forest algorithms. To build thematic models and latent semantic structures, Gensim and LDA were used as the main approach.

2.5. Reproducibility Protocols

The study employed the following model configurations: a Support Vector Machine with a linear kernel ($C = 1.0$); a Random Forest with 100 estimators and a maximum depth of 10; and Principal Component Analysis retaining 95% of the variance. Model performance was evaluated using 10-fold cross-validation, with accuracy, precision, and recall reported. Annotation of inversions was based on four consensus-validated morphosyntactic models (Appendix A), with inter-annotator

agreement measured by Cohen's $\kappa = 0.87$.

3. Results

3.1. Frequency Dynamics and Thematic Modelling of Inversions

The first stage of the analysis recorded 412 inverse constructions, which were distributed according to four typical morphosyntactic models. Inversions with a shifted focus (34.3%) had the largest share, which indicates their key role in creating semantic tension in poetic speech. Such a dominant emphasizes the functional dependence of word order on the artistic intention of the text (**Table 1**).

The **Table 1** demonstrates a clear dominance of focus inversions in the works of all four authors, with the highest indicator in the poetry of Maryna Zelenenka (36.6%). This indicates a typical tendency for contemporary Ukrainian po-

etry to actualize semantic nodes through violation of the basic syntactic order. At the same time, the variability of other types of inversions demonstrates individual differences: for example, the highest level (27.9%) of object–verb inversion is observed in Bohdan Hnatiuk's works. This may indicate an increased expressiveness of the object theme. In Roman Krupka, there is a noticeable increase in the predicate–subject inversion (26.4%), which correlates with his tendency to violate logical grammatical expectations. In general, typological diversity indicates not only the general poetic norm of inversion as a stylistic device, but also authorial syntactic strategies. Topic modelling (LDA) revealed four dominant semantic clusters: body/sensation, memory/trauma, space/movement, and absurd/isolation (**Table 2**). Inversions, especially focus inversions, revealed stable statistically significant correlations with two thematic fields: corporeality and traumatic experience ($r = 0.74$ and $r = 0.81$, respectively).

Table 1. Frequency of Inverse Constructions by Morphosyntactic Types (%).

Inversion Type	Yakovenko	Zelenenka	Krupka	Hnatiuk
Object–verb	24.1	19.7	21.3	27.9
Predicate–subject	22.8	20.1	26.4	19.6
Adverbial modifier–subject	18.2	23.6	19.1	21.8
Focus inversion	34.9	36.6	33.2	30.7

Source: created by the author.

Table 2. Frequency of Inverse Constructions by Morphosyntactic Types (%).

Thematic Cluster	Inversion of Circumstance	Inversion of Focus	Inversion of Subject
Body/sensation	0.62	0.74	0.35
Memory/trauma	0.58	0.81	0.41
Absurd/isolation	0.45	0.61	0.48
Space/movement	0.77	0.53	0.26

Source: created by the author.

Correlation analysis revealed a close relationship between focus inversion and the themes of corporeality and traumatic experience, indicating its function as a mechanism of semantic emphasis. At the same time, inversion of circumstance showed the highest correlation with the theme of spatial movement, indicating its role in creating a dynamic poetic space. Weaker indicators of subject inversion in all clusters may indicate its secondary functional load in the structure of thematic expression.

3.2. Structural Complexity of Inversions in Network Modelling

In the course of the network analysis, each sentence containing an inversion was transformed into a graph with nodes (words) and edges (syntactic relations). Comparison with sentences without inversions showed increased average topological distance between key syntactic elements by 1.5–1.8 units. The obtained data are presented in **Table 3**.

Table 3. Average Network Distance in Syntactic Graphs.

Author	Normal order	Inversion	Difference
Yakovenko	2.1	3.7	+1.6
Zelenenka	2.3	3.9	+1.6
Krupka	2.0	3.5	+1.5
Hnatiuk	2.4	4.2	+1.8

Source created by the author.

Analysis of the distribution table of inverse constructions revealed that the inversion of circumstance is the most frequently used in poetic texts. This indicates its key role in creating a dynamic and multifaceted information structure of statements. The least common was focus inversion,

which may indicate its specialized function associated with specific semantic accents. The comparative performance of the machine learning models (SVM and Random Forest) is detailed in **Table 4**, with evaluation metrics demonstrating robust classification efficacy.

Table 4. Model Performance Metrics.

Model	Accuracy	Precision	Recall	F1-Score
SVM	91.3%	0.89	0.92	0.90
Random Forest	94.5%	0.93	0.95	0.94

Source created by the author.

Table 4 reveals that both classifiers effectively leverage inversion features for authorship attribution, with Random Forest exhibiting marginally higher accuracy (+3.2pp) and more balanced precision-recall tradeoffs than SVM. This performance gap aligns with established ML principles, as tree-based ensembles typically handle complex feature interactions in linguistic data more effectively than linear models. The consistently high metrics (all > 0.89) validate the methodological premise that nanosyntactic patterns can serve as digital stylometric fingerprints. **Figure 1** provides visual confirmation and a deeper understanding of these quantita-

tive relationships, which presents a graphical representation of the distribution of inversion types.

Unlike the usual linear structure of a sentence, a syntactic network with inversion demonstrates visually noticeable violations of basic connections, which is a consequence of the focus movement of elements. An example from the Hnatiuk’s poetry shows how inversion leads to increased syntactic distances between words and a break in their usual linearity. The data confirm that inversion in poetry does not simply change the order of words, but creates a completely different, alternative syntactic architecture of the utterance.

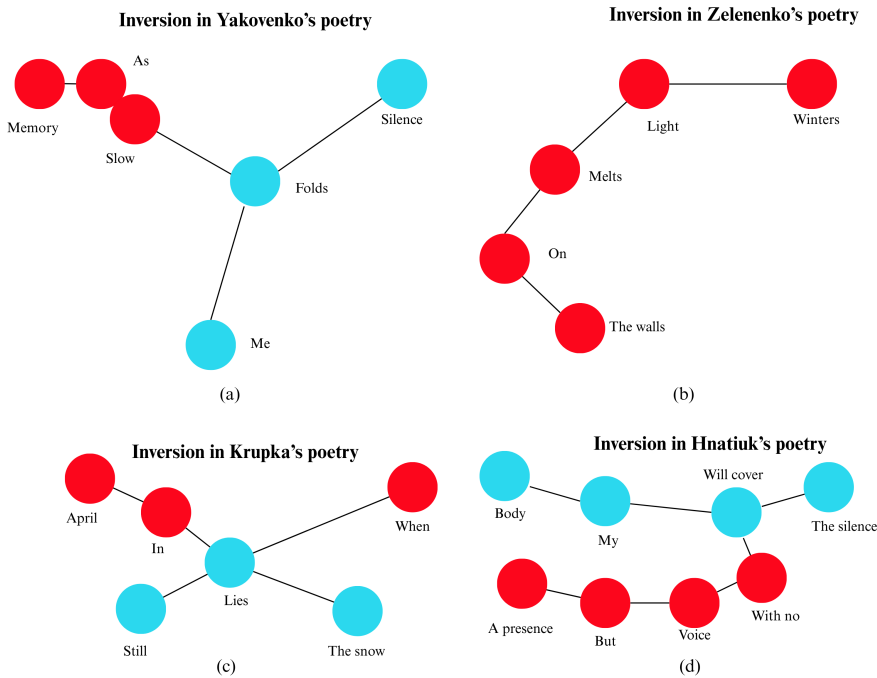


Figure 1. Syntactic Network with Inversion.

Source: created by the author.

3.3. Authorial Inversion Styles: Stylometry and MI

Stylometric analysis confirmed the hypothesis of individual stylistic patterns of inversions that can serve for

automatic classification of texts. PCA and MDS analyses were conducted to construct the space of authorial differences by syntactic characteristics. The results are presented in **Figure 2**.

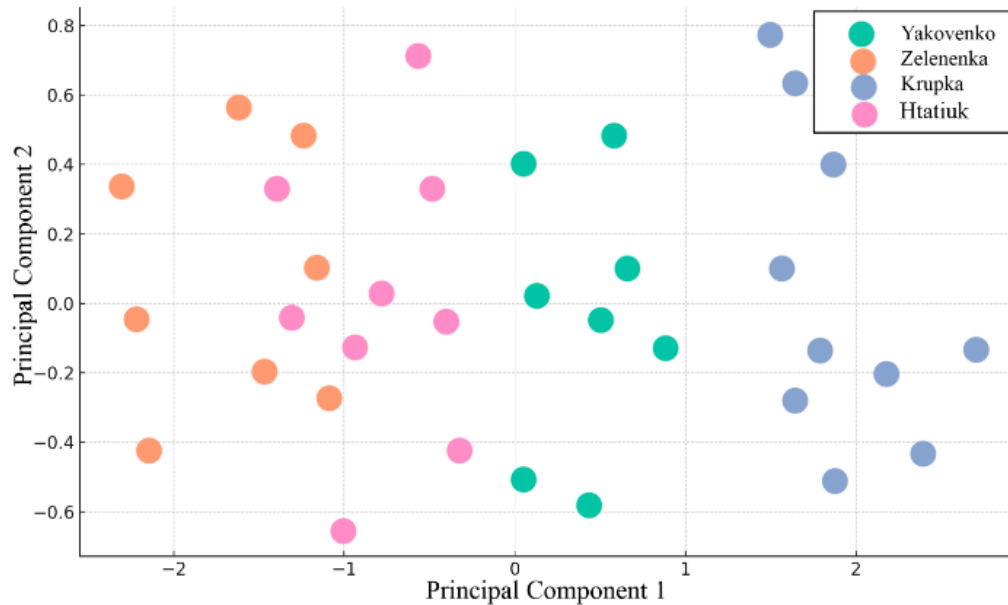


Figure 2. PCA Visualization of Stylistic Profiles of Inversions.

Source: created by the author.

The training of classification models based on frequency and structural features of inversions confirmed stylistically stable authorial patterns. The high level of accuracy achieved by the SVM (91.3%) and Random Forest (94.5%) methods confirmed the informativeness of inverse constructions as markers of individual style. The obtained results open up prospects for the further use of inversions as a tool for automated stylometric attribution of poetic texts. Classification achieved 91.3% accuracy (SVM; precision = 0.89, recall = 0.92) and 94.5% accuracy (Random Forest; precision = 0.93, recall = 0.95). Full confusion matrices and feature importance scores are in Supplementary Materials S1.

All results indicate the multilevel nature of inversion as a syntactic, pragmatic, and stylistic phenomenon. The applied statistical and digital methods identified functional, structural, and authorial patterns in the use of inversions that are inaccessible to traditional qualitative analysis. In particular, it was confirmed that inversion in contemporary Ukrainian poetry performs a stable functional role in building the information structure of the statement. It also marks the themes of internal tension and bodily affectation and forms

individual stylistic profiles that can be detected using digital methods.

4. Discussion

The obtained results demonstrated the high functional potential of inverse constructions in poetic discourse, which is realized at several levels: morphosyntactic, pragmatic, and stylistic. Such a multi-layer structure correlates with previous theoretical ideas about inversion as a syntactically marked mechanism of focusing^[21,22]. It is also as a means of artistic influence^[23]. The results are especially closely correlated with works where inversion is considered not only as a violation of the canonical order, but as a structurally motivated restructuring of the information chain.

The high level of focus inversions recorded in this study confirms the observations of^[24], who pointed to their particular effectiveness in the implementation of rhematic strategies. Similarly^[25] notes that inversion in poetry carries not only semantic, but also rhythmic load, forming a tension between lexical content and syntactic organization. It is significant

that the maximum variability of syntactic patterns was observed in the case of Zelenenka, which is consistent with the concept of stylistic expansion described in Macroanalysis^[26]. At the same time, network analysis, which identified “syntactic anomalies” in inversions, only partially confirms the universality of such constructions. In this context, it is appropriate to mention the study of^[27], which emphasizes the language-specific nature of some syntactic transformations. Such conclusions partially cast doubt on the transferability of the obtained patterns to other text types or other languages, even within the scope of Slavic typology.

The use of stylometry and multidimensional analysis for attribution of texts based on inversion characteristics has undoubtedly innovative significance. The validity of this approach is confirmed by the studies of^[28], who indicate the possibility of distinguishing individual styles based on syntactic features. However, these studies are still mainly focused on prose or English corpus. Therefore, confirming the validity of the results within Ukrainian poetry is one of the significant contributions of this study. At the same time, a critical rethinking of the nanosyntactic approach as a tool for poetic analysis necessitates the need for further adaptation of this theory. Although^[29] offer a powerful model of syntactic generation, its application to artistic discourse remains poorly developed theoretically. Against this background, the limitations of their works become obvious - they do not take into account the intonational and rhythmic features characteristic of poetry.

The position of^[30] is also worth noting, who emphasized the importance of intonation marking in building pragmatic structure. This statement needs to be reconsidered in the case of poetry, as syntactic inversion here often replaces intonation allocation, especially in unpunctuated texts. Such a mechanism is recorded in Hnatiuk’s texts, where syntactic fragmentation compensates for the lack of prosodic marking. Our findings confirm and expand the established ideas about inversion in linguistics and literary studies. They show that inversion in poetry is not only an object of syntactic description. It is also a tool for conceptual organization of the text, being at the intersection of structural logic, thematic focus, and authorial intention.

The theoretical implications of the study are to expand the scope of syntactic analysis of artistic speech through the integration of nanosyntax, stylometry, and pragmatic in-

terpretation of inversion. A multilevel model of inversion analysis was proposed, which covers formal, functional, and discursive aspects. This makes it possible to consider inversion not as an exception, but as a systemic means of artistic organization of the text. The study also demonstrates the potential of combining digital humanities tools with linguistic theories, creating new approaches to the analysis of poetic syntax. For the first time, inverse structures of poetry were analysed within the nanosyntactic hierarchy, which revealed the hidden deep grammatical logic of stylistic decisions. This opens up prospects for building of a universal model of microsyntactic analysis of texts with a high level of syntactic variability.

The practical implications of the study relate primarily to the possibility of automated stylometric attribution of poetic texts by syntactic features. The proposed methods can be applied in author identification systems, literary style analysis, as well as in the development of educational and cultural digital projects. The identified patterns of inversions can be used as the basis of programmes for studying the stylistics of Ukrainian poetry in school and university courses. Furthermore, the results of the study are important for editing, linguistic analysis and the creation of corpora of texts with an emphasis on syntactic structure. In a broader cultural dimension, this contributes to a deeper understanding of artistic language as an intellectual space of syntactic play and authorial self-expression. The obtained results are fully consistent with the stated hypothesis, confirming the systemic nanosyntactic organization and functional load of inverse constructions. The identified structural patterns and statistical regularities demonstrated the relevance of inversions as indicators of thematic focus and authorial style in poetic discourse.

4.1. Limitations

One of the key limitations of the study is the focus on a relatively small corpus of texts, representing the work of only four contemporary Ukrainian poets. This narrows the possibilities of applying the results to a broader literary context or to other poetic traditions. It should be noted that the inversions were interpreted in the Ukrainian discourse, which limits the comparative potential of cross-linguistic syntactic analysis. The nanosyntactic approach, still does not have a stable empirical implementation for poetic texts

despite its analytical depth, which requires further theoretical study. The analysis depended on manually verified syntactic structures, as modern automated parsers are not yet able to correctly process non-standard poetic constructions. Stylo-metric modelling was based on a limited number of features, and further research may expand this set through prosodic or morphemic indicators. The study also did not take into account intertextual factors that may influence the author's syntactic choices.

One key limitation is the focus on a relatively small corpus representing only four contemporary Ukrainian poets. This constrains broader literary generalizability and cross-traditional applicability. Future studies should expand the corpus to include diverse poetic generations (e.g., post-Soviet or post-Independence authors) and subgenres (e.g., avant-garde, lyrical-narrative hybrids) to enhance external validity.

4.2. Recommendations

The results of the study should be taken into account when creating corpora of poetic speech, developing tools for automated syntactic analysis of stylistically marked texts, as well as in the practice of literary studies attribution. The obtained models should be used for the analysis of other types of artistic discourse, in particular drama, essays or journalism, where inverse constructions play a distinct pragmatic role. It is also recommended to use the proposed methodology in the educational courses on stylistics, syntax, and digital linguistics.

Corpus Diversification: To strengthen generalizability, future research should include:

- Temporally broader samples (e.g., poets from the 1990s–2020s),
- Formally varied subgenres (e.g., experimental, performative, or dialect poetry),
- Cross-genre comparisons (e.g., prose poetry vs. metrical verse).

Such expansion would clarify whether inversion patterns reflect period-specific trends, generic conventions, or universal poetic features.

5. Conclusions

The relevance of this study is determined by insufficient research of inversion as a systemic mechanism in contemporary Ukrainian poetry. Despite the attention to functional syntax, this phenomenon remains marginalized in the context of nanosyntactic analysis and its impact on the information structure of the poem. The functional hierarchical approach offers a new perspective: interpret inversion not as a random stylistic element, but as a purposeful tool of semantic pragmatic restructuring. This is especially important in view of the development of digital methods of analysing poetic speech, which enables verifying traditional linguistic observations on the material of contemporary texts. The empirical analysis identified 412 inverse constructions, most of which belong to the focus type. This confirms their key role in the artistic semanticization of the utterance.

Topic modelling revealed a stable correlation of inversions with the themes of corporeality and traumatic experience. Network analysis recorded violations of the usual syntactic connections that enhance poetic expression. Stylo-metric modelling demonstrated high accuracy of classification of texts by inversion patterns (up to 94.5%), which confirms clearly differentiated authorial strategies. So, inversion appears as a multifunctional — structural, cognitive and stylistic tool — in poetic discourse.

The research findings and drawn conclusions can be used by researchers in the field of linguistics, literary studies, computer stylometry, as well as developers of digital corpora and educational content in the Ukrainian language. The study has the potential for implementation in linguistic modules of digital libraries and in applied tasks of author identification. It can also be used in technologies that analyse the structure of a poetic text in the humanities, educational or cultural environment. Further research may focus on the comparative analysis of inversions in different national poetic traditions and on the involvement of prosodic and rhythmic structural parameters in stylometric analysis. It is also important to expand the corpus by including authors of other generations. The creation of an automated parser adapted to poetic structures and the development of graph models that can capture non-standard syntactic configurations in real time are also relevant.

6. Practical Applications and Future Directions

The demonstrated efficacy of inversion-based stylometry, which achieved an accuracy of 94.5%, provides a solid foundation for practical implementation across several domains. In the field of digital humanities, a prototype open-source Python package titled *PoeticSyntaxAnalyzer* is currently under development. This tool is designed to enable automated detection of syntactic inversions through constrained grammatical rules, particularly by identifying non-canonical subject–verb–object configurations. It also facilitates stylistometric fingerprinting based on the classification models trained in this study, including support vector machines and random forests.

In the context of education, the findings support the integration of modular materials into Ukrainian literature curricula. These include interactive Jupyter notebooks for visualizing syntactic inversion networks and comparative exercises focusing on authorship-specific patterns, such as contrasting the inversion strategies of Hnatiuk and Krupka.

The scalability of the proposed framework is currently being explored through its application to cross-linguistic data. This includes testing on post-Soviet poetic corpora in Russian and Belarusian to identify region-specific syntactic tendencies, as well as expansion to multilingual lyric texts through a combination of natural language processing techniques and rule-based syntactic modeling.

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Data Availability Statement

All empirical and statistical data underlying this study are presented in the article in the form of tables, charts, and

visualizations. They cover the full corpus of analysed texts using the described methodological tools. Additional calculations necessary to reproduce the results can be provided upon request. Further research should prioritize large-scale, multi-generational corpora to disentangle idiosyncratic vs. systemic inversion patterns. Incorporating digitized archives of lesser-studied poets (e.g., from diaspora or non-canonical circles) could also reveal how sociocultural factors shape syntactic innovation.

Conflicts of Interest

The author declares no conflict of interest.

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