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Emotional Arabic Corpus: Affection Classification Based on Balāghah Structural Analysis

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Abstract
This study aims to develop an emotional Arabic corpus and to examine affection classification based on balāghah structures as an analytical framework. The primary objective is to provide a computational model capable of detecting and classifying emotions in Arabic texts while considering aspects of classical stylistics. The methodology involves the collection of Arabic textual data from both classical and contemporary literary sources, affect annotation conducted by linguists and experts in balāghah, and the application of machine learning algorithms for emotion classification. The analysis focuses on the relationship between stylistic devices—such as *majāz*, *tashbīh*, *isti'ārah*, and other rhetorical patterns—and the emotional intensity represented in the corpus. The results indicate that balāghah structures contribute significantly to classification accuracy, particularly in detecting subtle and context-dependent emotional nuances. The developed classification model demonstrates superior performance compared to purely lexicon-based approaches, achieving an improvement in accuracy of approximately 12–15% in complex emotion categories. These findings highlight the relevance of traditional linguistic approaches in modern affective analysis and open opportunities for the development of Arabic natural language processing (NLP) applications that are sensitive to emotional and rhetorical contexts. In conclusion, the integration of balāghah structures into an emotional corpus can enhance computational understanding of the affective dimensions of the Arabic language while also providing a methodological contribution to the fields of linguistics and artificial intelligence.

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INTRODUCTION

The Arabic language, as one of the classical languages rich in aesthetic values, possesses a high expressive capacity for conveying emotions through rhetorical and stylistic structures (*balāghah*).[1] The expectation of Natural Language Processing (NLP) is to accurately capture meaning, context, and affect, enabling computational systems to understand the emotional nuances

[1] Hany Rashwan et al., "Balāgha Is Not Rhetoric: The Untranslatability of Arabo-Islamic Literary Terms," *Translation and Interpreting Studies. The Journal of the American Translation and Interpreting Studies Association* 20, no. 2 (December 2025): 189–211, https://doi.org/10.1075/tis.25037.ras.

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embedded in Arabic texts.[2] Ideally, an affect classification system should be able to integrate the rhetorical elegance and syntactic complexity of the Arabic language in order to produce emotional interpretations that approximate human understanding.

However, in practice, research on Arabic Natural Language Processing (NLP) has largely focused on lexical analysis and word frequency without adequately considering traditional stylistic aspects. This approach often fails to capture subtle emotional nuances, irony, or metaphors that are commonly found in both classical and modern Arabic literature. As a result, automated systems frequently interpret texts in a superficial manner, overlooking the rhetorical context that influences the intensity or type of affect conveyed.[3]

Previous studies have demonstrated several advancements in the affective processing of the Arabic language. For instance, some researchers have developed lexicon-based sentiment analysis models capable of classifying Arabic texts into positive, negative, and neutral categories.[4] Meanwhile, other studies have applied machine learning approaches to detect complex emotions in Arabic social media texts.[5] Although the results are relatively satisfactory within the lexical domain, these approaches remain less sensitive to balāghah devices, which often convey additional layers of emotional meaning.

Several other studies have emphasized the importance of balāghah in the classical linguistic understanding of Arabic.[6] For example, previous research has shown that rhetorical structures such as *majāz*, *tashbīh*, and *istiʿārah* play a significant role in conveying emotional intensity and nuance. However, these studies have largely remained manual or theoretical in nature, lacking computational integration that would enable large-scale analysis.

Based on this review, a clear research gap can be identified: there is currently no emotional Arabic corpus that integrates affect classification based on balāghah structures with computational models. This limitation constrains the development of Arabic NLP, particularly in detecting emotions that are contextual, subtle, or metaphorical in nature. To address this issue, the proposed solution is to develop a new corpus specifically annotated for affect, while simultaneously applying machine learning algorithms that incorporate balāghah features as predictive variables in emotion classification.

[2] Mokhaiber Dandash and Masoud Asadpour, "Personality Analysis for Social Media Users Using Arabic Language and Its Effect on Sentiment Analysis," *Social Network Analysis and Mining* 15, no. 1 (March 2025): 6, https://doi.org/10.1007/s13278-025-01413-2.

[3] Jebran Khan et al., "Textual Variations in Social Media Text Processing Applications: Challenges, Solutions, and Trends," *Artificial Intelligence Review* 58, no. 3 (January 2025): 89, https://doi.org/10.1007/s10462-024-11071-z.

[4] Engi Amin, Mazen Hassan, and Sarah Mansour, "Producing a Sentiment Lexicon for Colloquial Egyptian on Social Media: Methodology and Findings," *British Journal of Middle Eastern Studies* 0, no. 0 (July 2025): 1–18, https://doi.org/10.1080/13530194.2025.2524817.

[5] Fatemah Husain, "Towards Safe Digital Communication: Building an Offensive Language Detection Framework for Kuwaiti Arabic," *Social Network Analysis and Mining* 16, no. 1 (February 2026): 36, https://doi.org/10.1007/s13278-026-01580-w.

[6] Muhammad Afthon Ulin Nuha, Ubay, and Nurul Musyafaah, "Digging Into The Beauty Of Language: Effective Balaghah Learning Strategies In The Digital Age," *Journal of Teaching and Learning* 2, no. 2 (January 2026): 81–92, https://doi.org/10.71305/jtl.v2i2.1372.

Furthermore, the integration of balāghah into emotion classification models also has the potential to enhance both the accuracy and the interpretive relevance of emotional analysis,[7] This is because the approach does not rely solely on words or frequency patterns, but also incorporates rhetorical structures that shape emotional meaning. Such an approach is expected to bridge the gap between classical linguistic analysis and modern NLP technologies, thereby providing a dual contribution to the fields of Arabic linguistics and affective computing.

Against this background, the present study aims to develop an emotional Arabic corpus classified according to affective categories, utilizing balāghah structures as the primary analytical foundation. Specifically, this research focuses on: (1) the collection and annotation of Arabic texts with clearly defined emotional categories; (2) the identification of balāghah features that contribute to the intensity of affect; and (3) the application of machine learning models for emotion classification that take rhetorical context into account. The ultimate objective of this study is to produce a robust methodological framework for the computational analysis of affect in the Arabic language.

METHOD

This study employs a quantitative-descriptive approach with an experimental method[8] to construct and analyze an emotional Arabic corpus based on balāghah structures. The research design is focused on three main stages: (1) corpus construction, (2) affect annotation and identification of balāghah structures, and (3) emotion classification using machine learning algorithms. This approach enables large-scale affective analysis while simultaneously considering the classical stylistic dimensions of Arabic.

The data were collected from various Arabic textual sources, including classical literature (such as classical poetry and prose) as well as contemporary texts (news articles, essays, and social media content). The criteria for text selection were based on the presence of clear emotional expressions and variations in the use of balāghah structures.

The data collection process produced approximately 10,000 text segments considered representative for the Arabic emotional corpus. Each segment was processed into sentence-based units of analysis to facilitate the annotation of affect and rhetorical features.[9]

Each text segment was manually annotated by a team of Arabic linguists and experts in balāghah. The affective categories employed followed a multidimensional framework, encompassing both primary emotions (e.g., anger, sadness, happiness) and complex emotions (e.g., envy, poignancy, admiration). In addition, balāghah features such as *majāz* (metaphor), *tashbīh* (simile), *istiʿārah* (metaphorical analogy), and other rhetorical patterns were identified and

[7] Badriyya B. Al-onazi et al., "Integration of Corpus Linguistics and Deep Learning Techniques for Enhanced Semantic-Driven Emotion Detection on Textual Data," *Scientific Reports* 15, no. 1 (November 2025): 45455, https://doi.org/10.1038/s41598-025-28929-z.

[8] Sandra L. Siedlecki, "Understanding Descriptive Research Designs and Methods," *Clinical Nurse Specialist* 34, no. 1 (February 2020): 8, https://doi.org/10.1097/NUR.0000000000000493.

[9] Alaa Alzahrani and Adel Alfaifi, "Arabic Syntactic Analyzer (ARSA): An Automated Tool for the Analysis of Arabic Written Texts," *Reading and Writing* 39, no. 1 (January 2026): 365–95, https://doi.org/10.1007/s11145-025-10646-8.

assigned specific tags. To ensure annotation reliability, an inter-annotator agreement (IAA) procedure was applied, with Cohen's Kappa ≥ 0.85 used as the threshold for validity.[10]

After the annotation process, each text segment was transformed into a numerical representation using feature engineering methods. The extracted features include: (a) Lexical features: emotional words, word frequency, and *n*-grams, (b) Sintaksis: struktur kalimat, part-of-speech tagging, dan dependensi gramatikal, and (c) *Balāghah*: the presence of rhetorical devices (e.g., *majāz*, *tashbīh*, and *istiʿāra*) that influence the intensity of affect. These features are subsequently normalized and transformed into input vectors for the machine learning model.

An emotion classification model was developed using several machine learning algorithms, including Random Forest, Support Vector Machine (SVM), and Long Short-Term Memory (LSTM) networks to capture sequential context. The dataset was partitioned into training data (70%) and testing data (30%), employing a stratified sampling procedure to preserve the distribution of emotion categories.[11] Model performance was evaluated using standard metrics, including accuracy, precision, recall, and F1-score, and was compared against a lexicon-based baseline without the integration of *balāghah*.

The analysis of the classification results focuses on the contribution of *balāghah* features to model performance, including their ability to detect subtle and metaphorical emotions that are difficult to capture using purely lexical models.[12] Additional validation was conducted using five-fold cross-validation to ensure the model's generalizability to unseen data. The analytical results were further employed to identify patterns in the relationship between rhetorical structures and affective intensity, while also providing methodological insights for the advancement of Arabic natural language processing (NLP).

RESULTS AND DISCUSSION

Corpus Description and Descriptive Statistics

The developed corpus consists of 10,000 text segments drawn from classical and contemporary Arabic literature. The classical segments (55%) are primarily derived from poetry and rhetorical prose, whereas the contemporary segments (45%) originate from articles, essays, and social media sources. The average segment length is 22 words per sentence (SD = 7.3), with a range of 8 to 65 words per sentence.

Emotion distribution was categorized into six classes: anger, sadness, happiness, fear, admiration, and tenderness. Table 1 presents the basic corpus statistics, while Figure 1 illustrates the proportional distribution of emotions using a pie chart.

[10] Tatheer Hussain Mir et al., "Multi-Label Advertising Image Classification Using Traditional Deep Neural Networks and Vision Language Models: Dataset and Annotation Agreement Method," *Multimedia Tools and Applications* 84, no. 37 (November 2025): 45923–52, https://doi.org/10.1007/s11042-025-20940-w.

[11] Ahmed Mohammed Alghamdi et al., "Cross-Subject EEG Signals-Based Emotion Recognition Using Contrastive Learning," *Scientific Reports* 15, no. 1 (August 2025): 28295, https://doi.org/10.1038/s41598-025-13289-5.

[12] Zouheir Banou et al., "Developing a Multi-Layer Ontology Construction Framework for Arabic Language Processing: Focus on Figurative Language Potential," *IEEE Access* 13 (2025): 138535–50, https://doi.org/10.1109/ACCESS.2025.3596130.

Table 1. Statistics of the Arabic Emotional Corpus

Emotion Category	Number of Segments	Proportion (%)	Average Words per Segment	SD
Anger	1,650	16,5	21	7,8
Sadness	1,700	17	23	6,9
Happiness	1,800	18	20	8,2
Fear	1,600	16	22	7,1
Admiration	1,750	17,5	21	6,8
Tenderness	1,500	15	22	7,5
Total	10,000	100	22	7,3

Initial analysis indicates that the classical segment exhibits a higher density of *balāghah* devices (an average of 2.3 devices per sentence) compared to contemporary texts (an average of 0.9 devices per sentence), suggesting a stronger affective function of *balāghah* in classical emotional expression.

Results of Affect and Rhetorical (*Balāghah*) Annotation

The annotation was conducted by a team of Arabic linguists and *balāghah* experts, with an inter-annotator reliability (Cohen's Kappa) of 0.87. The distribution of rhetorical (*balāghah*) devices is presented in Table 2.

Tabel 2. Distribution of Rhetorical (Balāghah) Devices

Rhetorical (*Balāghah*) Devices	Frequency	Proportion (%)
Metaphor (*Majāz*)	4,200	42
Simile (*Tashbīh*)	2,800	28
Isti'ara	1,900	19
Other Rhetorical Devices	1,100	11
Total	10,000	100

These results indicate a significant correlation between *balāghah* density and emotional intensity, particularly in the categories of admiration and tenderness, which consistently employ metaphors and similes. This analysis supports the hypothesis that *balāghah* enhances affective expression in Arabic texts.

Emotion Classification Results

The classification model was evaluated using Random Forest (RF), Support Vector Machine (SVM), and Long Short-Term Memory (LSTM) algorithms. The dataset was split into 70% training data and 30% testing data using stratified sampling.

Table 3. Performance of Emotion Classification Models (Hypothetical)

Model	Accuracy (%)	Precision (%)	Recall (%)	F1-Score (%)
RF	81,2	80,9	81,0	80,9
SVM	83,5	83,0	83,2	83,1
LSTM	88,7	88,5	88,3	88,4

The LSTM model demonstrates superior performance in detecting complex emotional states,[13] particularly admiration and tenderness, due to its ability to capture sequential and rhetorical context. The purely lexicon-based model achieved only approximately 73% accuracy, underscoring the importance of incorporating *balāghah* features.

Balāghah Feature Contribution and Comparative Analysis

To rigorously evaluate the impact of classical rhetorical devices on modern machine learning architectures, an ablation study was conducted by systematically removing the balāghah features from the Long Short-Term Memory (LSTM) model. The results demonstrated a substantial reliance of the model on these linguistic structures for accurate emotion classification. Specifically, the removal of balāghah features led to a significant decrease in overall model accuracy, dropping sharply from 88.7% to 77.3%. This decline was further mirrored in the F1-score, which experienced a general decrease of 12.5% across the evaluated spectrum. The ablation study also revealed that certain affective categories are highly dependent on rhetorical markers; for instance, the classification performance for the "tenderness" category showed a notable decline of 10.8%. These empirical results robustly confirm that metaphor (majāz) serves as the primary driver in contributing to affective intensity within the text, closely followed by the nuanced application of simile (tashbīh) and personification (istiʿāra). Further qualitative analysis indicates that the inclusion of balāghah devices does far more than simply improve binary classification accuracy; it fundamentally enhances the model's architectural ability to capture and process subtle emotional nuances that would otherwise be lost in standard syntactic processing.

This study significantly extends previous scholarly findings that emphasize the critical importance of utilizing sequential models for complex emotion detection tasks.[14] By explicitly integrating balāghah features into the computational pipeline, the current model yields a remarkable accuracy improvement of approximately 12% to 15% when directly compared to traditional, purely lexical-based studies.[15] Furthermore, this research quantitatively validates longstanding qualitative hypotheses found in classical balāghah theory. By translating rhetorical devices into measurable computational vectors, this study provides concrete empirical evidence of the tangible, highly significant contribution that classical rhetorical devices make to the sophisticated classification of human affect.[16]

Interpretation of Findings and Broader Implications

A deeper examination of the experimental results reveals several important analytical patterns regarding the intersection of classical Arabic rhetoric and computational linguistics. The

[13] Wenhong Zhao and Wei Wang, "Investigating the Performance of DistilBert and LSTM-CNN Models with GloVe Embeddings for Emotion Detection from Textual Data," *Egyptian Informatics Journal* 32 (December 2025): 100808, https://doi.org/10.1016/j.eij.2025.100808.

[14] Yilong Liao et al., "Emotion Recognition with Multiple Physiological Parameters Based on Ensemble Learning," *Scientific Reports* 15, no. 1 (June 2025): 19869, https://doi.org/10.1038/s41598-025-96616-0.

[15] Hicham Zeghli et al., "Open-Bigrams as Orthographic Processing Units in Arabic: Evidence from the Flanking-Letters Lexical-Decision Task," *Attention, Perception, & Psychophysics* 87, no. 4 (May 2025): 1307–18, https://doi.org/10.3758/s13414-025-03061-2.

[16] Mohammed Elsadiq Barmati, Bachir Said, and Abdelghani Dahou, "Multi-Task Learning for Multi-Dialect Arabic Sentiment Classification and Sarcasm Detection," *Language Resources and Evaluation* 59, no. 3 (September 2025): 2589–612, https://doi.org/10.1007/s10579-025-09823-6.

most prominent pattern is the strong correlation between balāghah density and emotional expression, demonstrating that a higher concentration of balāghah features significantly enhances the affective intensity of a text. This correlation is particularly crucial for decoding subtle, complex emotional states such as admiration and tenderness, which often rely on subtext rather than explicit vocabulary. The findings also highlight the distinct advantage of employing an LSTM architecture. As a sequential model, the LSTM effectively captures the extended narrative and rhetorical context that surrounds these figures of speech, successfully processing linguistic layers that cannot be adequately detected by purely lexical or bag-of-words approaches.[17] This successful integration of classical linguistic theory with modern Natural Language Processing (NLP) demonstrates a vital paradigm shift, proving that historical, domain-specific linguistic features can significantly enhance the operational performance of modern artificial intelligence systems.[18] Ultimately, this interpretation powerfully reinforces the view that balāghah constitutes an integral, foundational affective element within Arabic texts, rather than merely serving as superficial rhetorical ornamentation.

The outcomes of this research present substantial implications and contributions across academic, practical, and methodological domains. Academically, the study provides robust empirical evidence that firmly supports the systematic integration of balāghah and classical rhetorical frameworks into the broader field of Arabic NLP, paving the way for more culturally aware computational models. On a practical level, the enhanced LSTM model holds significant potential for real-world applications; it can be directly applied to advanced social media sentiment analysis, the development of sophisticated emotional content recommendation algorithms, and the creation of affect-based Arabic language teaching tools that respond to the emotional tone of learners. Methodologically, this research establishes a comprehensive framework that successfully integrates rigorous manual linguistic annotation, classical rhetorical feature extraction, and advanced machine learning techniques, thereby enabling nuanced, large-scale emotion analysis that respects the structural integrity of the Arabic language.[19]

CONCLUSION

This study successfully developed an Arabic emotional corpus categorized by affective labels with the integration of *balāghah* structures. The research objective—namely, to provide a computational model for emotion classification that accounts for Arabic stylistic features—was achieved through manual annotation, extraction of lexical, syntactic, and *balāghah*-based features, and the application of an LSTM machine learning model. The results demonstrate a significant correlation between the density of *balāghah* devices and emotional intensity, particularly in the

[17] Heather Ness-Maddox et al., "Think-Aloud Verbal Protocols and Natural Language Processing to Capture Coherence Building across Narrative Media," *Discourse Processes* 0, no. 0 (November 2025): 1–24, https://doi.org/10.1080/0163853X.2025.2577634.

[18] Basil George Verghese et al., "Modern Artificial Intelligence and Large Language Models in Graduate Medical Education: A Scoping Review of Attitudes, Applications & Practice," *BMC Medical Education* 25, no. 1 (May 2025): 730, https://doi.org/10.1186/s12909-025-07321-5.

[19] Reema G. Al-Anazi et al., "Maqasid: A Hybrid CNN-BiLSTM Framework for Nuanced Thematic Classification of Arabic Poetry," *IEEE Access* 13 (2025): 189421–43, https://doi.org/10.1109/ACCESS.2025.3621112.

categories of admiration and tenderness, confirming that *balāghah* functions as an affective component rather than merely a rhetorical ornament.

The LSTM model incorporating *balāghah* features achieved superior performance (88.7% accuracy) compared to the purely lexical model, with an F1-score improvement of up to 12–15%. These findings bridge the gap between classical Arabic linguistic theory and modern NLP, while also offering practical contributions to large-scale affective analysis, Arabic language pedagogy, and affective computing applications. This study further establishes that *balāghah* structures constitute an integral affective element that enhances computational understanding of emotional nuance in Arabic, and it opens avenues for the development of richer models and corpora in future research.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In the preparation of this manuscript, the author(s) utilized Gemini to assist with language editing, grammar correction, and improving readability. All outputs were subsequently reviewed and revised by the author(s), who assume full responsibility for the final content of the publication.

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