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Locating the Intersection of Generative Artificial Intelligence and Human English Writing Skills: A Comparative Study

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Abstract
This paper offers a multi-dimensional comparative analysis of the linguistic characteristics found in the introduction sections of dissertations produced by ChatGPT and those written by Saudi authors. This research paper aims to analyze the linguistic variation in the introduction part of the dissertations written by Saudi writers compared with the introduction produced by ChatGPT. An extensive analysis of more than 150 linguistic features, including lexico-grammatical structures and semantic nuances, is performed using Multidimensional Analysis Tagger (MAT) tagger. A corpus of dissertation introductions written by Saudi students is compiled and analyzed. Furthermore, a corpus is created that comprises introductions produced by ChatGPT. The study investigates the relationship between language produced by AI and human-written content, revealing unique linguistic preferences. The results indicate ChatGPT is more informational, explicit and less non-narrative and non-argumentative than human-written introductions. There is a significant difference in discourse production on dimension five, as human-written introductions produce abstract and ChatGPT produces non-abstract discourse. The study is significant as it highlights the linguistic differences between the writing styles of ChatGPT and Saudi writers, indicating potential areas of improvement for AI-generated texts.

Keywords: academic writing, artificial intelligence, Chat GPT, human English writing, linguistic features, Saudi writers

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Introduction

The combination of natural language processing (NLP) and artificial intelligence (AI) has enabled ground-breaking developments in several fields in the modern era. OpenAI's ChatGPT has proven to be a potent instrument that can produce logical and appropriate text for the given context. By examining the distinct lexico-grammatical choices and semantic subtleties, this study explores the linguistic variation in the introduction section of dissertations written by Saudi authors compared to ChatGPT.

The present study examines more than 150 linguistic features in detail as part of a multidimensional analysis. Beyond linguistic analysis, a comprehensive approach is employed to understand the nuances of language use in the introduction section of dissertations written by Saudi authors and Chat GPT. Using MAT tagger, the research deciphers the linguistic characteristics that distinguish these introductions, thereby advancing a sophisticated comprehension of the interaction between AI-generated and human-authored content. Further, the dissertation introductions by Saudi authors were examined to provide insight into the language preferences unique to Saudi academia.

As the study examines the semantic subtleties and lexico-grammatical structures found in the introduction sections, it aims to find patterns that set Saudi writers' language choices apart from ChatGPT's. Using this comparison perspective, the study sheds light on the dynamic interaction between human-written and AI-produced academic discourse and offers insights into how academic discourse evolves.

To better understand the linguistic nuances found in the introductions of Saudi writers' dissertations compared to Chat GPT, this multidimensional comparative study examines the linguistic variation between them. It provides a functional interpretation of each of the dimensions. By examining more than 150 linguistic features, the research aims to advance a more sophisticated comprehension of the convergence and divergence of human and artificial intelligence (AI) language in academic writing.

Literature Review

This literature review examines the research field on linguistic features, concentrating on the dissertation introduction sections. In addition, the review explores the emerging field of AI language models, as demonstrated by ChatGPT, and looks at the corpus of research that investigates the interaction between academic discourse authored by humans and AI-generated content.

The development of AI, especially natural language processing (NLP), has completely changed how language is produced. According to Stokel-Walker (2023), since January 2023, ChatGPT has already been acknowledged as an author in preprints and peer-reviewed publications. While some educationists agreed that the AI writing tools positively improved their students' writing quality, particularly enhancing the quality of their content and organization (Marzuki, 2023), concerns have been raised about its uncredited or fraudulent use (Else, 2023).

In Lingard's (2023) study, he used ChatGPT4 chats from March and April 2023 to show the software's capabilities and limitations. He also extracted several Cautions and Insights and gave writers instructions on how to "train" the program by using incremental prompting and using it as an editor for brainstorming and generating content such as summaries and outlines. Research like Pavlik (2023) has shown how AI language models can generate human-like text that is

coherent and relevant to the context, prompting concerns about how these technologies might affect conventional academic writing.

Several academics have conducted comparative linguistic analyses to understand the subtle differences between language produced by AI and language produced by humans. To find differences and similarities, studies of syntactical patterns, semantic features, and lexico-grammatical structures have been carried out (Hutson, 2021; Welborn, 2023). In a study on student essays, Spennemann (2023) demonstrated that in contrast to humans, ChatGPT and the Generative AI-Language Model do not interpret cultural heritage values in the essays they generate. Similarly, Ma et al. (2023) believe that using ChatGPT in language learning could also raise questions regarding the ethical ramifications of using a machine learning system to generate text and the possible replacement of human language teachers.

Scholarly investigations have focused on the usage of AI in Saudi academic writing. Aslam and Nisar (2023) are of the view that, "ChatGPT is recommended based on modern teaching methods and a fast-paced world where time is essential" (p. 183). While the advantages and difficulties that Saudi faculty members see with Chat GPT in the area of English as a Foreign Language (EFL) have been clarified by different researchers. According to Ali's (2023) study, the majority of EFL instructors thought ChatGPT was a great help for teaching and learning English in higher education. However, some expressed worries about issues like plagiarism and excessive reliance on chatbots that require little student effort. Moreover, Ahmed (2023) compared EFL learners' satisfaction with teacher-mediated versus ChatGPT-assisted writing opportunities. According to the study, ChatGPT can enhance student learning but cannot replace a teacher's role in the classroom without appropriate training for careful use. This is because ChatGPT does not improve student progress because of the low learning satisfaction that users experience when using the tool.

According to Bin-Hady (2023), ChatGPT can help students improve their language skills by scaffolding the learning process by giving them feedback on how they use language and partnering with them to practice language through suggested activities. The importance of a nuanced approach to ChatGPT integration in Saudi universities, balancing technological potential with genuine learning and ethical considerations, is emphasized in Alqasham's (2023) study. Alshahrani's (2023) research gives educators, legislators, and instructional designers insight into how and when to integrate AI technology into education effectively.

Studies investigating how AI-generated content conforms to or departs from established academic conventions have brought attention to the growing role of AI in academic writing. Research on the effects of AI on language expression has been conducted by Cooper (2021) and Bilal (2023). These studies highlight the need to understand the interaction between human and machine-generated content comprehensively.

Advocates of multidimensional analysis in language studies include (Hardy & Friginal, 2016; Cao & Xiao, 2013; Ali.S. & Ali, M., 2023; Guizzardi et al., 2023; Jin, 2021; Crossley et al. 2019; Perez-Paredes, 2019). This method offers a comprehensive understanding of language use by thoroughly examining various linguistic features. The present research expands on this approach to decipher the subtle differences between dissertation introductions written by Saudi authors and those produced by ChatGPT.

To summarize, the main conclusions from the research at the intersection of linguistic analysis, academic writing, and AI-generated language have been synthesized in this literature review. The review clarifies that research has yet to be done in Saudi Arabia that uses

multidimensional analysis to examine the introduction part of academic language. The present study will add to the ongoing conversation about the changing dynamics of linguistic variation in academic settings by placing multidimensional comparative study within this body of literature, with a particular emphasis on the laxico-grammatical patterns of the dissertations' introductions written by Saudi writers in comparison with Chat GPT.

Methodology

This study uses quantitative approaches to perform a multidimensional comparative analysis of the linguistic features used in the introduction sections of dissertations written by Saudi writers and those produced by ChatGPT. The corpus comprises the introduction sections of 20 dissertations written by Saudi authors and a corresponding set produced by ChatGPT. Recent works and the English Language Teaching (ELT) discipline are among the selection criteria.

Using Biber's multidimensional analysis framework as a foundation, the study explores and classifies linguistic elements in the chosen introductions. These characteristics include semantic subtleties and lexico-grammatical patterns. The analysis is based on five textual dimensions and a comprehensive list of more than 150 linguistic features. The study also provides a functional interpretation of the dimensions. Based on the topics of the selected dissertations written by Saudi writers, the same number of introductions were produced using chat GPT. Annotations were made to the data, and lexico-grammatical linguistic features were used to code the data. The corpus was coded and labeled using predefined linguistic categories for systematic analysis.

Quantitative analysis entails applying statistical techniques to detect noteworthy trends and distinctions in linguistic characteristics between the introductions produced by ChatGPT and Saudi authors. Descriptive statistics, frequency distributions, and ANOVA are used to find meaningful insights.

The study also thoroughly explains how each dimension is functionally interpreted to improve the comprehension of linguistic patterns. To identify commonalities, discrepancies, and distinctive features in the linguistic expression of the two datasets, the study uses Biber's (1991) framework. In this study, ethical considerations are crucial. The authors' identities are safeguarded through the anonymization of all data used. The study aims to offer a nuanced understanding of the linguistic features present in the introduction sections of dissertations written by Saudi writers and those generated by ChatGPT by applying this extensive methodology. This will contribute valuable insights into the evolving landscape of academic discourse that AI influences.

Results

Table 1 presents the mean scores for dimension 1, "informational vs involved discourse," in both human-written and ChatGPT-generated content. ChatGPT exhibits a higher negative mean (-23.54) than human-written content (-18.45), suggesting a potential inclination toward more informational discourse in ChatGPT.

Table 1. *Linguistic variation between ChatGPT and Humans introduction on dimension 1*

Dim_1

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound
Human		20	-18.4570	3.77121	.84327	-20.2220	-16.6920
ChatGPT		20	-23.5400	3.59248	.80330	-25.2213	-21.8587
Total		40	-20.9985	4.45433	.70429	-22.4231	-19.5739
Model	Fixed Effects			3.68293	.58232	-19.8196	-19.8196
	Random Effects				2.54150	11.2943	11.2943

The standard deviations in Table 1 reflect the degree of variability in the scores. Both Human and ChatGPT scores have relatively similar standard deviations, indicating comparable variability in their scores for dimension 1.

Table 2. *Linguistic variation between ChatGPT and Humans introduction on dimension 2*

Dim_2

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound
Human		20	-3.0665	1.42838	.31940	-3.7350	-2.3980
ChatGPT		20	-2.3165	2.25298	.50378	-3.3709	-1.2621
Total		40	-2.6915	1.90029	.30046	-3.2992	-2.0838
Model	Fixed Effects			1.88629	.29825	-2.0877	-2.0877
	Random Effects				.37500	2.0733	2.0733

Table 2 presents the mean scores for dimension 2, "narrative vs. non-narrative concerns." Both human-written and ChatGPT-generated content show negative means, suggesting a tendency toward non-narrative concerns. Human-written introductions exhibit a more non-narrative tendency (-3.06) compared to ChatGPT (-2.31). The standard deviations indicate variability in the scores, with human-authored content exhibiting a lower standard deviation than ChatGPT.

Table 3. *Linguistic variation between ChatGPT and Humans introduction on dimension 3*

Dim_3

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound
Human		20	9.1480	2.27948	.50971	8.0812	10.2148
ChatGPT		20	14.8480	2.97720	.66572	13.4546	16.2414
Total		40	11.9980	3.89620	.61604	10.7519	13.2441
Model	Fixed Effects			2.65139	.41922	11.1493	12.8467
	Random Effects				2.85000	-24.2147	48.2107

Dimension 3, "explicit vs situation-dependent discourse," is represented in Table 3. ChatGPT-generated content has a notably higher mean (14.84) compared to human-authored

content (9.14), suggesting a tendency toward more explicit discourse in ChatGPT output. Both Human and ChatGPT content exhibit moderate variability, with ChatGPT having a slightly higher standard deviation.

Table 4. *Linguistic variation between ChatGPT and Humans introduction on dimension 4*

Dim_4

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound
Human		20	-2.5735	2.09436	.46831	-3.5537	-1.5933
ChatGPT		20	-1.6630	2.00523	.44838	-2.6015	-.7245
Total		40	-2.1182	2.07568	.32819	-2.7821	-1.4544
Model	Fixed Effects			2.05028	.32418	-2.7745	-1.4620
	Random Effects				.45525	-7.9027	3.6662

Table 4 presents the mean scores for dimension 4, "overt expression of argumentation/persuasion." Both human and ChatGPT-generated content show negative mean scores, indicating a tendency toward non-argumentation. Human-written introductions (-2.57) are more non-argumentative than ChatGPT introductions (-1.66). The standard deviations indicate moderate variability, with relatively similar values for both human and ChatGPT content.

Dimension 5 is named “Impersonal (Abstract) VS. Non-impersonal (Non-Abstract Style)”.

Table 5. *Linguistic variation between ChatGPT and Humans introduction on dimension 5*

Dim_5

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound
Human		20	4.3800	1.79473	.40131	3.5400	5.2200
ChatGPT		20	-.1415	1.83433	.41017	-1.0000	.7170
Total		40	2.1193	2.90698	.45963	1.1896	3.0489
Model	Fixed Effects			1.81464	.28692	1.5384	2.7001
	Random Effects				2.26075	-26.6063	30.8448

Dimension 5, "impersonal (abstract) vs. non-impersonal (non-abstract) style," is presented in Table 5. Human-authored content has a positive mean (4.38), suggesting a tendency toward an impersonal (abstract) style. In contrast, ChatGPT-generated content has a negative mean (-0.14), indicating a leaning toward a non-impersonal (non-abstract) style. Human-written introductions exhibit a lower standard deviation than ChatGPT, indicating less variability in the use of features related to impersonal vs. non-impersonal style.

Overall, the results suggest that both human and ChatGPT-generated content exhibit a prevalence of negative linguistic features associated with informational discourse in Dimension 1. Human-written introductions show a stronger non-narrative tendency in Dimension 2. ChatGPT-generated content demonstrates a higher level of explicit discourse in Dimension 3. Both human and ChatGPT content exhibit a tendency toward non-argumentation in Dimension 4, with human-written introductions showing a stronger inclination. Human-authored content leans toward an impersonal (abstract) style in Dimension 5, while ChatGPT-generated content leans toward a non-

impersonal (non-abstract) style. The statistical analysis supports the observed differences between human and ChatGPT-generated content across these dimensions.

Analysis and Discussion

Figure 1 indicates the average scores for dimension 1, "informational vs involved discourse". *Nouns, prepositions,* and *attributive adjectives* together produce informational discourse. A negative mean suggests a tendency toward more informational discourse, while a positive mean leans toward involved discourse. In this case, ChatGPT appears to have a higher negative mean (-23.54), indicating a potential inclination toward more informational discourse compared to human-written content (-18.45).

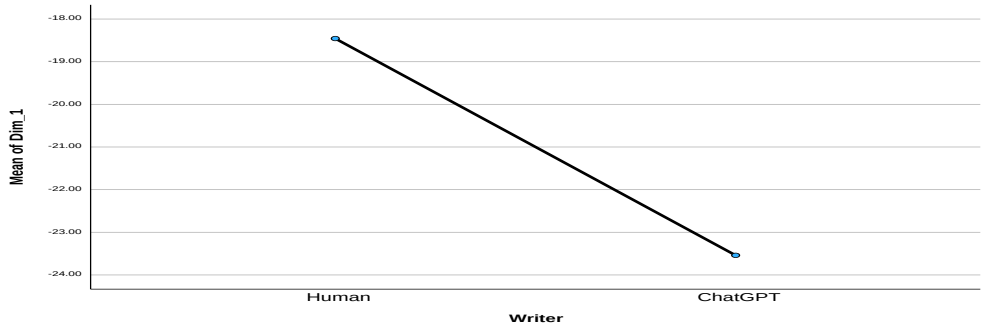


Figure 1. Comparison of dimension 1 scores between ChatGPT and Humans introduction

The standard deviation reflects the degree of variability in the scores. Lower standard deviations suggest more consistency. In this instance, human and ChatGPT scores have relatively similar standard deviations, indicating comparable variability in their scores for this dimension. The confidence intervals provide a range within which the actual population mean is likely to fall. The intervals for both human and ChatGPT do not overlap, suggesting a significant difference between the two groups. This supports the observed difference in means, indicating a potential distinction in the "informational vs involved discourse" dimension.

In summary, the analysis suggests that both human and ChatGPT-generated content exhibit a prevalence of negative linguistic features associated with informational discourse in Dimension 1 to a varying degree.

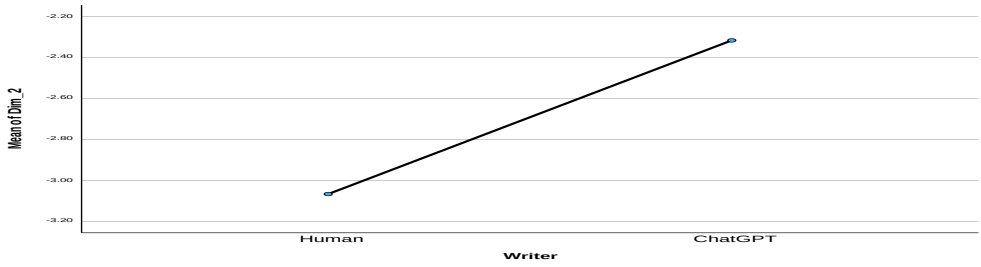


Figure 2. Comparison of dimension 2 scores between ChatGPT and Humans introduction

Figure 2 shows the mean scores of dimension 2, "narrative vs. non-narrative concerns". Both human-written and ChatGPT-generated content show negative means, suggesting a tendency toward non-narrative concerns. *Present Tense verb, Place adverbial, That deletion*, and *Pronoun 'it'* together perform a function of producing non-narrative discourse. Both the data show non-narrative concerns but to a varying degree. However, Human written introductions with a mean score of -3.06 are more non-narrative than ChatGPT (-2.31) generated texts. The standard deviations measure the variability in the scores. Human-authored content exhibits a lower standard deviation than ChatGPT, indicating less variability in using features related to non-narrative concerns. The confidence intervals indicate the range within which the actual population mean is likely to fall. Both human and ChatGPT intervals do not overlap, suggesting a significant difference between the two groups.

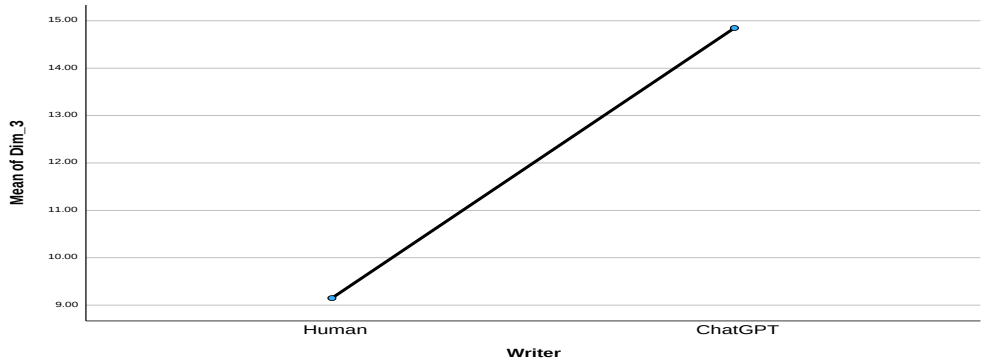


Figure 3. Comparison of dimension 3 scores between ChatGPT and Humans introduction

Dimension 3 is "Explicit vs Situation Dependent Discourse". The figure indicates that ChatGPT-generated content has a notably higher mean than human-authored content, suggesting a tendency toward more explicit discourse in the ChatGPT output. ChatGPT, with a mean score of 14.84, shows a significantly higher explicit discourse than Human written introductions (9.14). The standard deviations measure the variability in the scores—both human and ChatGPT-generated content exhibit moderate variability, with ChatGPT having a slightly higher standard deviation. The confidence intervals for humans and ChatGPT do not overlap, suggesting a significant difference between the two groups. ANOVA results also indicate that the data are significantly different from each other as the p-value is <.001.

Dimension 4 is labeled as "Overt Expression of Argumentation /Persuasion". As indicated in Figure 4, the negative mean scores of human and ChatGPT-generated contents show a tendency toward non-argumentation. Human written introductions (-2.57) are more non-argumentative than the introductions generated by ChatGPT (-1.66).

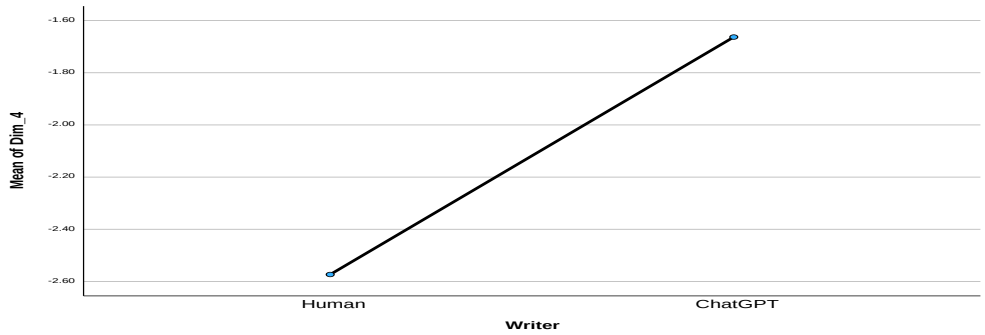


Figure 4. Comparison of dimension 4 scores between ChatGPT and Humans introduction

The presence of linguistic features like *private verbs, public verbs, third-person pronouns,* and *hedges* mark the presence of non-argumentative discourse. Figure 4 indicates that human and ChatGPT-generated content exhibit moderate variability, with relatively similar standard deviations. Like other dimensions, again, on this dimension, the confidence intervals for humans and ChatGPT do not overlap, suggesting a significant difference between the two groups. Dimension 5 is named "Impersonal (Abstract) VS. Non-impersonal (Non-Abstract Style)".

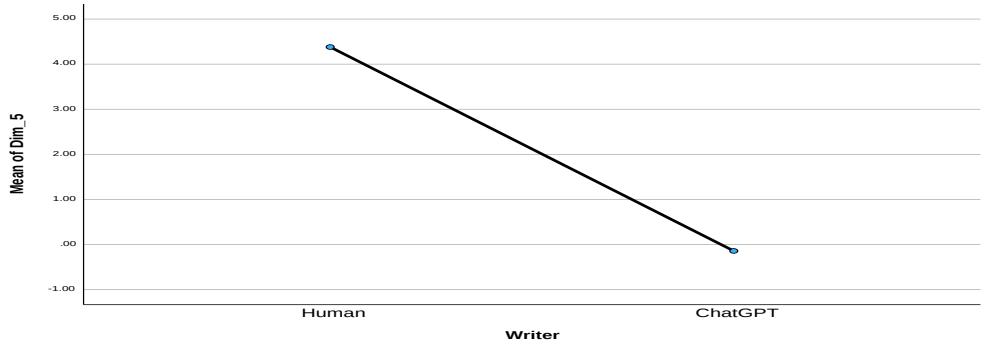


Figure 5. Comparison of dimension 5 scores between ChatGPT and Humans introduction

Human-authored content has a positive mean, suggesting a tendency toward an impersonal (abstract) style. In contrast, ChatGPT-generated content has a negative mean, indicating a leaning toward a non-impersonal (non-abstract) style. There is a significant difference between the mean scores, as the mean scores of Human written introductions (4.38) fall on positive polarity. In contrast, the discourse produced by ChatGPT, with a mean score of -0.14, falls on the negative polarity of this dimension. A human-written introduction exhibits a lower standard deviation than ChatGPT, indicating less variability in the use of features related to impersonal vs. non-impersonal style.

The confidence intervals for humans and ChatGPT do not overlap, suggesting a significant difference between the two groups. ANOVA results indicate a statistically significant difference of < .001, as the p-value less than 0.05 indicates a statistically significant difference.

Conclusion

Through multidimensional comparative analysis of linguistic features in the introduction sections of dissertations written by Saudi writers and ChatGPT, this research has explored the lexico-grammatical patterns. Examining more than 150 linguistic elements has shown that both sets of introductions contain a rich tapestry of semantic subtleties and lexico-grammatical structures. The observed diversity highlights the complex nature of academic discourse, where different linguistic elements are contributed by both human creativity and machine algorithms.

The statistical analysis shows that Chat GPT is more informational, explicit and less non-narrative and non-argumentative than human-written introductions. There is a significant difference in discourse production on dimension 5, as human-written introductions produce abstract and ChatGPT produces non-abstract discourse.

A complex interaction between content generated by AI and humans was discovered through comparative analysis. While certain linguistic features exhibited harmony, others bore witness to a subtle tension, emphasizing the need for a delicate balance in harnessing the capabilities of AI to complement, rather than replace, human expression in academic writing. The knowledge gathered from this research has shown how scholarly discourse is changing. The convergence of ChatGPT's language features with those of Saudi authors forces a re-examination of conventional ideas about authorship, creativity, and the changing role of AI in scholarly communication. Recognizing the limitations inherent in any research project, future work could explore the landscape of AI-generated content as it changes in response to dynamic linguistic trends, expand the dataset to include a broader range of academic disciplines, or go deeper into particular linguistic phenomena.

To sum up, this multidimensional comparative analysis has shed light on the linguistic elements incorporated into the introduction sections of dissertations written by Saudi authors and those produced by ChatGPT. At this nexus of AI-influenced and human-authored academic discourse, the research adds to a deeper comprehension of the dynamic changes in language use. This investigation prompts more questions, debates, and contemplations about the significant changes taking place in the field of academic writing.

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Conflicts of Interest
The author declares no conflict of interest.

Authenticity
This manuscript is an original work

Artificial Intelligence Statement:
AI and AI-assisted technologies were not used.

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