Exploring the Role of ChatGPT and social media in Enhancing Student Evaluation of Teaching Styles in Higher Education Using Neutrosophic Sets

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Abstract

This paper provides an in-depth analysis of how Chat GPT and social media can be used as tools for capturing real-time student feedback on teaching styles in higher education. The study employs neutrosophic sets to deal with the uncertainties and ambiguities that arise in student evaluation data. Traditional methods of evaluating teaching styles in higher education, such as paper-based surveys, may not fully capture the nuanced experiences of students in the classroom. Recent advancements in chatbots, such as ChatGPT, and the growing use of social media platforms offer new opportunities for more efficient and effective methods of evaluating teaching styles. However, there are significant challenges in using these technologies, including the handling of indeterminate and uncertain data. Neutrosophic sets provide a mathematical framework for handling ambiguity and uncertainty in data and can be used to better capture the complex and multifaceted aspects of student experiences in the classroom. Additionally, the use of chatbots and social media platforms raises practical and ethical concerns that must be addressed in the evaluation process. This study aims to explore the role of ChatGPT and social media in enhancing student evaluation of teaching styles in higher education using neutrosophic sets, while also addressing the practical and ethical challenges that arise from their use.

Keywords: Neutrosophic Sets; AHP; Uncertainty; Education; Chat GPT

1. Introduction

In the past few years, educational establishments of a higher level have been making an effort to offer students a combination of "hard capabilities," including cognitive information and professional abilities, and "Soft abilities," like the ability to solve issues and work well with others. Traditional education has been performing a predominating role, which means that instructors have been acting as "the carrier of the knowledge" while students have been acting as "the receiver of the information." Achieving these skill-related objectives, however, is not a simple task because of this. As a consequence of this, it is challenging for students to completely participate in learning practices, which may result in a rudimentary comprehension of subject matter [1], [2].

In addition, educational institutions, and study universities, place a greater emphasis on the development of students' research abilities as opposed to the growth of students' professional or transferrable skills. Because of this, there may be a disconnect between the skills students acquire at the institution and the skills they require in the workplace. It is recommended that students be given the opportunity to participate in actual problem-solving and knowledge construction within authentic professional contexts as a means of bringing about a change in this circumstance. This

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is what is meant by "authentic professional contexts." So, the evaluation of the student in higher education is very hard [3], [4].

There are many components that go into making a good education in higher education, such as having a straightforward instructional presentation, effectively managing student behavior, creating intellectual enthusiasm, and building interpersonal camaraderie. compassionate, methodical, intellectually interesting, showing respect for the students, having organizational and ability to present, and having the ability to push the students to their limits. So Social media has the greatest impact on education in the higher education [5], [6].

A wide availability, a huge quantity of knowledge, and the keen interest of consumers in the material of social media platforms naturally raise inquiries regarding their credibility. Credibility is thought to be one of the primary criteria for differentiating various types of content, ranging from content that is honest and accurate to content that is considered to be false and deliberately misleading. Daily, we have to evaluate our situation and determine which of the available options will serve us best[7], [8].

The information that can be found online has varying degrees of importance, and trustworthiness is an essential factor in weeding out information that is difficult to believe. This is because it serves as a constant reminder of the need to evaluate and assess online media, content producers (also known as resources), and knowledge (content). Also, chat GPT can impact education in several ways[9], [10].

Chat GPT is able to do all of these things for the students, and it can do them simply, swiftly, and effectively. For a very long time, it has been necessary to consider whether or not the objective of educational writing should be questioned. Even before the use of artificial intelligence to write was a possibility, there are many educators who think outside the box and contemplated why they need to teach conventional writing[11], [12].

The mastery of techniques for instructing personal narrative, informational, and persuasive writing will no longer be the primary emphasis in English classrooms thanks to the introduction of artificial intelligence instruments like Chat GPT. Instead, we should concentrate on teaching critical thinking, rewriting, investigation, conversation, and artistically organizing ideas using new and evolving forms of media such as webpages, interactive demonstrations, videos, infographics, podcasts, blog entries, digital art, and so on. Because of its ability to offer students with concise summaries of various pieces of writing, Chat GPT has the potential to become a writing teacher or a personal instructor [13], [14].

This study fills in such a void by establishing the relationships between the variables of teaching quality in social media and chat GPT through the use of an analytical assessment that takes into account complexity as well as unpredictability from the perspective of a system. A review of the relevant literature was conducted for the purpose of compiling, in this work, a summary of the variables that have a substantial influence on the standard of instruction. An AHP strategy is used because the discovered variables involve subjective characteristics that require expert judgments in order to evaluate whether a particular factor impacts another, such as the degree to which such influence exists[15].

Neutrosophy was a philosophy that was first presented by Smarandache. Within the context of this idea, the neutrosophic set can be understood as a generalization of the intuitionistic fuzzy set [16], [17]. The intuitionistic fuzzy set is able to successfully represent real-world situations because it takes into account all elements of a decision scenario, including truthiness, indeterminacy, and falsehood[18], [19]. In recent years, there has been a growing trend in the research community toward integrating AHP methodology with neutrosophic sets [20]. Neutrosophy is a philosophical concept that deals with indeterminate or uncertain concepts, which can be applied to many fields, including science, engineering, and economics. One key advantage of neutrosophy is its ability to handle data with varying levels of ambiguity, which is often present in real-world scenarios. This makes it a valuable tool for decision-making processes and risk assessments. Additionally, neutrosophy can be used in conjunction with other mathematical frameworks such as fuzzy logic and probability theory to create more comprehensive models that better capture the complexity of real-world problems. As such, neutrosophy is a promising area of research with the potential to improve decision-making processes and problem-solving capabilities in various fields.

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The reminder of this paper is organized as follows: section 2 explains the previous studies related to the paper topic. Section 3 describes the suggested methodology of analyzing the collected data using Neutrosophic theory. Section 4 summarizes the obtained results. Finally, section 5 concludes the paper.

2. Literature review

Mamites et al. [21]conducted an analysis of the components that affect teaching quality in order to discover the causal linkages between these factors and, ultimately, to pinpoint those ones that are most important. They used ten criteria in their work. They used the DEMATEL method in their work. The DEMATEL manages the causal linkages among the aspects of teaching quality, whereas single-valued neutrosophic numbers are used to mimic the ambiguity related to domain specialists soliciting judgments inside the DEMATEL. According to the findings, the most important aspects of teaching quality include human traits, psychological features, and the culture of the institution, whereas the most important aspects of learning quality are minor key elements such as institutional resources and student composition. Because of their vital role in determining the overall quality of instruction, higher education institutions (HEIs) need to give greater consideration to the aforementioned aspects when developing new programs. These findings provide important insights that can be utilized by HEIs when making decisions regarding hiring and hiring, strategic planning for the purpose of constructing a learning environment that values the quality of teaching, creating student makeup schemes, and choices regarding resource allocation for the purpose of promoting institutional assets that drive teaching quality efforts.

Yilmaz et al. [22]conducted research to determine the factors that influence the viability of distance education (DE) in higher education institutions. Additionally, they sought to comprehend the differences in the viewpoints of multiple internal stakeholders in DE by using an integrated decision-making approach that incorporated both the neutrosophic AHP and the Copeland method. An in-depth literature analysis and the views of industry professionals are used to determine the variables that influence the DE's capacity to be sustainable. Following this, bibliometric analysis is carried out in order to highlight the gap in the existing literature and justify the originality of the proposed methodology. After that, an innovative combined neutrosophic AHP and Copeland technique is designed to rank essential success elements according to the viewpoint of the organization's internal stakeholders. The findings analyze and enhance DE by including the viewpoints of all the organization's internal stakeholders. The results may serve as a roadmap for practitioners to follow while developing DE planning.

Tack and Piech [23]developed a solution based on the realization that conversational agents can be run in parallel to human teachers in real-world dialogues, that different agents' responses to students can be simulated, and that the resulting responses can be compared in terms of three abilities: speaking like a teacher, understanding a student, and helping a student. Their methodology makes use of a probabilistic model and Bayesian sampling to infer estimations of pedagogical skill. This technique is based on the dependability of comparison judgments in the educational field.

During the COVID-19 epidemic, Tkacová et al. [24]carried out an investigation on the ways in which Social media formulae may be used in online education. The purpose of their research was to (1) identify different types of online education, which were broken down into six groups, as well as different types of educational activities, and (2) highlight the special potential of using social media in online education throughout a pandemic. Their research looked at the events that were actually carried out at the high schools in Slovakia that were surveyed. In the end, the data that were provided may also be used to assist decision-making on additional steps and stages leading to the incorporation of trustworthy social media into teaching techniques both now and in the future.

From the literature review, there is no paper conducted on the role of social media and chat GPT in enhancing student evaluation. So, we proposed the neutrosophic AHP method to evaluate the role of chat GPT and social media in education.

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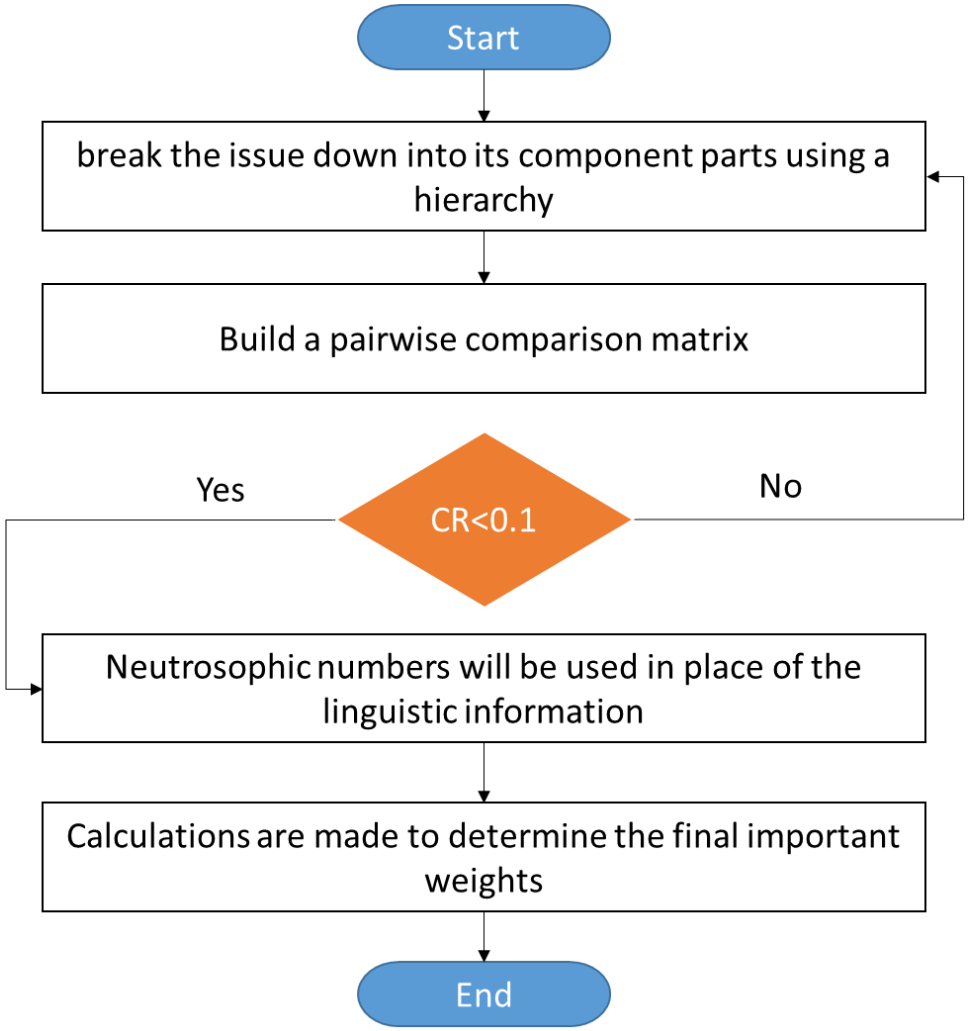

Figure 1: The steps of the model used in this paper.

3. Methodology

The approach to research that was used in this investigation was a novel modification of a well-known MCDA technique (namely, the AHP), and it was carried out in an atmosphere of uncertain neutrosophic decision-making [25]–[27]. Figure 1 shows the steps of the proposed method.

First, break the issue down into its component parts using a hierarchy:

Establishing a hierarchy in the AHP technique that represents the aim, criteria, and options is necessary in order to make the issue more understandable. Within the scope of this investigation, the hierarchy of decision-making encompasses one degree of obstacles.

Second, building a pairwise comparison matrix involves the following steps:

Using the Saaty importance scale, the specialists conduct an evaluation of the factors (also known as criteria) based on the relative significance of each factor Ci in comparison to Cj. When filling out the questionnaire, specialists choose a linguistic term that best conveys how critically important each component is in relation to the others.

$$R = \begin{bmatrix} 1 & 1/r_{12} & \cdots & r_{1n} \\ r_{12} & 1 & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/r_{1n} & 1/r_{2n} & \cdots & 1 \end{bmatrix}$$

Third, Determine the consistency ratio (CR) using the following formula:

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In order to determine whether or not the ratings are consistent with one another, Saaty advised doing a consistency test. Calculating a CR value allows for testing of the cardinal and output-based consistency in pairwise comparisons.

$$CR = \frac{\lambda_{-}n}{n-1}/RI \quad (1)$$

Fourth, Neutrosophic numbers will be used in place of the linguistic information as follows:

The components in the pairwise comparison matrix are replaced with the neutrosophic number that correspond to those elements.

Fifth, compiling the thoughts of the knowledgeable members of the neutrosophic number:

Collect the thoughts of a variety of specialists, then choose how much weight to give each one.

Sixth, In order to calculate the neutrosophic synthetic values, we will:

The neutrosophic value of each element's synthetic production,

$$V_i = \sum_{j=1}^{n} \mathrm{T}_{ij} * \left[\sum_{i=1}^{n} \sum_{j=1}^{n} \mathrm{T}_{ij} \right]^{-1} \quad (2)$$

i=1,2,3….n

Seventh, Calculations are made to determine the final important weights.

$$W_i = \frac{V_i}{\sum_{i=1}^{n} V_i} \quad (3)$$

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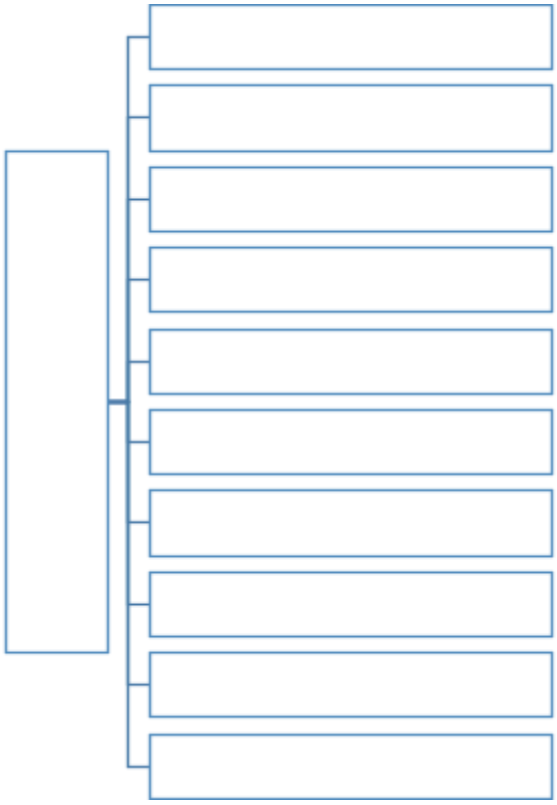

Figure 2: The ten criteria used in this paper.

4. Results

Cognitive factors (such as media dependability, tradition, credibility, and knowledge, among other things), institutional factors (such as the social standing of the media, reputation, and confidence in the brand, among other things), and technological factors all play a role in Social media. (Social media design, ease of use, degree of interaction, etc.). It goes without saying that the user's own personal perspective on the material shared on social media is also significant; for this reason, it is essential to highlight the aspects of trustworthiness that are most significant from the user's point of view. Figure 2 shows the criteria used in this paper.

Let three experts evaluate the criteria. The experts build the pairwise comparison matrix of the opinion of experts. Then combine these matrices into one matrix as shown in Table 1. Then normalize the pairwise comparison matrix. Then compute the weights of the criteria using Eq. (3). The weights of the criteria are shown in Figure 3.

Table 1: The aggregated pairwise comparison matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
C_1	1	0.266667	0.266667	0.533333	0.533333	0.433333	0.566667	0.466667	0.666667	0.533333
C_2	3.888889	1	0.3	0.9	0.733333	0.533333	0.766667	0.433333	0.233333	0.166667
C_3	5.277778	5.111111	1	0.4	0.4	0.433333	0.633333	0.233333	0.333333	0.433333
C_4	4.259259	1.111111	4.861111	1	0.3	0.633333	0.366667	0.433333	0.466667	0.466667

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C_5	4.22619	1.388889	2.5	5.555556	1	0.266667	0.3	0.333333	0.8	0.333333
C_6	4.814815	4.22619	2.444444	4.074074	3.888889	1	0.133333	0.8	0.833333	0.533333
C_7	4.179894	1.309524	4.074074	4.666667	3.333333	8.333333	1	0.466667	0.466667	0.733333
C_8	4.416667	4.814815	4.444444	4.814815	5.47619	1.25	2.777778	1	0.433333	0.766667
C_9	2.407407	4.444444	5.47619	2.222222	1.263228	1.203704	2.809524	4.444444	1	0.566667
C_{10}	4.22619	7.777778	2.888889	2.333333	3.333333	1.944444	1.369048	1.342593	4.179894	1

Table 2: The normalized pairwise comparison matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
C_1	0.025842	0.008479	0.009438	0.020126	0.026322	0.02703	0.052846	0.046884	0.070822	0.096386
C_2	0.100496	0.031796	0.010617	0.033962	0.036193	0.033268	0.071497	0.043535	0.024788	0.03012
C_3	0.136387	0.162513	0.035391	0.015094	0.019742	0.02703	0.059063	0.023442	0.035411	0.078313
C_4	0.110067	0.035329	0.172039	0.037736	0.014806	0.039506	0.034194	0.043535	0.049576	0.084337
C_5	0.109212	0.044161	0.088477	0.209644	0.049354	0.016634	0.027977	0.033488	0.084987	0.060241
C_6	0.124423	0.134376	0.086511	0.153739	0.191934	0.062377	0.012434	0.080372	0.088528	0.096386
C_7	0.108016	0.041638	0.144185	0.176101	0.164514	0.519811	0.093257	0.046884	0.049576	0.13253
C_8	0.114134	0.153092	0.157293	0.181691	0.270274	0.077972	0.259048	0.100465	0.046035	0.138554
C_9	0.062212	0.141315	0.193808	0.083857	0.062346	0.075084	0.262009	0.446512	0.106233	0.10241
C_{10}	0.109212	0.247302	0.10224	0.08805	0.164514	0.121289	0.127674	0.134884	0.444045	0.180723

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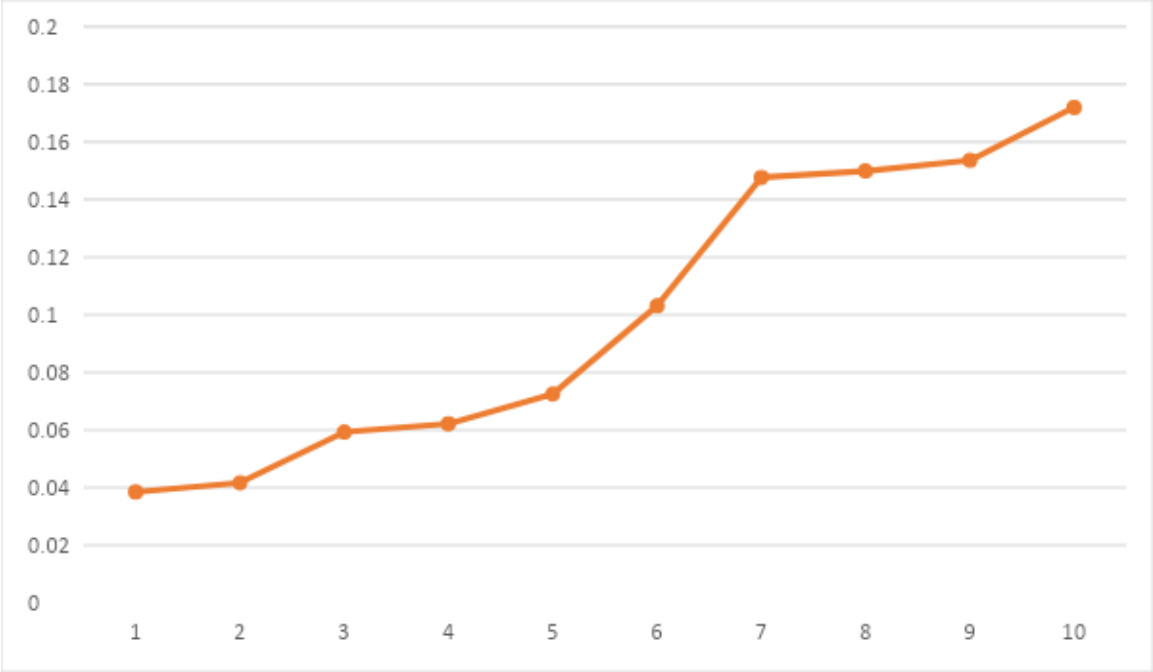

Figure 3: The weights of the used criteria to measure the performance.

5. Discussion

The notion that credibility is the foundation of an individual's qualitative connection to information, to the online content provider, to online media, and to the technology itself is supported by the fact that synonyms of the term credibility include the phrases trustworthiness, trust, credibility, dependability, or honesty. These words all imply that credibility is the base of credibility. Therefore, youth education, which incorporates and makes use of social media, must properly react to the volume of online information that conveys genuine and honest content, as well as content that seems to be factual but is really misleading or even untrue. Conversational agents, sometimes known as chatbots, provide exciting new possibilities for use in educational settings. They can play a variety of roles (such as knowledgeable tutors and assistants focused on providing service) and work towards a variety of goals (such as enhancing students' skill sets, bolstering students' motivation, and enhancing the effectiveness of education). The most common use for an educational chatbot is that of an AI instructor that assists a student in improving their skills and provides more chances for practice. This is by far the most popular use for educational chatbots. Some recent meta-analyses have even found that chatbots have a considerable influence on skill progress, such as in language acquisition.

6. Conclusion

In conclusion, ChatGPT is a useful tool that can provide information and respond to queries in a variety of sectors, including the field of education. Despite this, it is essential to recognize the constraints imposed by it and combine its application with that of other resources to get precise and productive results in the field of education. The use of ChatGPT in the field of education requires thorough deliberation and implementation with extreme caution. This paper used the AHP to analyze and evaluate the role of chat GPT and social media in education. The AHP method is a MCDM method. The AHP is used to compute the weights of the criteria. The AHP is combined with the neutrosophic sets. This paper used the neutrosophic sets to overcome the uncertainty in the process of the evaluation.

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