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Evaluation of the Convincing Ability through Presentation Skills of Pre-Service Management Wizards Using AI via T2 Linguistic Fuzzy Logic

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Abstract: Convincing ability is one of the most desirable attributes to be a successful management wizard in any field whether political, business, or domestic. They require to present various facts in such convincing style, strategically employing verbal as well as non-verbal communication, that all being persuaded, accede to their proposal, and their goal is achieved very smoothly. Till date this presentation evaluation skill has been measured in various ways without emphasizing much on various style enhancing attributes. So, in this present paper a communicative approach has been made proposing a model, devised centering Interval Type-2 Fuzzy logic for evaluating the convincing ability of the presenter/communicator through the positive response from the affected audience. And this has been done conducting the study on a group of students budding to be masters in business administration. Here it has also been shown the advantage of the present evaluation procedure over the previously suggested methods.

Keywords: evaluation methodologies, verbal–nonverbal communication, artificial intelligence, fuzzy, human–computer interface, education technology

1. Introduction

Motivating quality is probably one such quality which is not merely an individual but also every nation craves for through the development of own style and makes an identity of one's own. Thus, we often hear people trying to follow the style of famous personalities such as legendary Gandhi's style, Martin Luther King's style, Roosevelt's style, Washington's style, Rousseau, Voltaire, and Gariboldi's style since this motivational capacity gives birth to great presenters, or orators, invincible jurymen, and often great politicians who lead the nation in the most crucial period safely to the pinnacle of peace and success. Besides these, this convincing ability can be set as models and all management wizards often draw lessons from these, which end up in as success in marketing managements. Thus till date, we have the need and hence always a search for good presenters with pleasant body language and distinguished gift of articulation.

To convince or motivate a person, which is most important, is to win the trust of the listener, and for that the speaker requires to have a "good sense, good moral character and good will" (Aristotle, 2012). These qualities not only boost the confidence of the speaker but also "induce the faith in the audience and the message appears to them to be truth itself to be readily welcomed and accepted" (Dey, 2016). Hence to grade a person as a good orator with high convincing ability, his/her assessment and evaluation become indispensable. In fact, the teachers should also in the academic institutions give it sufficient importance and consider it as one of the important duties to develop the presentation skills of the students (Aldağ & Gürpinar, 2007) and make them successful presenters. In the presentation, however, style of representing the matter does play a very vital role in producing the desired effect on the audience. Thus, though so far not so much stressed upon, in this paper through the computational communicative approach to evaluation of presentation, it has been shown that a special care should be taken for the development of good style too so that the speakers ultimately learn to convince the listeners and achieve their aim.

2. Assessment and Evaluation

Though assessment and evaluation are often used interchangeably, there lies a fine line of difference between the two in the education process. The term assessment, for the past few years, has been applied to indicate at least certain degree of amelioration in the process of assessment (Borden & Zak Owens, 2001; Palomba & Banta, 1999). At the same time, evaluation has been used to hint at the judgment on the quality of progress. Actually, assessment and evaluation are quite close to each other. In both cases, for instance, an individual collects (as assessor) or observes (as evaluator) evidences regarding a performance or a result, and an individual either as assessee or evaluatee performs or produces a result. Again, in both the cases, it is the candidate under assessment who moves for the process of evaluation or for the process of assessment. But the point of difference is, in case

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of assessment, the center of control resides with the performer, while in case of evaluation, the decision is in the hands of the observer. Moreover, the reports of the two processes also vary considerably. Assessment tells about the cause of success or failure, why the performance was strong or not up to the mark, and suggests ways for further amelioration. But it does not speak about its quality. Whereas, evaluation report specifically points out the degree of improvement, its quality in terms of grades or marks or a comment like "sincere attempt," "good work," etc., as we see in the examination system or the progress reports. But other than suggesting the level of performance, it however does not suggest or advice any path for any kind of further improvement. Thus, both these processes are simultaneously adapted in various ways in the education process to train the students in the best ways. Objective questions, essay type questions, multiple choice questions, oral tests, etc. are such conventional means of evaluating the learners. But when the matter to be evaluated is presentation or motivating someone through speech, the point of appointing multiple evaluators arises since in a presentation not only verbal communication, that is, linguistic features, nonverbal communication, that is, the paralinguistic features like gestures, voice modulation, facial expressions, paralanguage, artifactics, olfactics equally plays a very vital role. In fact, this nonverbal communication in companion with this verbal communication enables the presenter to convince the audience through the development of an impressive style. Magin and Helmore (2001) thus suggest for appointing more than one evaluator when the evaluation of presentation skill is to be done for getting more accurate as well as reliable results. But appointing more than one evaluator to evaluate and assess an individual is not only time taking but also expensive too.

3. Artificial Intelligence and Assessment Evaluation

In this age of artificial intelligence where man–machine interface is exulting the triumph of success almost in every field like health, transportation system, forensic department, etc., computer application, thus, can be considered as a way out to the problem of getting multiple teachers' opinion in the most cost-saving as well as time-saving way. Computers programmed properly for the purpose would not only enable a convenient obtaining of the results, but these expert systems in the form of a software would also be a useful means of easily handling out these kinds of intricate situations and work pressure with such expertise that it can procure more perfect result in complex environments as well (Önder, 2003). Thus, in 2005, to provide the teachers with a more flexible interface, the web-based self/peer assessment system (Web-SPA) is developed by Sung et al. (2005). In Bai and Chen (2008), a new method of evaluating the students' performance is followed in which the fuzzy membership functions (MFs) and the fuzzy rules are applied in order to evaluate and gauge the problems, importance, and level of complexity of the answer scripts of the students. It also enables the teacher to distinguish between the ranks of the students with equal marks. In 2009, to overcome the learning barriers, Chen and Bai (2009) also use this artificial intelligence via fuzzy logic for "adaptive learning systems." Saleh and Kim (2009) too propose a fuzzy system for the purpose of evaluating the students' answers, but here the difficulty, vitality, and level of complexity of the questions are taken into account, wherein through fuzzification, fuzzy inference, and defuzzification the questionnaires are evaluated. Then it was Baba et al. (2009) who apply Fuzzy Group Decision Support System (FGDSS) in measuring the performance level of the project presentation of the graduate-level students. But Baba et al. (2009) then come up with more user-friendly FGDSS software showing its multipurpose decision-making ability where a researcher is allowed to use fuzzy inference methods of two different types in assessing the performance of the research assistants. In this way, multiple fuzzy inference methods are introduced in order to evaluate the students and grade their performance.

Very recently, researchers have shown some discrete applications of this artificial intelligence via fuzzy in assessment and evaluation. For instance, Chai et al. (2015) have shown an innovative fuzzy peer methodology enhancing cooperative learning of the educands considering the vagueness and imprecision of the words used in the whole course of the evaluation process. Sanchez-Torrubia et al. (2012) have attempted to develop a granular linguistic model of a phenomenon (GLMP) to design the learning process as is in the e-learning system and apply the automated generation of the assessment of an assessment report. This will not only reduce the work load but will also automatize the process with greater speed and higher precision. Chen and Li (2011) also presented a new method of assessing students' performance in which the values of attributes such as "accuracy rate, time rate, difficulty, complexity, answer cost, and importance" are automatically generated using fuzzy reasoning capability, and the student's ability to learn is more accurately assessed. Artificial intelligence via fuzzy logic has been used by Chua et al. (2013) in the assessment and measurement of outcome-based education (OBE) on the basis of traditional OBE measurement system. This framework is further extended from Inductive Logic to Second-Order languages, and Wilmer's Principle is introduced. Hameed (2011) also comes with another system based on Gaussian MFs which appeared a pretty more reliable being based on a tri-fuzzy-node system each of which applying fuzzification, fuzzy inference, and defuzzification while considering the complexity, significance, and convolution of questions.

4. Fuzzy Logic and Communicative Approach

The type-2 fuzzy logic (T2FL) is actually an uncomplicated illustration of the knowledge in terms of certain if-then rules (Naderloo et al., 2012). These if-then rules are set in a particular format along with the corresponding degrees for a specific situation (Amiryousefi et al., 2011). The type-2 fuzzy (T2F) inference system can thus manage imprecise conditions by developing a model with words and linguistic variables, which is particularly useful when models are produced based on engineers' knowledge and the personnel involved do not have access to a mathematical environment. Fuzzy inference system (FIS) with the aid of some of these given specific rules can precisely render the description of the complex and nonlinear phenomena. Thus, keeping in mind all these already proposed models we have in this paper come up with a new approach to assess and evaluate the individuals' performance and draw inference regarding their convincing ability setting the measuring parameters from communicative viewpoint and applying them through interval type-2 fuzzy (IT2F) model (Jana et al., 2017, Jana et al., 2021). This newly made communicative approach to the devising of the parameters and measuring the students' convincing ability for the first time will not only evaluate the participants' logical sense and subject knowledge but also mark their delivery skill with best

aesthetic appeal making the persuasion of the audience a success, and the T2F model will render a more precise result of greater accuracy than the former suggested techniques. Communicative approach include linguistic competence along with performance, and the rhetorical devices are marked out as sticks used in framing the style and analyzed to show how language has strategically been used to produce the desired effects on the audience. Thus, in this present study, the five canons of rhetoric have specifically been considered while drawing the parameters. "Greek and Latin rhetoricians divided their rhetorical precepts into five arts or canons that recapitulate the act of planning, composing, and delivering a speech. In English, these five arts are called invention, arrangement, style, memory, and delivery" (Sloane, 2001). These five canons thus have summarily been presented in the parameters as primary organization, arrangement, memory, and delivery style. Van Dalen-Oskans (2012) writes that style is defined in the Digital Humanities as anything that can be measured in a text's linguistic form, "such as vocabulary, punctuation marks, sentence length, word length, the use of character strings" and so on. Every word and feature adds to the overall tone of the text; a different frequency ratio, a different average sentence length, or a different punctuation style results in a distinct tone of the text. In a nutshell, everything matters.

With this perception of style in Digital Humanities, these parameters have further thus been categorized as follows in Table 1.

Fuzzy logic, an approach to compute, actually is grounded on the verbal expressions and the logical relations which hold true in them (Akpolat, 2005). Out of the two methods for FL such as Suegno and Mamdani, Suegno is more suitable for mathematical analysis, and Mamdani conforms well with human input as a result of which Mamdani is preferred more in the field of social science (Uddin, 2012). Hence in this paper also, at first a complete T2F model providing an important parameter-based indicator of evaluation of presentation skill of college students is presented. After that, making a primary investigation of the parameters deciding upon the presentation as well as the convincing ability assessing and selecting the most befitting input as well as output variable, a Mamdani IT2F inference system is developed using the very input–output variables. Using the normal T2F MFs, a model is formed and by sensitivity analyses we opt for the most suitable model among them. After that, with the aid of graphical representations, we validate the selected model with the physical theoretical models.

The lacunae which still persist in the formulation and the solution model of the earlier researches from Ozdemir and Tekin (2016) and Schmid (2007) have been worked and sorted out in this model such as:

- Communicative approach via IT2FC for the evaluation of convincing ability through presentation skill in a college.
- IT2FLC helps in tracing the results in a well-defined way for drawing the inferences so that different types of presentation skill assessments can be predicted.
- The qualitative factors that decide upon the refined quality/degree of the presentation skill assessment can easily be incorporated in the prediction model of T2F to increase the accuracy.
- The model proposed here is validated with the aid of some statistical date analysis and the multiple linear regression (MLR).

5. Preliminaries on T2FS

T2F set, as holds Jana et al. (2017) and Jana et al. (2021), is a tool which can evaluate the uncertain and imprecise nondeterministic degree of truth for an element of a set. T2FS is denoted and defined by $\widetilde{\widetilde{B}}$, which is defined by T2MF $\mu_{\tilde{B}}(x,u)$. In $\mu_{\tilde{B}}(x,u)$, $x \in X, \forall u \in J_x^u \subseteq [0,1]$, and $0 \leq \mu_{\tilde{B}}(x,u) \leq 1$ defined by equation (1) (Castillo et al., 2007):

Table 1
Presentation evaluation scale parameters

Category	Description of Matter	Average	Importance
	Taking psychological preparation for the speech	4	Very Imp
	Collecting the necessary points for the speech	3	Mod Imp
	Assimilation/addition of innovative ideas to it	1.75	Less Imp
Primary organization	Succinct representation of the subject	3.25	Mod Imp
	Selection of the necessary figures of speech (schemes and tropes like chaismus, hyperbaton, metaphor, euphemism, innuendo, litotes, paratactic and hypotactic construction, parallelism, etc) to be used.	4.5	Very Imp
	Selection and use of word appropriate to the context	4.25	Very Imp
	Use of lucid language	3.25	Mod Imp
Arrangement	Following the proper protocol such as start with a proper introduction of the topic	2	Less Imp
	Discussion of the matter	4.5	Very Imp
	Elucidation of the observation with live or practical examples	4	Very Imp
	Drawing inference	3	Mod Imp
Memory	Correctness of the points presented with a sense of completion infused in them	3.25	Mod Imp
	Accuracy in the quotations used and their appropriateness to the context	3	Mod Imp
	Proper pronunciation and use of the paralinguistic skills (such as accent, pitch, and intonation)	4	Very Imp
	Proper facial expression, gesture, and body movement	3.75	Very Imp
Delivery	Positing an optimistic view	4	Very Imp
	Justification of all the points	3.5	Mod Imp
	Sound clear, compassionate, considerate, courteous, and confident	4.5	Very Imp
	Having good presence of mind to handle any question after the presentation and generate positive response of the audience	4	Very Imp

$$B = \{(x, u, \mu_{\tilde{B}}(x, u)) | x \in X, \forall u \in J_x^u \subseteq [0, 1]\} \quad (1)$$

Let us consider a continuous variable $\widetilde{\widetilde{B}}$ as a T2F. It is denoted and defined by the following equation (2):

$$\widetilde{\widetilde{B}} = \left\{ \int_{x \in X} \left[\int_{u \in J_x^u} f_x(u)/u \right] /x \right\} \quad (2)$$

where the union of x and u is denoted by $\int \int$. If we consider A to be FT2 discrete variable, then it can be represented through equation (3):

$$\widetilde{\widetilde{B}} = \left\{ \sum_{x \in X} \mu_{\tilde{\tilde{B}}}(x)/x \right\} = \left\{ \sum_{i=1}^{N} \left[\sum_{k=1}^{M_i} f_{x_i}(u_k)/u_{ik} \right] /x_i \right\} \quad (3)$$

where the union of x and u is denoted by $\sum \sum$ and $f_x(u) = 1, \forall u \in [\underline{J}_x^u, \overline{J}_x^u] \subseteq [0, 1]$, the type-2 membership function (T2MF) $\mu_{\tilde{\tilde{B}}}(x, u)$ is expressed by one type-1 inferior MF, $\underline{J}_x^u = \mu_B(x)$, and one type-1 superior, $\overline{J}_x^u = \mu_B(x)$, then it is said an IT2F set which is represented by the following equation (4):

$$\widetilde{\widetilde{B}} = \{(x, u, 1) | \forall x \in X, \forall u \in [\underline{\mu}_B(x), \overline{\mu}_B(x)] \subseteq [0, 1]\} \quad (4)$$

Definition 1. *A T1F set X comprises a domain D_X of real numbers which is also called the universe of discourse X, together with a mf $\mu_x : D_X \rightarrow [0, 1]$. It can be represented by the equation:*

$$X = \int_{D_x} \mu_x(x)/x \quad (5)$$

where in $\int$ denotes the collection of all points $x \in D_X$ which is associated with membership grade $\mu_x(x)$.

Definition 2. *The MF $\mu_x(x, u)$ characterizes, as says Mendel (2001), an IT2 FS $\widetilde{X}$, that is,*

$$\widetilde{X} = \int_{x \in D_x} \left[\int_{u \in J_x \subseteq [0,1]} 1/u \right] /x \quad (6)$$

here x, which is the primary variable, has domain $D_{\tilde{X}} : u \in [0, 1]$, which is referred to as the secondary variable. It has the domain $J_x \subseteq [0, 1]$ at each $x \in D_{\tilde{X}}$; J_x is the support of the secondary MF and the amplitude of $\mu_{\tilde{X}}(x, u)$. The amplitude of $\mu_{\tilde{X}}(x, u)$ is said to be the secondary grade of $\widetilde{X}$, which equals 1 for $\forall x \in D_{\tilde{X}}$ and $\forall u \in J_x \subseteq [0, 1]$. The general T2F sets $\mu_X(x, u)$ can be any number ranging between $[0, 1]$, and it varies as x and/or u. A graphical representation of an IT2F set is depicted in Figure 2.

Definition 3. *The footprint of uncertainty (FOU) of $\widetilde{X}$ of T2F is defined by the equation:*

$$FOU(\widetilde{X}) = \bigcup_{\forall x \in D_{\tilde{X}}} J_x = \{(x, u) : u \in J_x \subseteq [0, 1]\} \quad (7)$$

The size of an FOU's size is directly proportional to the area of the common region. It is conveyed by an IT2 FS. So, an FOU with larger area happens to be more uncertain than that with the one with the lesser area which has been depicted in Figure 1.

Figure 1
Graphical representation of interval type-2 set

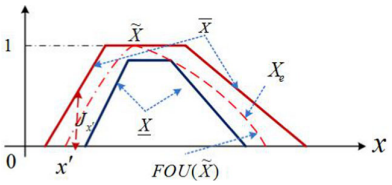
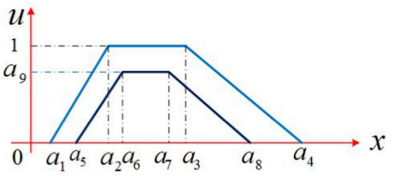


Figure 2
The trapezoidal IT2 FS



Definition 4. *The upper MF (UMF) $\mu_{\overline{X}}(\xi)$ and lower MF (LMF) $\mu_{\underline{X}}(\xi)$ of $\widetilde{X}$ have been defined as:*

$$J_\xi = [\mu_{\underline{X}}(\xi), \mu_{\overline{X}}(\xi)] \quad (8)$$

Using (8), FOU $(\widetilde{X})$ can also be expressed as:

$$FOU(\widetilde{X}) = \bigcup_{\xi \in D_\xi} [\mu_{\underline{X}}(\xi), \mu_{\overline{X}}(\xi)] \quad (9)$$

5.1 Fuzzy tool: Fuzzy inference system (FIS)

FIS is a system that works as a scientific tool for mapping the features, which function as inputs, to the classes functioning as output, in fuzzy classification, using fuzzy set (FS) theory. Without a thorough mathematical explanation, it is used for the replication of the system (Dey & Jana, 2015). Fuzzy logic, according to Lotfi Zadeh (1965), comprises senses of two distinct types. In one sense, it deals with that class of things which has imprecise boundaries wherein the membership is a matter of degree, while, according to the other sense of understanding, it deals with a set of if-then rules or fuzzy rule (Khoshnevisan et al., 2014). It is broadly applied to elicit or evoke the expert's knowledge, take cognizance of it, and frame the human thinking process into a model (Afrinaldi & Zhang, 2014). There are four stages in a FIS (Bojadziev & Bojadziev, 2007).

(a) Fuzzification: The first step in the inferencing process which describes the input data, the output data, and the MFs of those respective inputs and outputs is fuzzification. This stage entails converting the true numerical values of input and output variables into the membership grade of a FS, which uses MFs to express the variable's property in fuzzy form (MFs). A MF is just a curve that assigns a membership value between 0 and 1 to each point in the input space (Dey & Jana, 2015). If the universe of discourse is said to be X, and its elements are represented by x, then a FS $\widetilde{B}$ will be said to be a set of ordered pairs. Fuzzy MFs are divided into linear functions and S-shaped functions, and curves of different types such as trapezoidal, triangular, Gaussian, generalized - bell, and sigmoidal can be used for MF.

(b) Use of the rule-based system in fuzzy data: A rule-based system is one which refers to a set of if-then linguistic rules which depicts a system's logical evolution according to the linguistic values of its linguistic variables. In other words, it can be said that the relation among the MF and form of the result of MF is simplified by the rule base (Dey & Jana, 2015). The general form of if-then linguistic rules is:

If ξ_1 is X_1 AND ξ_2 is $X_2 \cdots$ AND ξ_m is X_m THEN η is Y, where $\xi_1 \cdots$, ξ_m are input variables with linguistic values $X_1 \cdots$, X_m, respectively, and η is the output variable with linguistic value Y.

Actually, in several ways, the fuzzy rules can be stated quantitatively by choosing an unambiguous mathematical expression operators (Tsourveloudis & Phillis, 1998) of the AND, OR, and any other compensatory. As an example, if two IT2F sets $\tilde{\tilde{X}}$ and $\tilde{\tilde{Y}}$ are defined on the universe U, for a given element ξ belonging to U, then the conjunction AND is expressed by Min operator and OR by Max operator.

(c) Inference of fuzzy results: The fuzzy input is converted by the if-then type fuzzy rules into fuzzy output. In the defuzzification phase, these fuzzy outputs are then transfigured into real data.

(d) Defuzzification: In the process of defuzzification, the inference engine's fuzzy output is converted into deterministic value using the MFs. No such unique technique is there for executing this defuzzification operation. The various existing approaches to defuzzification take into account the shape of the fuzzy numbers, namely the height of the triangles and the trapezoids, the length of supporting intervals, and closeness to central triangular numbers. Largest of the maximum (LoM), center of the maximum (CoM), smallest of the maximum (SoM), mean of the maximum (MoM), and the center of gravity (CoG) or the center of area (CoA) methods are a few from the most commonly used defuzzification techniques found almost in all models.

An in-depth study shows that the mathematics involved in FL and in FLC have in detail been discussed in many research works whose more exhaustive details are provided in Lee (1990) and Bojadziev and Bojadziev (2007), etc. It is also depicted in Figure 3.

6. Model Formulation

To evaluate an individual's persuasive capacity in an environment with unexpected listeners, an interval type-2 fuzzy logic control (T2FLC) technique with multiple linguistic parameters as well as paralinguistic aspects have been developed. Proper analysis of the need, making required planning, collecting, and arranging the required points to meet the need with a possible solution, handling the situation in a strategic way, and making the proper delivery with impressive articulations and advice always fetch a positive result with successful management of the whole. As far as style of presentation is concerned where language indubitably plays a very vital role, no predictable rule is followed in this individual arrangement of words, selection, and use of rhetorical devices and final delivery with proper body gestures. Moreover, this presentation style further varies as per the topic and/or situation along with the audience.

It is, therefore, difficult to establish a linear relation between the style of presentation, topic, and/or audience. In fact, all three are associated with each other in a nonlinear way. The T2FL helps in a way such that the input parameters and output parameters are marked in a well-organized way (as shown in Figure 4) forming a

Figure 3
Block diagram of T2 inference FS structure

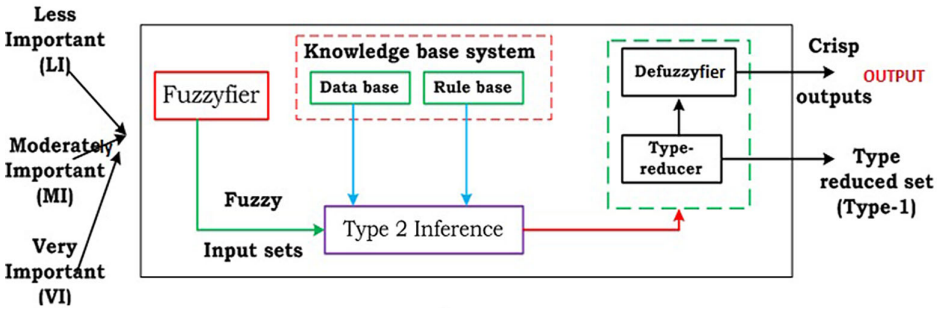
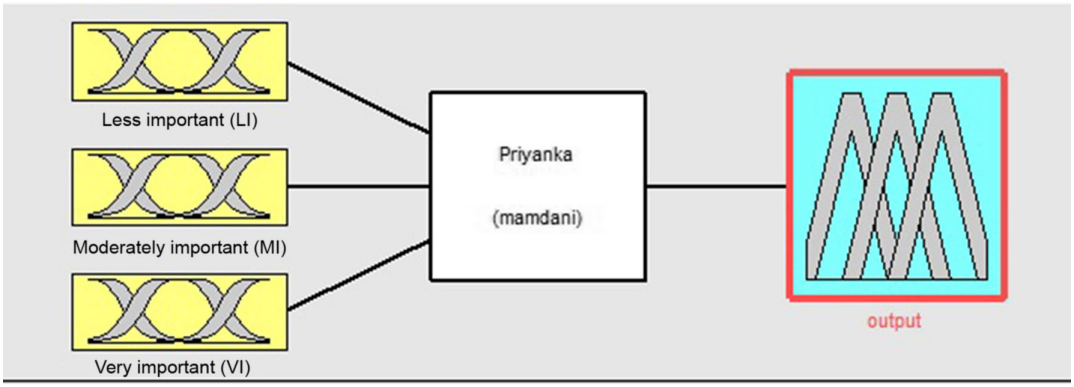


Figure 4
The structure of Mamdani FIS



pattern for prediction of various types of presentation style with their convincing ability. This prediction helps the nurturing academic institutions to know not only about the success of their candidates as management wizards, but also to get an impression about their growth as leading personalities in various fields become prominent.

7. Methodology

The method used to achieve the aim of our study, based on the consideration of the reviews of the earlier research works in the present subject area and problem identification, is presented here. At first, two groups were made. Group-A comprised 14 instructors, some serving as English teachers in Applied Science and Humanities Department and some as teachers in Management in Business Administration Department of Haldia Institute of Technology. This group gave expert advice on developing the parameters and evaluating the importance of the topics in the Presentation Evaluation Scale (PES), as well as defining the rule base that allowed the IT2FL approach to function. Group-B consisted of 41 second-year students of MBA department having marketing and human resource as their special paper. The students belonging to this group made a presentation which are related to the units of this course, an application of PES on them was done, and the research was held on the basis of the obtained data procured from that scale. Three input parameters (Figures 5, 6, and 7) and one output in (Figure 8) Mamdani T2F system were made use of by the classified data which were obtained from the PES.

This is the IT2FL technique or method (Figure 4) which formed the initial level, that is, level one (L1) of the entire procedure. The data of the research work were obtained through the PES that Kazu et al. (2005) had made application of. Fuzzy logic's if-then rule given for the evaluation of the students' (or presenters') convincing ability through their presentation has been provided in Figures 9 and 10 and controller in Figure 11.

8. The Solution Method Via IT2FIS

Fuzzy technique which is a method having the ability to take into account ambiguous and vague thinking is one of the recent research inventions of high popularity to solve various intrigue problems where precision is in high demand. Their unique features are their ability to predict intricate phenomena. The two most vital FISs are Mamdani fuzzy inference system (MFIS) and Sugeno fuzzy inference system (SFIS). MFIS is the most prevalent and adopted inference method when the output variables are also FSs with mf. It was Mamdani and Assilian Mamdani and Assilian (1975) who introduced this method. The prime FIS structure for the system is represented as follows:

If x is $\widetilde{\widetilde{A}}$ and y is $\widetilde{\widetilde{A}}$, then z is $\widetilde{\widetilde{C}}$, where $\widetilde{\widetilde{B}}$ and $\widetilde{\widetilde{B}}$ are IT2F sets in the antecedent and $\widetilde{C}$ is an IT2F set in the consequence (Castillo & Melin, 2008).

A IT2FIS rule for this proposed method is:

If x is considered $\widetilde{\widetilde{A}}$ and y is considered $\widetilde{\widetilde{B}}$, then $z = f(x, y)$, where $\widetilde{\widetilde{A}}$ and $\widetilde{\widetilde{B}}$ are IT2F sets in the antecedent and if $z = f(x, y)$ is a deterministic function in the consequence. Generally, $f(x, y)$ is a polynomial in the input variables x and y (Castillo &

Figure 5
MFs for MI and LI

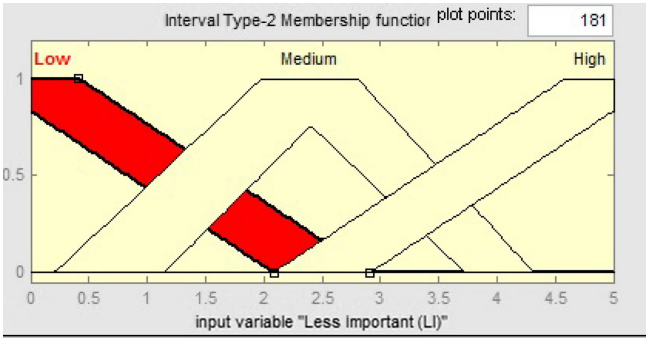


Figure 6
MFs for VI and MI

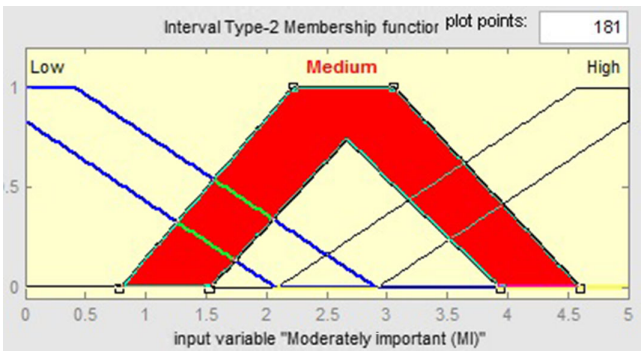


Figure 7
MFs for VI and LI

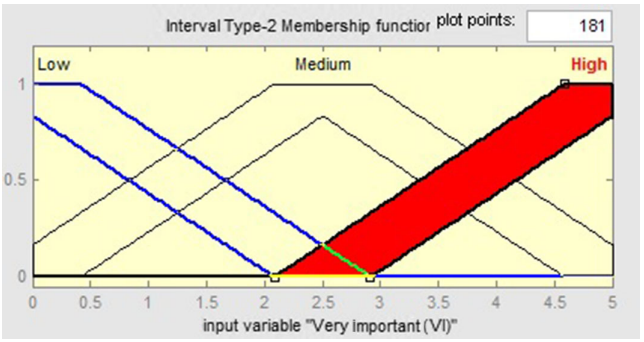


Figure 8
MFs for Output

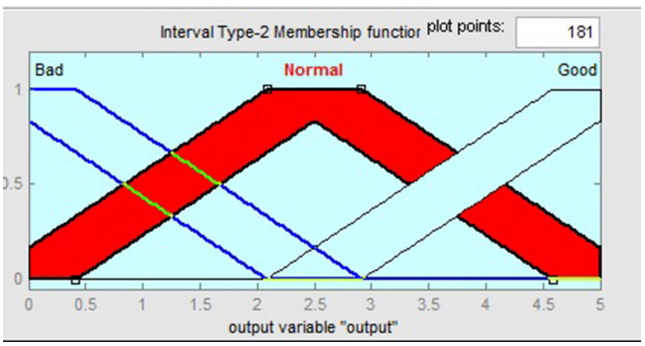


Figure 9
IF-THEN rule for the proposed model

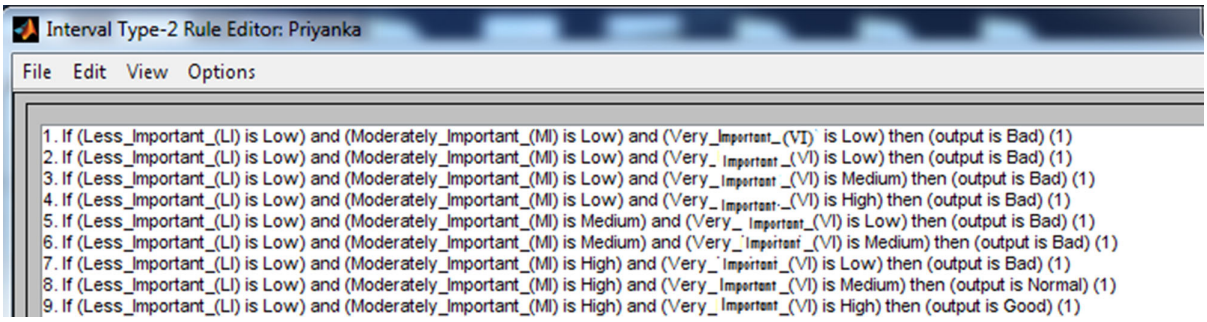
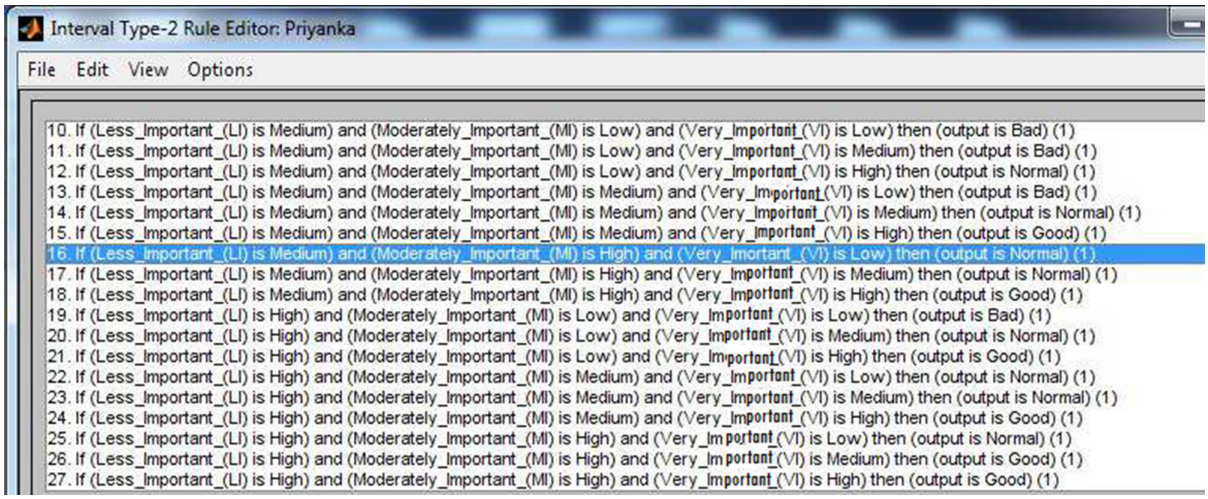


Figure 10
IF-THEN rule for the proposed model



Melin, 2008). The prime distinction between the two FIS methods resides in the consequence of fuzzy rules.

In the present research article, we have used MFIS to previse and evaluate the presentation skill. For calculating the output of the FIS of the given inputs, the following six steps are to be followed:

Step 1: Determining a set of fuzzy rules.
Step 2: Fuzzifying the input data employing the input membership functions (IMFs). The process involves the conversion of the crisp data input into a linguistic variable making use of the MFs kept saved in the fuzzy knowledge base).
Step 3: Combining, that is, synthesizing the fuzzified data inputs as per the rules of fuzzy for establishing a rule strength (fuzzy operations).
Step 4: Finding the rule's consequence by combining the output MF with the rule strength (implication).
Step 5: Combining the consequences for getting the aggregate of an output distribution.
Step 6: Defuzzifying the distribution of the output (which involves the conversion of the fuzzy output of the inference engine to crisp using MFs, analogous to those used by the fuzzifier).

The present research work presents Mamdani IT2FL inference system structure's command line editing procedure which has been implemented in the IT2FL system's toolbox. Mamdani T2F inference model proposed here with three input variables and one output variable is shown in Figure 4. In this model, we have applied 27 if-then rules (Figures 9–10). Min and Max operators have been used for evaluating the logical conjunction AND and OR. These Minimum and Maximum operators have been used by us for the proposition and the aggregation method, respectively. For defuzzification, we have used the centroid method.

8.1 Results and discussion

Aside from the ones listed above, statistical measures like the root mean square error (RMSE) and the determination coefficient (R^2) have been used to compare the anticipated and measured values of flexible modulus. The RMSE is represented through Eq. (10) and is given below:

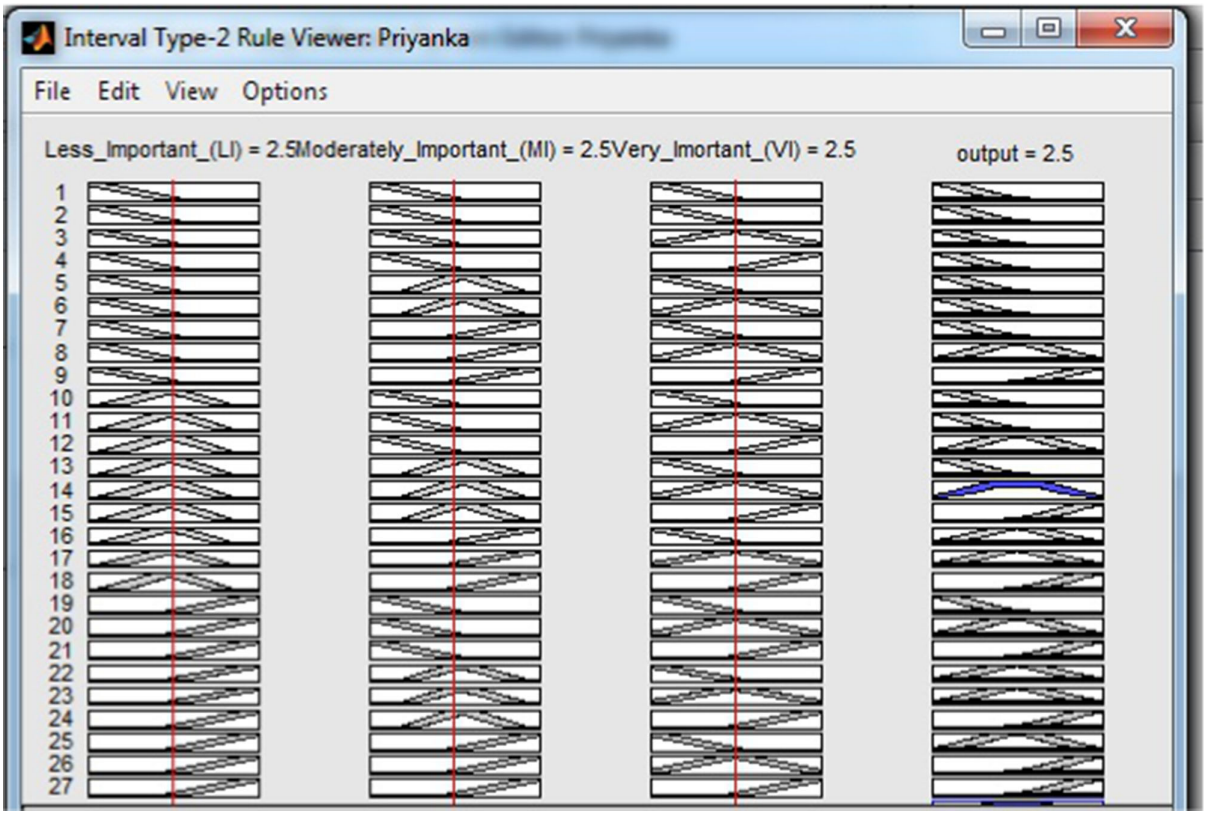
$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_{pred_i} - y_{obs_i})^2} \tag{10}$$

And (R^2) (determination coefficient) is calculated using Eq. (11) given as follows:

$$R^2 = 1 - \frac{\sum_{i=1}^{n}(y_{pred_i} - y_{obs_i})^2}{\sum_{i=1}^{n} y_{obs_i}^2} \tag{11}$$

The average of the squares of the mistakes is measured by the mean absolute percentage error (MAPE). The higher the accuracy of the

Figure 11
T2 fuzzy logic controller



suggested models, the lower is the MAPE value. This MAPE is calculated using equation (12) as follows:

$$MAPE = \frac{1}{n}\sum_{i=1}^{n}\frac{|(y_{pr_i} - y_{ob_i})|}{y_{pr_i}} \times 100\% \tag{12}$$

Mean absolute error (MAE) has been studied for the performance and efficiency models, which is given by Eq. (13):

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|y_{pr_i} - y_{ob_i}| \tag{13}$$

where n denotes the total number of data patterns in the data set, y_{pr_i} denotes one data point with i-'s predicted value, and y_{ob_i} denotes one data point with i-'s observed value. Figure 9–Figure 10 depict a diagrammatic representation of a fuzzy logic if-then rule for input and output data, while Figure 11 depicts an IT2F controller. Figures 12, 13, and 14 vividly depict how the outputs have changed as the degrees of importance have altered.

8.2 Error analysis using MLR

If x_i stands for the process parameters and e_i represents the low predictive error which is the optimization goal, then the MLR could be represented through the equation:

$$y_i = b_0 + b_1 x_{i1} + b_2 x_{i2} + \cdots + b_n x_{in} + e_i \tag{14}$$

Various types of methods can be made use of to measure the performative quality and efficacy of the proposed frameworks or models. This is achieved through statistical error analysis. For evaluating and to tally the performance and level of accuracy of the model proposed with the standard and verified classroom data, the deviation from the target and the actual result has been measured using this process of error analysis employing multiple linear progression. Then, as shown in Table 2, employing the RMSE and the correlation coefficient (R^2), the final result is obtained through regression in Matlab 14.

Figure 12
Change of Output w.r.t. MI and LI

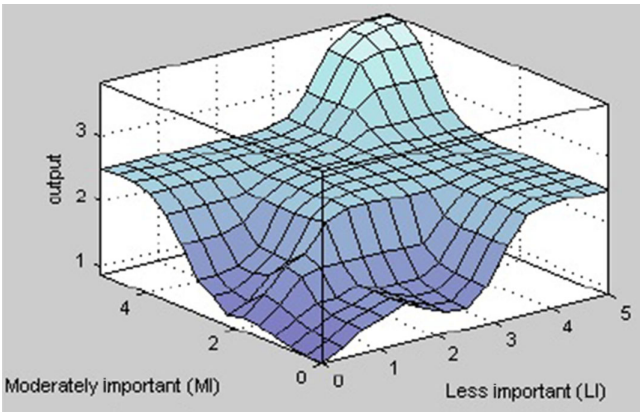


Figure 13
Change of Output w.r.t. VI and MI

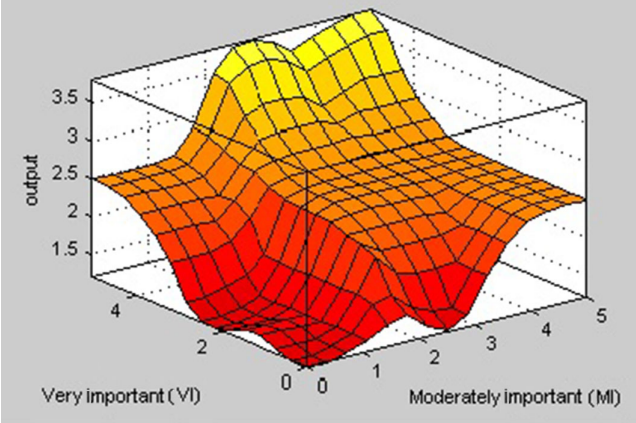


Figure 14
Change of Output w.r.t. VI and LI

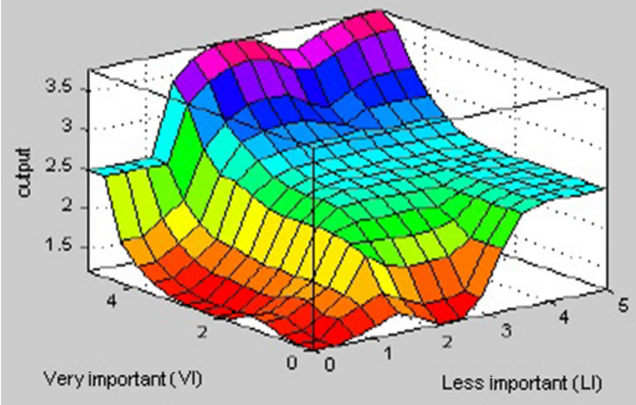


Table 2
Statistical analysis of output data using MLR-ANFIS

Model	Approach	RMSE	MAE	MAPE	R^2
1	MLR	0.05413	0.0772	0.968	0.9714
	ANFIS	0.05187	0.0763	0.978	0.9815

9. Conclusion

In the present study thus we observe that assessment while tells us about how the improvement can be made in the speaker to increase the convincing ability, evaluation of the presentation skill of the students done on the basis of verbal and non-verbal communication via interval type-2 fuzzy logic as an alternative is researched to determine if the standard is met. This study done on 41 students of MBA Department of Haldia Institute of Technology shows that following this method not only the limitations of the earlier traditional models could be resolved, in fact their convincing ability can also be measured with greater accuracy from the audience response and that too in a shorter period of time. In the study, it has been found that there is a noteworthy decrease in the marks scored by some students, while the scores of some students show an increase. Added to these, some students' scores show no significant change at all. A fall is observed in the average (i.e., the mean) of the FPSS. PES scores' mean is seen to be higher and the degree of variation, that is, the measure of the gap between the two groups' means, stands, significant. In short, this holds the analysis, that is, the evaluation done deploying a single evaluator is markedly different from the evaluation done using multiple evaluators. That which creates this difference in the marks or scores of the student is the evaluation of scale matters via IT2FL applied with a communicative approach using artificial intelligence which makes the whole evaluation process seem as if the result has been provided by an authentic human expert after deep observation and evaluation rather than the mechanical evaluation. This application is cost saving too, besides being quite handy and easy to use with greater precision and better result. It also solves the problem of getting multiple experts at a time and saves the expenditure on them. Above all, it is one of the most difficult tasks to precisely decide upon an abstract thing like style and its convincing power, they being both primarily dependent on the communicative competence and performance ability of an individual with remarkable aesthetic sense so that the presented words are readily accepted as the truth itself and abided by. Thus in this situation, this newly made computational communicative approach via IT2FL appears as an indispensable tool to measure the convincing ability of the pre-service management wizards and groom them accordingly. In future, we can further work on this using more deep and super intelligent methods like simulink, interpretive structural model, fuzzy neural network, etc., in order to assess and evaluate the degree of efficiency of our present study.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

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