

9(i) The Specific objectives of the research are to:

- design a fuzzy logic based career recommender model for pre-university students
- implement the model designed in (a).

(ii) Expected Contribution of the Research to Knowledge:

At the end of the research work, a fuzzy logic career recommender system that will recommend university courses for pre-university students will be developed.

10. Research Methodology

The proposed work will make use of the result of Senior Secondary School class (SSS) 2 as the dataset. The dataset will be narrowed down into four major career areas: science, commercial, arts and technology courses. For each of the four areas, grades of six subject requirements will be taken into consideration to determine the recommended career path. This dataset will contain 500 results of students together with the teachers view on each students and the intending student's career interest. The results of the students will form the input of the proposed system. The set of input dataset for the selected subjects will be in form of A1= Excellent, B2= Very Good, B3= Good, C4, C5, C6= Credit and D7, E8, F9= Fail. The crisp set of input data will be gathered and converted to a fuzzy set using fuzzy linguistic variables, fuzzy linguistic terms, through the process of Fuzzification and then construct a membership function for the sets of input. Gaussian Membership Function will be used to represents the degree of truth as an extension of valuation. This is represented using equation 1:

$$\mu_A(x, c, s, m) = \exp \left[-\frac{1}{2} \left| \frac{x-c}{s} \right|^m \right] \quad 1$$

where c, s represents the mean and standard deviation respectively, x represents width and m represents fuzzification factor.

The proposed system will make fuzzy inference system of five inputs and a single output. The inputs are deduced from the response that will be fed into the system (A1, B2, B3, (C4,C5,C6), (D7, E8, F9)). The inputs are represented as x_1, x_2, x_3, x_4, x_5 , and x_6 . The if-then rules for the first order Sugeno fuzzy model is given as:

Rule 1: If x_1 is A_1 and x_1 is B_1 then $y_1 = p_1x + q_1y + r_1$ 2

Rule 2: If x_2 is A_2 and x_2 is B_2 then $y_1 = p_2x + q_2y + r_2$ 3

Rule 3: If x_3 is A_3 and x_3 is B_3 then $y_1 = p_3x + q_3y + r_3$ 4

Rule 4: If x_4 is A_4 and x_4 is B_4 then $y_1 = p_4x + q_4y + r_4$ 5

Rule 5: If x_5 is A_5 and x_5 is B_5 then $y_1 = p_5x + q_5y + r_5$ 6

where x_1, x_2, x_3, x_4, x_5 and x_6 are the six subjects expected for each user to input into the system; A_1, A_2, A_3, A_4, A_5 and A_6 are also input values of grades from the six subjects, B_1, B_2, B_3, B_4, B_5 and B_6 are the careers in the database, $p_1 \dots p_6, q_1 \dots q_6$ and $r_1 \dots r_6$ are constants and y_1 is the output which is the best career recommendation.

The next stage is the defuzzification process, which is done by translating the output of the inference engine into crisp values which is mostly required for proper analysis and interpretation. This interface receives as input, the output of the inference engine which is a fuzzy set. The defuzzification process will be calculated by automatically loading the data and rules into the system.

$$z^* = \frac{\sum \mu(z) \cdot z}{\sum \mu(z)} \quad 7$$

where $\mu(z)$ was obtained as a result of the extraction process of the weight of membership, z the output value of each rule, while z^* represents the defuzzified output value which is the best career path recommended.

The student-side/interface pages (front-end) will be designed by using “Bootstrap 3” front-end framework that contains HTML5, CSS3 and JavaScript. For the back-end, PHP will be used to implement the Fuzzy Logic while MySQL will be used for working memory functional database.