An Analysis of Fuzzy set of Query Processing for Fuzzification

Dr. ASHISH KUMAR TAMRAKAR

Assistant Professor, RCST, DURG, Chhattisgarh, India

Abstract:
Natural Language Processing (NLP) is the electronic tactic to analyzing text that is depends on both a set of ideas and a set of technologies. Natural Language Processing (NLP) is a subfield of artificial intelligence and etymology it thinks about the issues of computerized era and comprehension of regular human dialects. Common dialect era frameworks change over data from PC databases into ordinary sounding human dialect, and normal dialect understanding frameworks change over specimens of human dialect into more formal representations that are less demanding for PC projects to control. The Fuzzy logic-based approach provides another alternative for effective natural language analysis. It is commonly recognized that many phenomena in natural language lend themselves to descriptions by Fuzzy mathematics, including Fuzzy sets, Fuzzy relations and Fuzzy logic. By defining a Fuzzy logic system and acquiring proper rules, we hope that difficulties in analysis of speech can be alleviated.
The goal of NLP is to enable communication between people and computers without resorting to memorization of complex commands and procedures.

Keywords: Fuzzy set, fuzzification, NLP, Fuzzy Logic.

Introduction:

Knowledge Acquisition for a Fuzzy Logic

Developing a powerful logic system requires large amounts of knowledge to be acquired either from knowledge experts or from automatic knowledge acquisition processes. We have developed a number of procedures to automatically extract information for a Fuzzy semantic logic.The fuzzification is a one important part of fuzzy logic. Fuzzy inference is the process of formulating the mapping from a given input to an output using fuzzy logic. The process of fuzzy inference involves all of the pieces that are described in the previous sections: membership functions, fuzzy logic operators, and if-then rules. The mapping then provides a basis from which decisions can be made, or patterns discerned.
The purpose of fuzzification is to map the inputs from a set of Database to values from 0 to 1 using a set of input membership functions. In the example shown in *Figure 1.1*, their are two inputs, x0 and y0 shown at the lower left corner. These inputs are mapped into fuzzy numbers by drawing a line up from the inputs to the input membership functions above and marking the

intersection point.

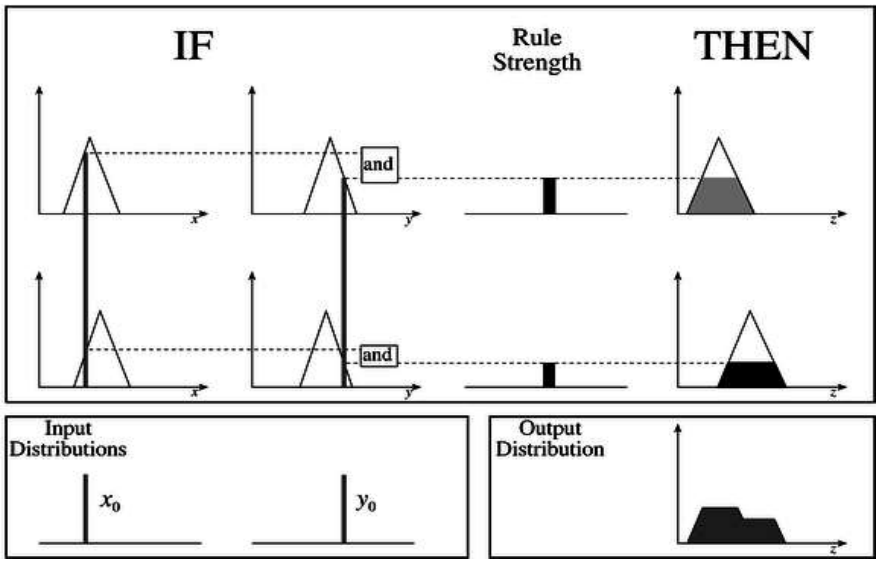

Fig. 1.1: A two input, two rule FIS with crisp inputs

These input membership functions can represent fuzzy concepts such as "best" or "better", "old" or "young", "good" or "better", etc. The membership functions could then represent "young"," better" amounts of data come from the database.

Review of Literature:

Human, when interacting with the database, want to make complex queries that have a lot of vagueness present in it. In real world applications we often need to test the queries based on fuzzy data. For example, some one can specify as find employee whose age is around 25 years old, find young person, find employee with good salary etc. A query is flexible if the databases contain imprecise and uncertain information or the query condition is imprecise and uncertain.

G.R., Bamnote. Abhijeet, R. Raipurkar.(2013),has proposed Structural Query Language (SQL) is very restrictive in data extraction. Human queries are rarely crisp which poses challenges in efficient answer formation and data retrieval.Classical SQL queries have remarkable capabilities in terms of data extraction and answer formation from information stored at widely dispersed databases. These are based on human perception which is grossly inexact and imprecise based on world knowledge. Integration of query languages with Fuzzy logic can increase their capability in data retrieval based on human perception. Query optimization is a difficult task in a distributed client/server environment as data location becomes a major factor. Fuzzy logic based query optimization in distributed database have an important impact on the performance of distributed query processing. The integration of a query processing subsystem into a distributed database management system with Fuzzy logic is used for analyzing query response time across fragmentations of global relations.

Fuzzy set of Query Processing for fuzzification:

After completion rules, the fuzzy in the fuzzy inference engine designing, membership functions are included.

- Fuzzy Inference Engine Designing: Most important application of fuzzy system is in uncertain issues. Whenany query is having imperfect information, fuzzy logic is a suitable tool for dealing with that query. So, first step of fuzzy inference engine designing is determination of input and output variables. After that membership function for all attributes will be designed.
- Input Attributes: various input attributes are :

Fuzzy Query : This input field is divided into four sets:-

- **1NF**- 1 Normal Form
- **2NF**-2 Normal Form
- **3NF**-3 Normal Form

Gender:This input field is divided into two sets:-

- Male
- Female

Age : This input field is divided into 4 fuzzy sets:-

- Youth
- Middle
- Mature
- Old

Input field	Normal forms	Fuzzy Set	Range
Age	1NF	Youth	< 18
		Middle	16-42
		Mature	38-58
		Old	>50
	2NF	Youth	< 18
		Middle	16-42
		Mature	38-58
		Old	>50
	3NF	Youth	< 18
		Middle	16-42
		Mature	38-58
		Old	>50

Table 1.1: Fuzzy set and Membership function of Age

$$\mu_{youth}(\alpha) = \begin{cases} 1 & \alpha \leq 16 \\ (18-\alpha)/7 & 16 < \alpha < 18 \end{cases}$$

$$\mu_{middle}(\alpha) = \begin{cases} 1 & 18 \leq \alpha \leq 38 \\ (42-\alpha)/7 & 38 \leq \alpha \leq 42 \\ (\alpha-16)/7 & 16 \leq \alpha \leq 18 \end{cases}$$

$$\mu_{mature}(\alpha) = \begin{cases} 1 & 42 \leq \alpha \leq 50 \\ (58-\alpha)/7 & 50 \leq \alpha \leq 55 \\ (\alpha-38)/7 & 38 \leq \alpha \leq 42 \end{cases}$$

$$\mu_{old}(\alpha) = \begin{cases} 1 & \alpha \geq 58 \\ (\alpha-50)/7 & 50 < \alpha < 58 \end{cases}$$

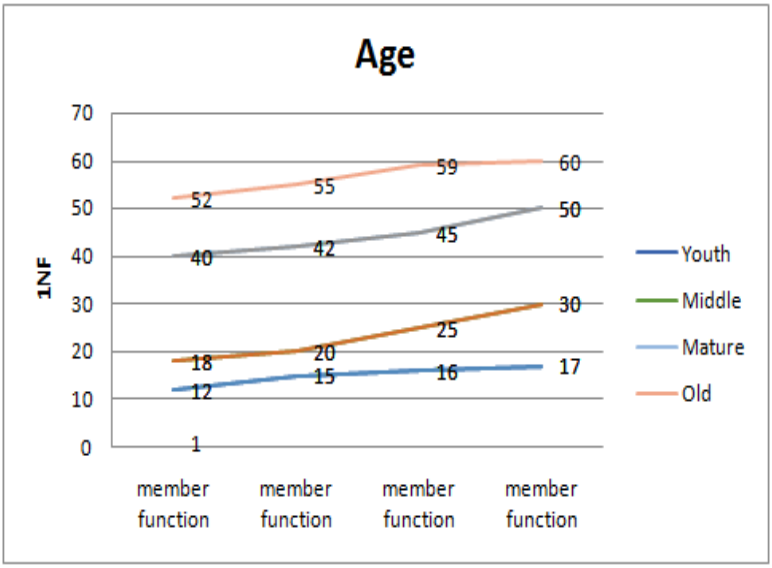

Fig. 1.1: Membership function of Age with Normal forms

Student-Attendance: In this field, 4 linguistic variables (fuzzy sets) (Poor,Average,Good,Excellent) areconsidered. In Table1.2, these fuzzy sets are defined. Membership functions will be shown in Fig.1.3.

Input field	Normal forms	Fuzzy Set	Range
Stu-Attendance		Poor	< 25
		Average	20-45

	1NF	Good	40-60
		Excellent	>55
	2NF	Poor	< 25
		Average	20-45
		Good	40-60
		Excellent	>55
	3NF	Poor	< 25
		Average	20-45
		Good	40-60
		Excellent	>55

Table 1.2: Fuzzy set andMembership function of Student Attendance

$$\mu_{poor}(\alpha) = \begin{Bmatrix} 1 & \alpha \leq 20 \\ (25-\alpha)/7 & 20 < \alpha < 25 \end{Bmatrix}$$

$$\mu_{average}(\alpha) = \begin{Bmatrix} 1 & 25 \leq \alpha \leq 40 \\ (46-\alpha)/7 & 40 \leq \alpha \leq 45 \\ (\alpha-20)/7 & 20 \leq \alpha \leq 25 \end{Bmatrix}$$

$$\mu_{good}(\alpha) = \begin{Bmatrix} 1 & 45 \leq \alpha \leq 55 \\ (60-\alpha)/7 & 55 \leq \alpha \leq 60 \\ (\alpha-40)/7 & 40 \leq \alpha \leq 45 \end{Bmatrix}$$

$$\mu_{excellent}(\alpha) = \begin{Bmatrix} 1 & \alpha \geq 60 \\ (\alpha-55)/7 & 55 < \alpha < 60 \end{Bmatrix}$$

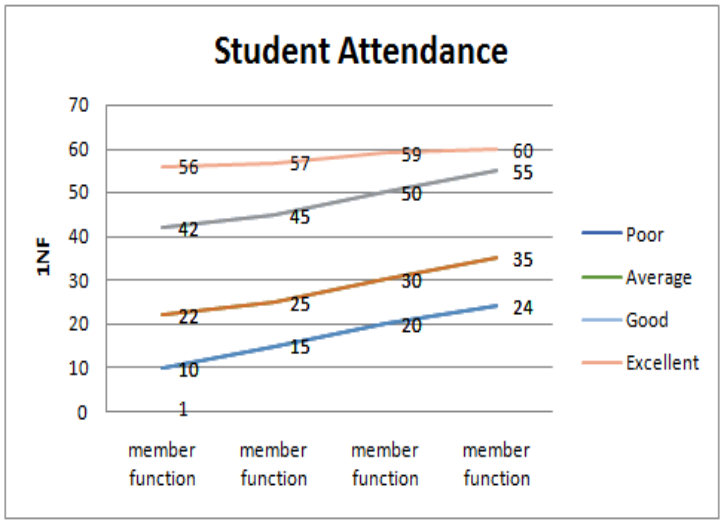

Fig. 1.3: Membership function of Stu- Attendance with Normal forms

Regularity: ---Regularity field has 3 fuzzy sets (Poor, Good, Better and Best). These fuzzy sets havebeen shown in Table 1.3. and membership functions are shown in Fig 1.4

Input field	Normal forms	Fuzzy Set	Range
Regularity	1NF	Poor	45-65
		Good	60-72
		Better	67-80
		Best	>85
	2NF	Poor	45-65
		Good	60-72
		Better	67-80
		Best	>85
	3NF	Poor	45-65
		Good	60-72
		Better	67-80
		Best	>85

Table 1.3: Fuzzy set andMembership function of Regularity

$$\mu_{poor}(\alpha) = \begin{cases} 1 & 65 \leq \alpha \leq 60 \\ (65-\alpha)/7 & 60 \leq \alpha \leq 65 \\ (\alpha-45)/7 & 45 \leq \alpha \leq 65 \end{cases}$$

$$\mu_{good}(\alpha) = \begin{cases} 1 & 63 \leq \alpha \leq 66 \\ (72-\alpha)/7 & 66 \leq \alpha \leq 72 \\ (\alpha-60)/7 & 60 \leq \alpha \leq 63 \end{cases}$$

$$\mu_{better}(\alpha) = \begin{cases} 1 & 70 \leq \alpha \leq 79 \\ (80-\alpha)/7 & 79 \leq \alpha \leq 80 \\ (\alpha-67)/7 & 67 \leq \alpha \leq 70 \end{cases}$$

$$\mu_{best}(\alpha) = \begin{cases} 1 & \alpha \geq 80 \\ (\alpha-85)/7 & 80 < \alpha < 85 \end{cases}$$

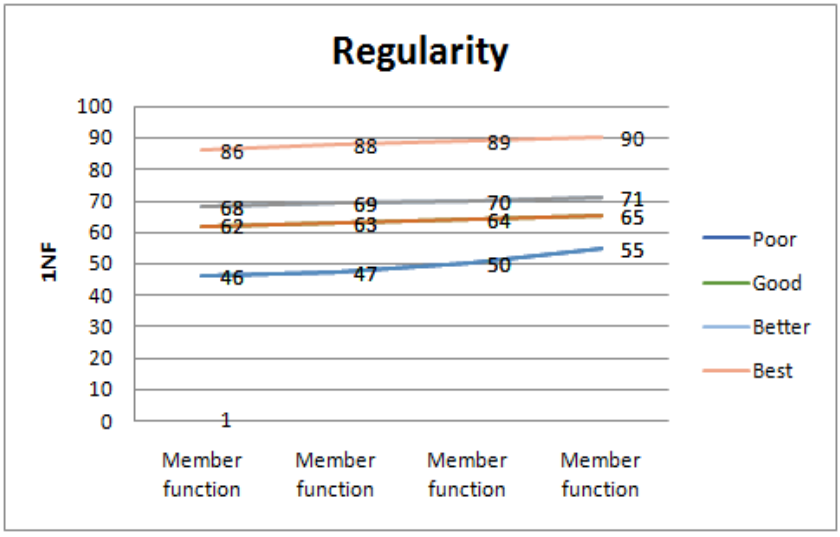

Fig. 1.4: Membership function of Regularity with Normal forms

Gradpoint:-It has 3 fuzzy sets (Low, Middle and High). These fuzzy sets have been shown in Table 3.4.and Membership functions are shown in Fig 1.5.

Input field	Normal forms	Fuzzy Set	Range
Gradpoint	1NF	Low	<5
		Middle	2-7
		High	>6
	2NF	Low	<5
		Middle	2-7
		High	>6
	3NF	Low	<5
		Middle	2-7
		High	>6

Table 1.4: Fuzzy set andMembership function of Gradpoint

$$\mu_{low}(\alpha) = \begin{cases} 1 & \alpha \leq 2 \\ (3-\alpha)/7 & 2 < \alpha < 3 \end{cases}$$

$$\mu_{middle}(\alpha) = \begin{cases} 1 & 3 \leq \alpha \leq 5 \\ (7-\alpha)/7 & 5 \leq \alpha \leq 7 \\ (\alpha-2)/7 & 2 \leq \alpha \leq 3 \end{cases}$$

$$\mu_{high}(\alpha) = \begin{cases} 1 & \alpha \leq 7 \\ (\alpha-5)/7 & 5 < \alpha < 7 \end{cases}$$

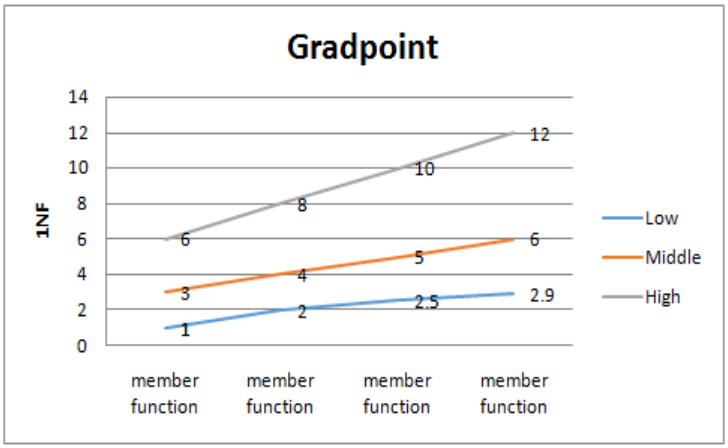

Fig. 1.5: Membership function of Grad-point with Normal forms

Skill point:-It has 3 fuzzy sets (good, better and best). These fuzzy sets have been shown in Table 1.5. Membership functions are shown in Fig.1.6.

Input field	Normal forms	Fuzzy Set	Range
Skill Point	1NF	Good	48-64
		Better	61-70
		Best	67-80
	2NF	Good	48-64
		Better	61-70
		Best	67-80
	3NF	Good	48-64
		Better	61-70
		Best	67-80

Table 1.5: Fuzzy set andMembership function of Skill point

$$\mu_{good}(\alpha) = \begin{cases} 1 & 64 \leq \alpha \leq 61 \\ (64-\alpha)/7 & 61 \leq \alpha \leq 64 \\ (\alpha-48)/7 & 48 \leq \alpha \leq 64 \end{cases}$$

$$\mu_{better}(\alpha) = \begin{cases} 1 & 63 \leq \alpha \leq 66 \\ (70-\alpha)/7 & 64 \leq \alpha \leq 70 \\ (\alpha-61)/7 & 61 \leq \alpha \leq 63 \end{cases}$$

$$\mu_{best}(\alpha) = \begin{cases} 1 & 70 \leq \alpha \leq 79 \\ (80-\alpha)/7 & 79 \leq \alpha \leq 82 \\ (\alpha-67)/7 & 67 \leq \alpha \leq 70 \end{cases}$$

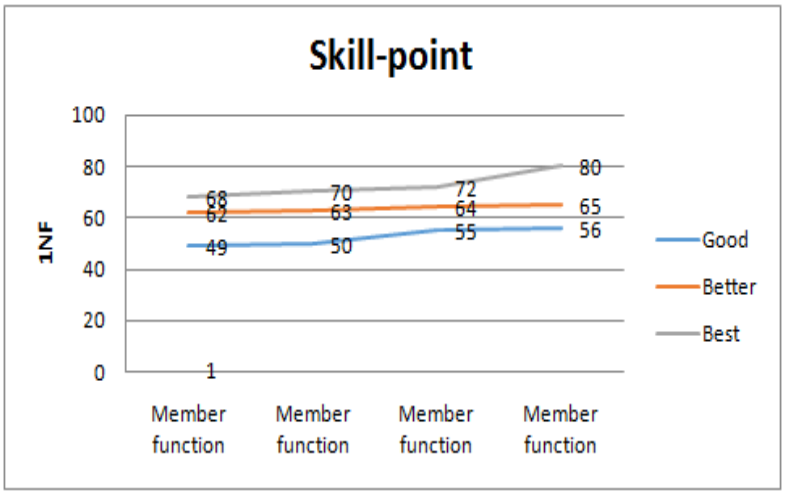

Fig. 1.6: Membership function of Skill-point with Normal forms

Punctuality: -It has 3 fuzzy sets (Low, Middle, High). These fuzzy sets have been shown in Table 1.6. Membership functions are shown in Fig.1.7.

Fuzzy sets are:-

- Low
- Middle
- High

With the help of fuzzy sets, we can create some member function under the given range. After that generate the graph according to members function. We can use many member functions.

Input field	Normal forms	Fuzzy Set	Range
Punctuality	1NF	Low	<7
		Middle	2-9
		High	>8
	2NF	Low	<7
		Middle	2-9
		High	>8
	3NF	Low	<7
		Middle	2-9
		High	>8

Table 1.6: Fuzzy set andMembership function of Punctuality

$$\mu_{low}(\alpha) = \begin{Bmatrix} 1 & \alpha \leq 2 \\ (5-\alpha)/7 & 2 < \alpha < 5 \end{Bmatrix}$$

$$\mu_{middle}(\alpha) = \begin{Bmatrix} 1 & 5 \leq \alpha \leq 6 \\ (7-\alpha)/7 & 6 \leq \alpha \leq 7 \\ (\alpha-2)/7 & 2 \leq \alpha \leq 5 \end{Bmatrix}$$

$$\mu_{high}(\alpha) = \begin{Bmatrix} 1 & \alpha \leq 8 \\ (\alpha-6)/7 & 6 < \alpha < 7 \end{Bmatrix}$$

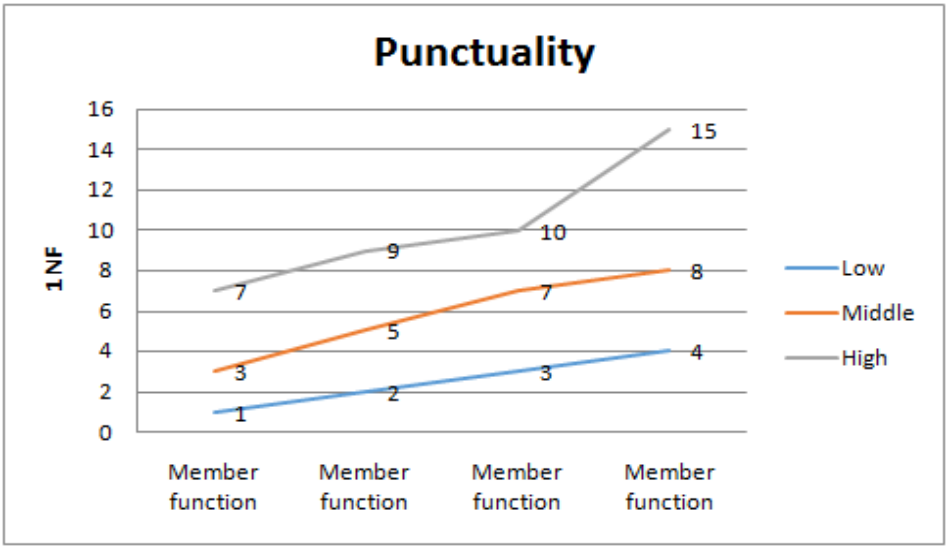

Fig. 1.7:Membership function of Punctuality with Normal forms

Proposed Method

The conventional query in relational database management system is not capable of satisfying the needs for dealing with queries which are in natural language. After going through different literature survey we have concluded that the earlier systems were not that much vital to as per the user's prospect. It condensed the user part of recalling the syntax but not to that amount. The system only provided search interface for only partial database due to that user was obligatory to input queries according to that database.

We have proposed Fuzzy basedNatural Language Processing swhich uses fuzzy logic for query processing for complex queries. We have implemented a software tool which can execute complex query on natural language and we can fetch the information from the database very effortlessly.The main aspect of fuzzy logic is that it is able to deal with imprecise linguistic information which makes it attractive for automatic text summarization from the mathematical viewpoint; complex-valued fuzzy sets are natural.

The traditional 2-valued logic is well equipped to represent:

- Situations when we are completely sure that a given Statement is true.
- Situations when we are completely sure that a given Statement is false.

Discussion:

The Fuzzy Query Processing System is based on Query solution along with a Complex structure of Query Optimization which is very tough to understand by common people. Fetching information in easy way is the main need of developed organization to support new resources and tool. Also learning language is the main need of literate organization in user friendly approach which is not also implemented in previous NLP research program. The Different Existing System performs the work on Complex structures and they cannot access data from the database by Simply Human Sounding Language. RDBMS performance will be best for join multiple tables together in a single SQL statement, rather than disperse the tables across multiple statements. The proposed Fuzzy Query Processing System is extremely supported to access information in a user friendly interface. It increases knowledge and information of common people from all types of database.

Fuzzy Based Query Processing System can able to fetch the information from database by two ways, first by simple Natural Query and second by click event. In this chapter, the goal of the system is clear. Different snapshots are attached for Fuzzy Based Query Processing System using NLP.

Conclusion:

Fuzzy Based Query Processing Language is a powerful tool for virtually interface provide in SQL database system. This Fuzzy Based Query Processing Language is currently used to handling simple Queries with standard join conditions. This all also support the SQL Queries for optimization. The optimization of Query from one single and simple statement is desirable to

fetch more and more knowledge to understanding the language in easy way. The proposed system is very helpful to recognize the Query in term of Simple Natural Language related to common human being communication. This system is useful for those people and organization who working in the database system for query optimization and finally it's give the result in the form of database Queries and specially those users, who doesn't have good skill knowledge of database system. This work helps users to access data from database in easily manner. This proposed system is very efficient research to encourage the research work in Fuzzy Based Query Processing and to support each type of communication in Natural Languages.

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