

Khulna University of Engineering & Technology (KUET)  
Department of Computer Science and Engineering  
CSE 4109: Artificial Intelligence (Topic: Fuzzy Expert Systems)  
Instructor: Prof Dr. M.M.A. Hashem

## **Assignment Title: Fuzzy Logic-Based Room Temperature Control**

**Objective:** To design a fuzzy inference system (FIS) that controls a fan or air conditioner speed based on room temperature and humidity.

**Problem Statement:** You are tasked to develop a fuzzy logic system that adjusts fan speed in a room depending on two input variables:

1. **Temperature** (Low, Medium, High)
2. **Humidity** (Dry, Comfortable, Humid)

The **output** is:

- **Fan Speed** (Slow, Medium, Fast).

### **Tasks for Students:**

1. **Define linguistic variables and membership functions** for temperature, humidity, and fan speed.
  - o e.g., Temperature: Low (0–15°C), Medium (15–30°C), High (30–45°C).
  - o e.g., Humidity: Dry (0–30%), Comfortable (30–60%), Humid (60–100%).
  - o Fan Speed: Slow (0–40), Medium (40–70), Fast (70–100).
2. **Construct fuzzy rules** (e.g., If temperature is high AND humidity is humid THEN fan speed is fast).
3. **Implement the fuzzy system** using any tool (C/C++, Python with scikit-fuzzy, or even manual calculation).
4. **Test the system** with at least 5 input cases and record the output fan speed.
5. **Write a short report** (2–3 pages) describing membership functions, rule base, and test results.



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**Assignment 1: Fuzzy Room Temperature Control**

**Objective:**

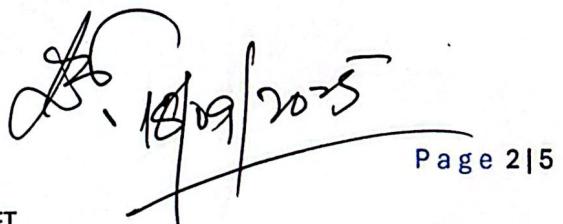
Design a fuzzy system to control fan speed based on room temperature and humidity.

**Inputs & Outputs:**

- Inputs:
  - Temperature (Low, Medium, High)
  - Humidity (Dry, Comfortable, Humid)
- Output:
  - Fan Speed (Slow, Medium, Fast)

**Tasks:**

1. Define membership functions for temperature, humidity, and fan speed.
2. Construct at least 6 fuzzy rules (e.g., If temperature is high AND humidity is humid THEN fan speed is fast).
3. Implement the system in C/C++/MATLAB/Python or manually.
4. Test with 5 input cases.
5. Submit a short report (2–3 pages).



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**Assignment 2: Fuzzy Traffic Light Control**

**Objective:**

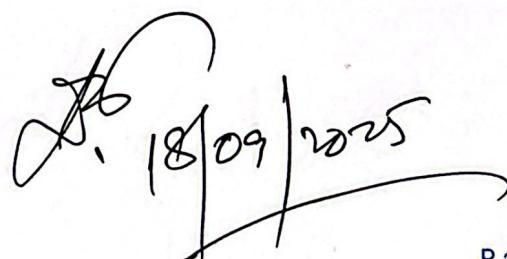
Control traffic light timing dynamically using fuzzy logic.

**Inputs & Outputs:**

- Inputs:
  - Vehicle Density (Low, Medium, High)
  - Waiting Time (Short, Medium, Long)
- Output:
  - Green Light Duration (Short, Medium, Long)

**Tasks:**

1. Define fuzzy sets for inputs and output.
2. Develop at least 6 rules (e.g., If density is high AND waiting time is long THEN duration is long).
3. Simulate different traffic conditions.
4. Document results.



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**Assignment 3: Fuzzy Student Performance Evaluation**

**Objective:**

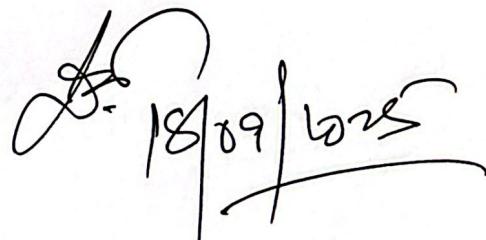
Design a fuzzy evaluation system to assess student performance.

**Inputs & Outputs:**

- Inputs:
  - Exam Score (Poor, Average, Good)
  - Class Participation (Low, Medium, High)
  - Assignment Quality (Low, Medium, High)
- Output:
  - Performance (Weak, Moderate, Strong)

**Tasks:**

1. Define fuzzy sets for inputs and output.
2. Create at least 9 rules (covering all major cases).
3. Test the system on 5 sample students.
4. Write a summary report.



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**Assignment 4: Fuzzy Washing Machine Controller**

**Objective:**

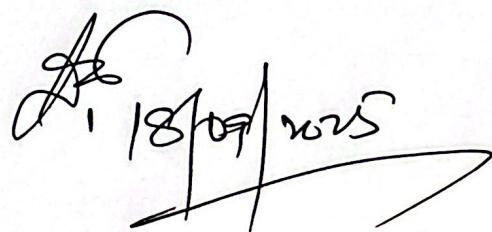
Design a fuzzy system that controls wash time based on clothes condition.

**Inputs & Outputs:**

- Inputs:
  - Dirtiness (Low, Medium, High)
  - Load Size (Small, Medium, Large)
- Output:
  - Wash Time (Short, Medium, Long)

**Tasks:**

1. Define fuzzy sets for dirtiness, load size, and wash time.
2. Create **at least 6 fuzzy rules**.
3. Simulate and test with **5 cases**.
4. Submit findings in a report.



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