Fuzzy Expert System Project Assessment

In this project, you will be building a Fuzzy Expert System for a given problem using the `scikit-fuzzy` library in Python.

Requirements

1. Problem Statement: You will be provided with a problem statement that describes a real-world problem. You will need to understand the problem statement and come up with a suitable Fuzzy Logic System to solve the problem.

2. Fuzzy Sets: Define at least three Fuzzy Sets for each input variable of the problem. Each Fuzzy Set should have a clear and concise definition.

3. Membership Functions: Design the membership functions for each Fuzzy Set. Depending on your use case, you can choose any membership function type from the `scikit-fuzzy` library, such as triangular, trapezoidal, Gaussian, etc. For each membership function, provide a clear and concise definition, as well as a graphical representation.

4. Rule Base: Create a Rule Base to map the inputs to the output. The Rule Base should have **at least** 5 rules. Each rule should have a clear and concise definition, as well as a graphical representation.

5. Inference Engine: Implement the inference engine to evaluate the fuzzy rules and determine the output. Depending on your use case, you can use any inference method from the `scikit-fuzzy` library, such as Mamdani, Larsen, etc. Provide a dynamic graphical representation for the inference steps.

6. Defuzzification: Implement the defuzzification method to determine the final output of the Fuzzy Expert System. Depending on your use case, you can choose any defuzzification method from the `scikit-fuzzy` library, such as centroid, bisector, etc.

7. User Interface: Develop a simple user interface that allows users to set the inputs and check the output of the developed system. (Extra)

8. Testing and Validation: Test and validate your Fuzzy Expert System using a suitable dataset. The dataset should contain a set of input values and the corresponding expected output. You should provide a clear and concise description of your testing methodology, as well as the results of your testing and evaluate its accuracy and performance. (Extra)

Documentation:

1. Document the system's design, implementation, and testing procedures.

2. Include the set of rules and the knowledge base used in the system.

3. Provide instructions for running the system and any dependencies.

4. Include a user manual for the system.

Organizational notes:

- Each group should consist of **three - four** students **from the same section.**
- **Students from different sections will not be interviewed, and ether way, their project grade will be zero**
- Each group would implement **one** problem statement that **matches** their group number.
- Contact your teacher if your group number is not listed, or if there is any issue related to the groups.
- The final groups are listed in pages 4-5**, any change cancels the project assessment.**
- Each implemented problem should have **at least** three inputs and one output.
- You should provide the resources used with the report.
- You should list the authoritative references that you depended on in your implementation.

Problem Statements:

1. A Fuzzy Expert System for predicting the energy consumption of a building based on the time of day, temperature, and occupancy.

2. A Fuzzy Logic System for predicting the likelihood of a patient having a heart attack based on their age, gender, and medical conditions.

3. A Fuzzy Logic System for predicting the outcome of a cricket match based on the team's performance, players' statistics, and weather conditions.

4. A Fuzzy Logic System for controlling the water flow in a canal system based on the water level, inflow rate, and outflow rate.

5. A Fuzzy Expert System for predicting the likelihood of a customer buying a product based on their age, income, and purchase history.

6. A Fuzzy Expert System for diagnosing a patient's illness based on their symptoms, age, and medical history.

7. A Fuzzy Logic System for recommending a suitable outfit to a customer based on their body type, style, and occasion.

8. A Fuzzy Expert System for recommending a restaurant based on the cuisine, price, and location.

9. A Fuzzy Expert System for predicting the stock price of a company based on its financial indicators, such as revenue, profit, and debt.

10. A Fuzzy Logic System for diagnosing the health condition of a battery based on its voltage, current, and temperature.

11. A Fuzzy Expert System for controlling the braking system of a car based on the speed, distance to the obstacle, and road conditions.

12. A Fuzzy Expert System for optimizing the traffic flow at an intersection based on the number of cars, time of day, and weather conditions.

13. A Fuzzy Expert System for diagnosing the health condition of a plant based on its soil moisture, light intensity, and temperature.

14. A Fuzzy Expert System for controlling the water level in a tank based on the inflow rate, outflow rate, and tank size.

15. A Fuzzy Expert System for classifying the severity of a patient's heart disease based on their symptoms, age, and medical history.

16. A Fuzzy Expert System for predicting the outcome of a football match based on the team's performance, players' injuries, and weather conditions.

17. A Fuzzy Logic System for controlling the air conditioning system in a building based on the number of occupants, temperature, and humidity.

18. A Fuzzy Expert System for recommending a movie to a user based on their age, gender, and movie preferences.

19. A Fuzzy Expert System for optimizing the production process of a manufacturing plant based on the machine speed, raw material availability, and energy cost.

20. A Fuzzy Logic System for recommending a suitable workout routine to a user based on their fitness level, age, and goals.

21. A Fuzzy Logic System for predicting the likelihood of a patient developing a specific disease based on their family history, lifestyle, and medical conditions.

22. A Fuzzy Logic System for predicting the weather condition of a location based on historical data and current atmospheric conditions.

23. A Fuzzy Logic System for diagnosing a patient's mental health condition based on their behavior, speech, and medical history.

24. A Fuzzy Logic System for predicting the likelihood of a customer defaulting on a loan based on their credit score, income, and financial history.

25. A Fuzzy Logic System for predicting the price of a house based on its size, location, and amenities.

26. A Fuzzy Logic System for recommending a suitable diet plan to a user based on their weight, age, and fitness goals.

27. A Fuzzy Logic System for classifying the sentiment of a text message based on the choice of words, emoticons, and grammar.

28. A Fuzzy Logic System for controlling the speed of an elevator based on the number of passengers, floor requests, and time of day.

29. A Fuzzy Logic System for recommending a suitable hairstyle to a customer based on their face shape, hair type, and preferences.

Bassel's Groups:

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رقم المجموعة	الأول	الثاني	الثالث	الرابع
1	قصي برو	عمار هنيدي	محمد ابو نقطة	عبد الجبار البرازي
2	يامن التكريتي	مرام الصفدي	سارية شربجي	محمد الخياط
3	عبد الرحمن نضال الحمصي	محمد مجد عبد السلام	عبد الله معتوق	نور الهدى عضل
4	هادي الحلبي	فاروق خانكان	يزن بو ترابه	هادي صقر
5	أسامه بازو	حمزه المحروس	عليا المسوتي	ياسين عبد المهدي
6	أحمد بسام عبود	أبي حافظ المحيثاوي	أحمد بهجات أبو عدس	
7	عمرو أدهم نصر	ليلى أدهم شهاب أبو فخر	أحمد يحيى عشماوي	
8	مايا عساف	هناء الهوشان	جودت قدور	
9	احمد ابو محمود	كنان ابو زين الدين	حيدر الصوص	
10	علي اومري	محمد رحال	شريف عثمان	
11	عمر علوش	فصيح الظاهر	محمد بشر الحمصي	
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رقم المجموعة	الأول	الثاني	الثالث	الرابع
1	قيس جربوع	ادوارد القرا	وسام الياس	كريم ريمي قصوعة
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3	فراس منير طيب	راما محمد يزبك	امامة جهاد عوير	امل حسن رجب
4	بتول الربداوي	بتول كيوان	تسنيم الفوال	ديما رمضان
5	علاء نخلة	محمد خضر محي الدين	غيث الرز	زهير تللو
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7	أغيد بقله	اية مراد	محمد كاتبة	عبد العزيز تللو
8	عبد الرؤوف حسحس	طوني بطرس	عبد الله الزبداني	عثمان دياربكرلي
9	نور الهدى أوضة باشي	سارة باسم الحوراني	رزان الحريري	فاطمة حيدر
10	شام العفير	سارة جمعه	بشار الخليل	كرم الفروان
11	فرح عياش	عمر النونو	هراير ديربيدروسيان	ماريان ديب
12	نيرمين محمد هدلا	حسن علي الزعبي	زاكروز نجم الدين اسماعيل	محمد عبد المجيد الاحمد
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17	كرم فراس الحمش	عز الدين احسان الحنبرجي	احمد عادل خضور	
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20	علي العبد	سليمان ونوس	حسن مرعي	
21	اسماعيل الرحمو	دانة عثمان	دانا هيبان	
22	عبدالرحمن الذياب	هاشم الحكيم	راما الحسين	
23	عرين حسين الهاجر	سكينة محمد الخليل	ربى خالد حمد	
24	اوس النصار	لجين طحينة	علا الزعبية	
25	نهى نزار شق	محمد محمد وليد عيساوي	علا محمد سليم مرتضى	
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27	لارا رياض فرعون	عيسى سامي الحجل	مظهر دريد جحجاح	
28	نابغ صايغ	فرح صايغ	مناف صعوب	
29	يارا الكاكا	هبة الله موصلي	ميساء عبد الحي	
30	مجد القائد	ماريا رزق	ميشيل غيث	
31	ايه المصري	ليلى عباس	هبة الله شكو	
32	علاء مرعي	غازي عطوه	ياسر زيدان	
33	محمد علي سعده	عبد الفتاح كناكرية		