Manual Fuzzy Calculation Example

1. Input Values:

   GPA: 2.15
   CCA: 68
   Attendance: 0.82
   Midterm: 78
   FinalExam: 85

2. Fuzzification Results:

   GPA: {'Low': 0.2500000000000011, 'Medium': 0.7499999999999989, 'High': 0}
   CCA: {'Low': 0, 'Medium': 1, 'High': 0}
   Attendance: {'Low': 0, 'Medium': 1, 'High': 0}
   Midterm: {'Low': 0, 'Medium': 1, 'High': 0}
   FinalExam: {'Low': 0, 'Medium': 0.5, 'High': 0.5}

3. Rule Firing Strengths:

   R1: Poor (firing=0.000)
   R2: Satisfactory (firing=0.500)
   R3: Excellent (firing=0.000)
   R4: Good (firing=0.000)
   R5: Needs Improvement (firing=0.000)

4. Defuzzification (Tsukamoto):

   Rumus: (Σ (α_i * z_i)) / (Σ α_i)
   Satisfactory: α=0.500, z=3.500, α*z=1.750
   Defuzzification value = 1.750 / 0.500 = 3.500

Final Prediction: Good

Defuzzification Value: 3.500

Penjelasan & Rumus Fuzzy Tsukamoto:

Setiap rule menghasilkan output crisp z_i dengan invers fungsi keanggotaan output.
Defuzzifikasi Tsukamoto:

$$z = (\Sigma (\alpha_i * z_i)) / (\Sigma \alpha_i)$$

Contoh invers output (monoton):

Poor: $z = 2 - \alpha$
Needs Improvement: $z = 3 - \alpha$
Satisfactory: $z = 4 - \alpha$
Good: $z = 4 + \alpha$
Excellent: $z = 5 + \alpha$

GPA Membership Function: