CS-663 Assignment-1 Report

Vetcha Gnana Mahesh
22B0949

1 Question 5

1.1 Part B

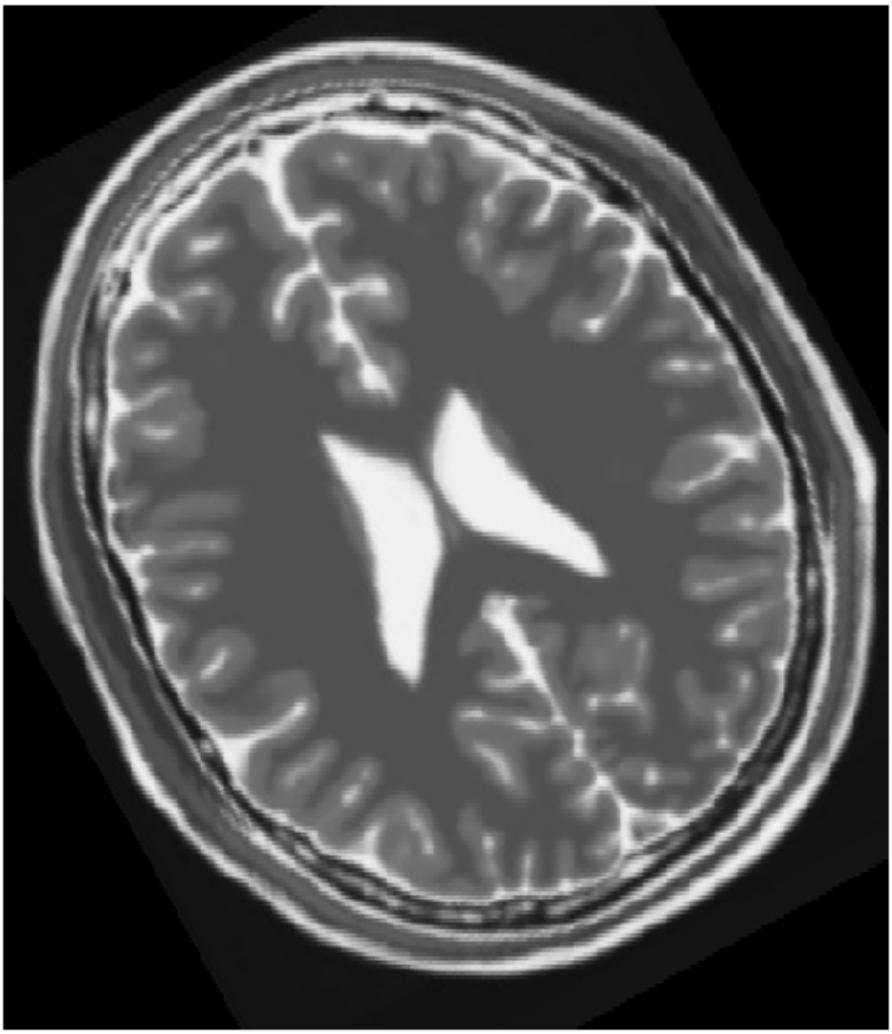

Figure 1: Rotated Image

1.2 Part C

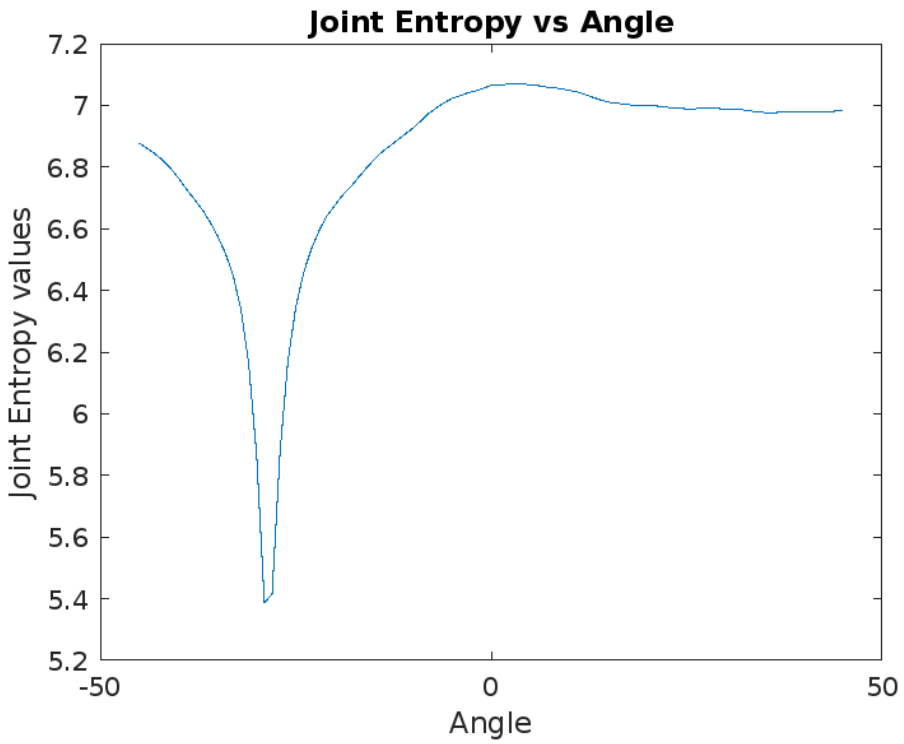

Figure 2: Je vs Angle

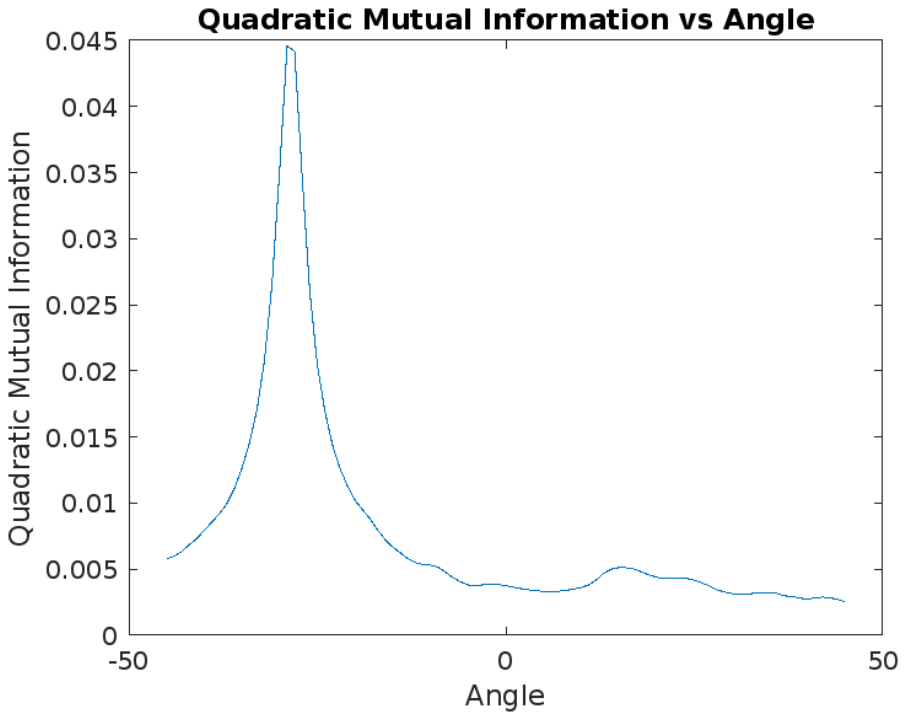

Figure 3: qmi vs angle

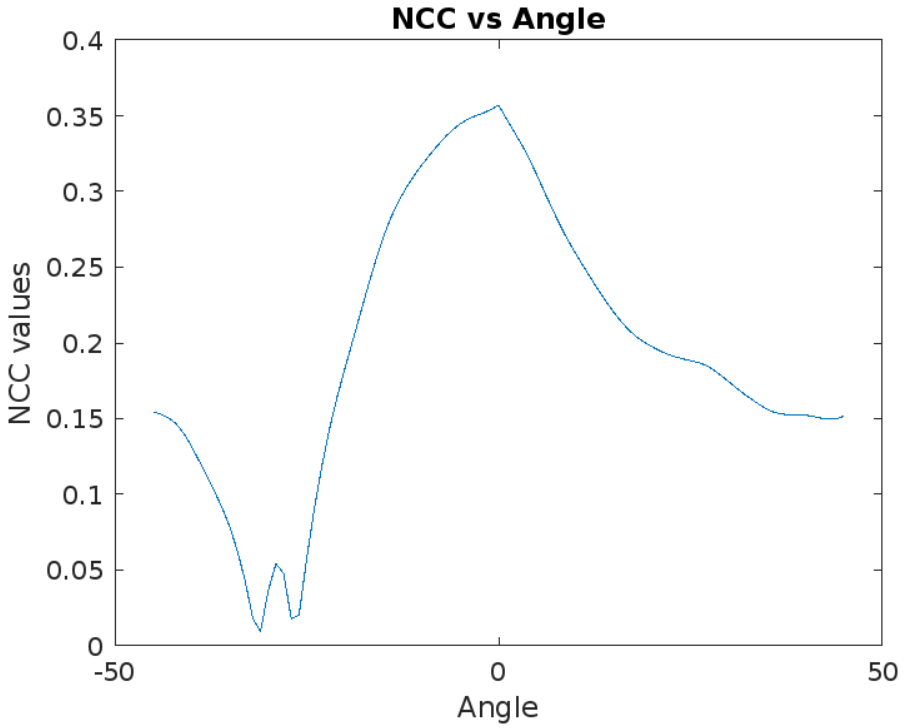

Figure 4: ncc vs angle

1.3 Part D

Optimal rotation between J3 and J1 for the three measures are:

- Normalized Cross-Correlation (NCC) - 0^o which is the global maximum.
- Joint Entropy (JE) - -29^o which is the global minimum.
- Quadratic Mutual Information (QMI) - -29^o which is the global minimum.

Clearly Joint Entropy and Quadratic Mutual Information gives the best results compared to Normalized Cross-Correlation

1.4 Part E

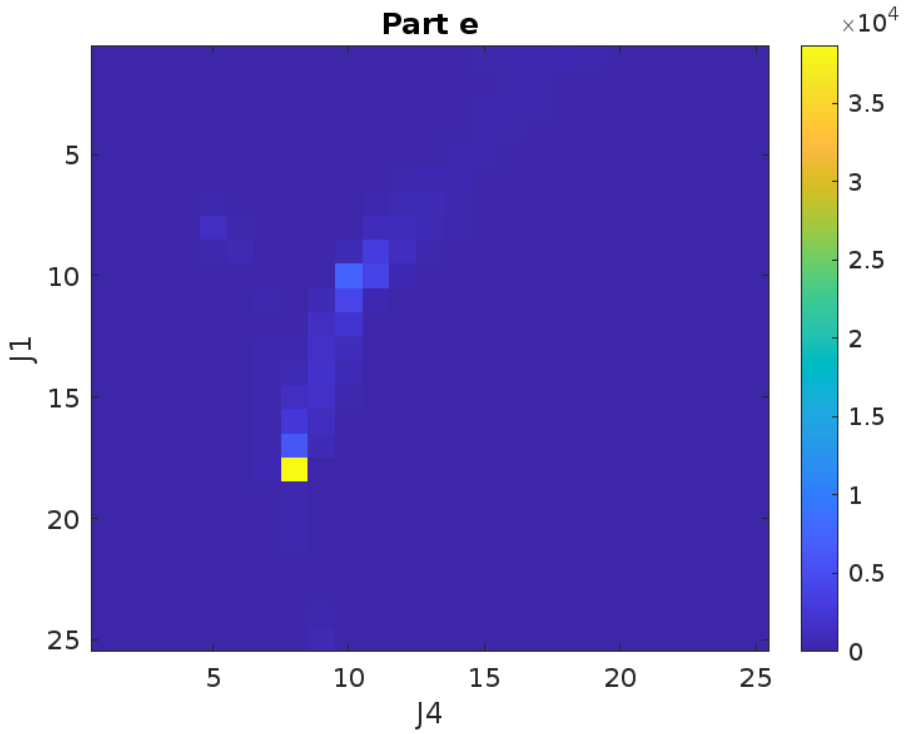

Figure 5: Histogram

1.5 Part F

Quadratic Mutual Information (QMI) measures the dependency between two random variables I_1 and I_2 by quantifying how much their joint probability distribution deviates from the product of their marginal distributions. The formula is:

$$\sum_{i1}\sum_{i2}(p_{I_1I_2}(i_1,i_2) - p_{I_1}(i_1)p_{I_2}(i_2))^2$$

I_1 and I_2 are independent if and only if $p_{I_1I_2}(i_1,i_2) = p_{I_1}(i_1)p_{I_2}(i_2)$ where QMI will be zero, hence higher QMI indicates a stronger dependence between I_1 and I_2.