Mech306, Tutorial 4
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Q1:

Figure 1: Hand Calculation for Quadratic Coefficients Using Least Square Method
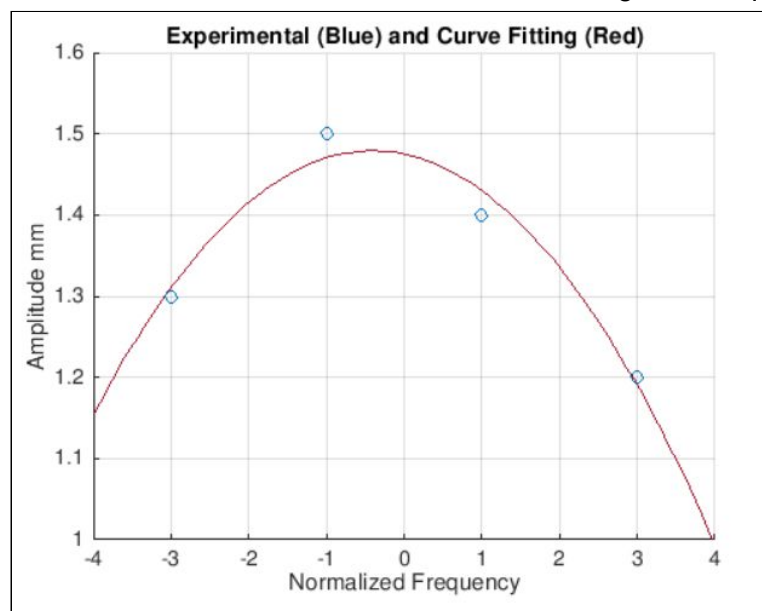

Figure 2: Normalized Frequency vs Amplitude

Matlab outputs [A B C] = [1.4750 -0.0200 -0.0250], different from [0.5296 -0.0080 4.2736]. This is likely because MATLAB uses a method slightly different from least square method. Natural frequency is at the peak of the curve, where the value is [-0.3636 1.4750]. By reverse-normalizing -0.3636, we can get 33.5Hz as natural frequency.
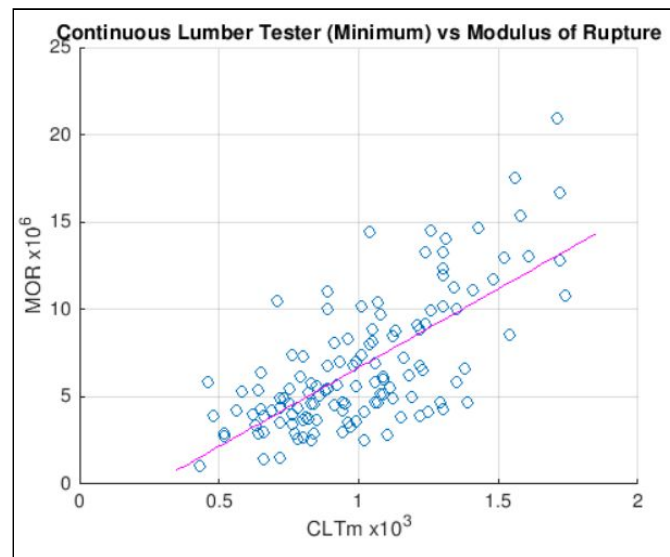
Q2:

Figure 3: CLTm vs MOR

Fit Equation: MOR = -2.3545 + 9.0208*CLTm
r^2: 0.496 -> r: 0.704
Sigma: 2.6595

According to Appendix C of JRT, where N = 131 and r0 = 0.704, there is less than 0.05%
probability for r to exceed the value we have calculated from MATLAB. Therefore, the plotted
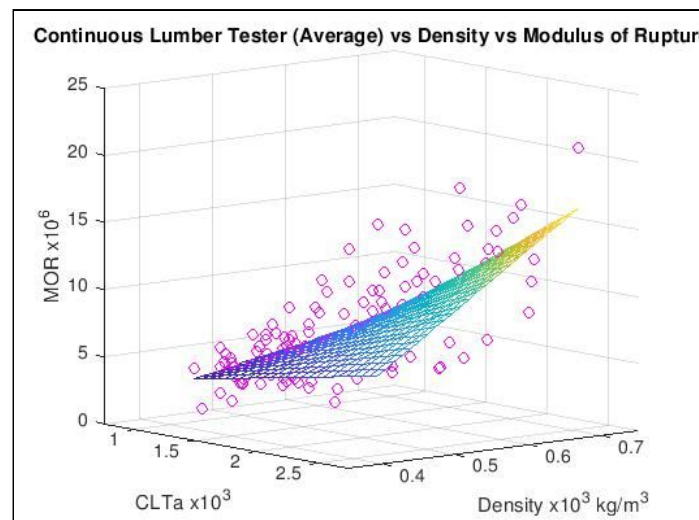correlation is highly likely to exist.

Figure 4: CLTa vs Density vs MOR

Fit Equation: MOR = 4.6792 – 6.1082*CLTa – 7.7193*(Density) + 18.3582*CLTa*(Density)
r^2: 0.548 -> r: 0.740
Sigma: 2.5383

Since MOEj is not an industry standard as the instruction has mentioned, CLTa vs Density vs MOR was plotted instead. Appendix C only over cases with two sets of data, we can't use it for Figure 4. However, we can visually make generalizations.
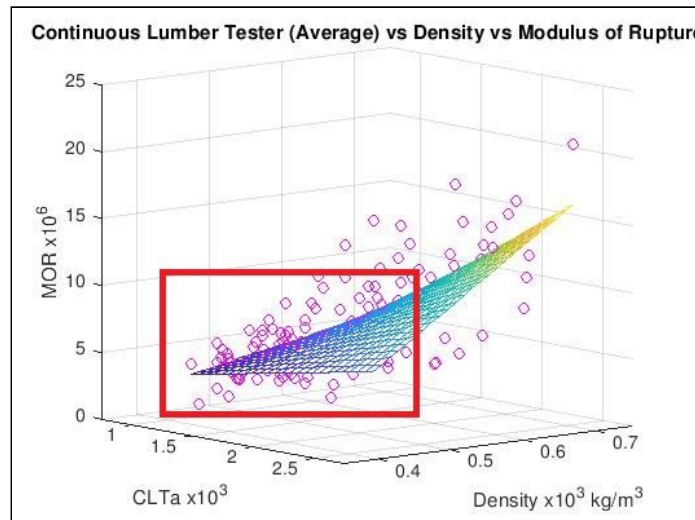

Figure 5: Visual Generalization

While there is a cluster of points around the red-boxed area, the fit is loose everywhere else. Therefore we can conclude that there is only a medium to low correlation between the datasets.