Modeling Robotic Surgery Predictions: Write-Up

Meftah, Morteza M.D,; Waren, Daniel M.D; Bosco, Joseph A. IV;
Di Gangi, Catherine; Watson, Cody Ph.D

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Top: Pre and post-op data displayed on a scatterchart of Joint Line Obliquity (JLO) and anterior Hip Knee Alignment (aHKA)
Bottom: Average Pre and post-op alignment grouped by pre-operative aHKA values. The average change from pre-op to post-op is shown.

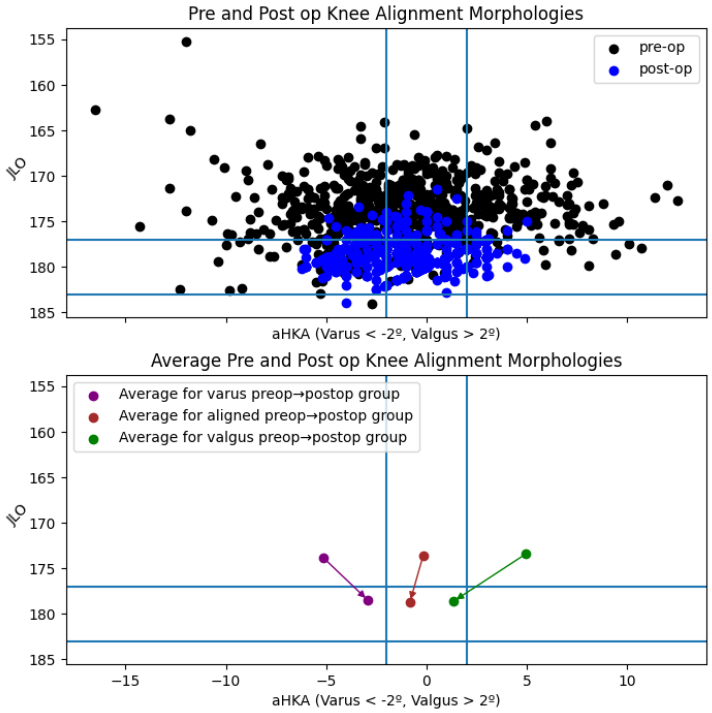

Figure 1: These are the averages of the clusters - See CPAK reference

First, the pre-operative data was standardized using the Z-score method. Then, the pre-operative alignments were clustered using the K-means algorithm.
Bottom Left: Arrows are drawn for each pre and post-operative pair (one pair per case).
Bottom Right: Averages are taken for each cluser and the change from pre-op to post-op is shown.

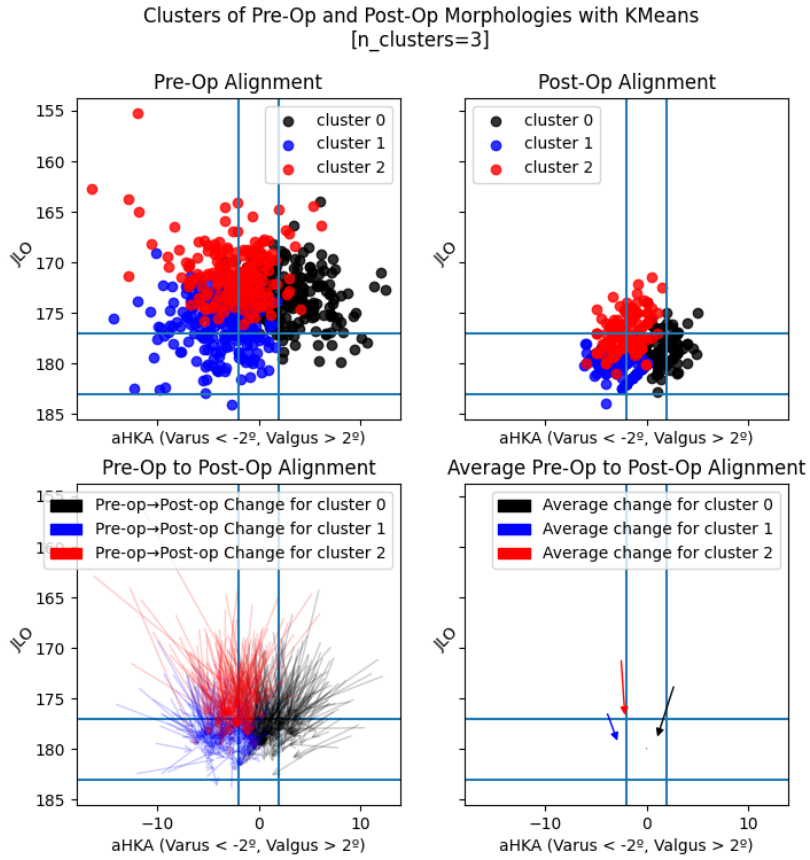

Figure 2: These are the clusered data points.

To create this regression, the pre and post-operative aHKA values were standardized using the Z-score method.
Then, the features are transformed using a polynomial transformation of degree 3 (see Sklearn Polynomial Features).
Finally, the model is trained using a linear regression algorithm (see Sklearn Linear Regression).

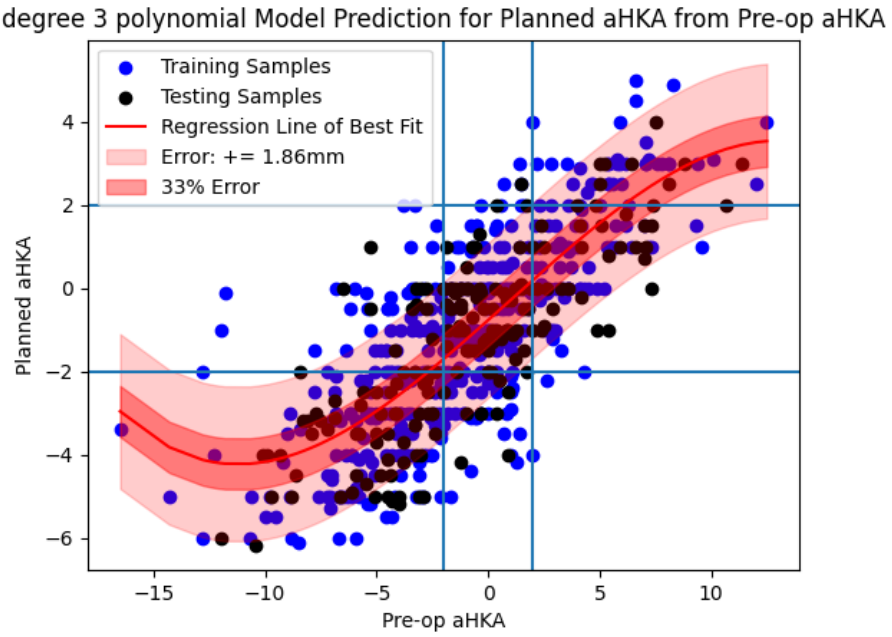

Figure 3: This is a regression trained using a linear regression algorithm. The error is the mean squared distance from the testing set (black). The regression is trained on the training set (blue)

To create this regression, the pre and post-operative aHKA values were standardized using the Z-score method.
Then, the model is trained using a nu support vector regression algorithm (see Sklearn Support Vector Machine).

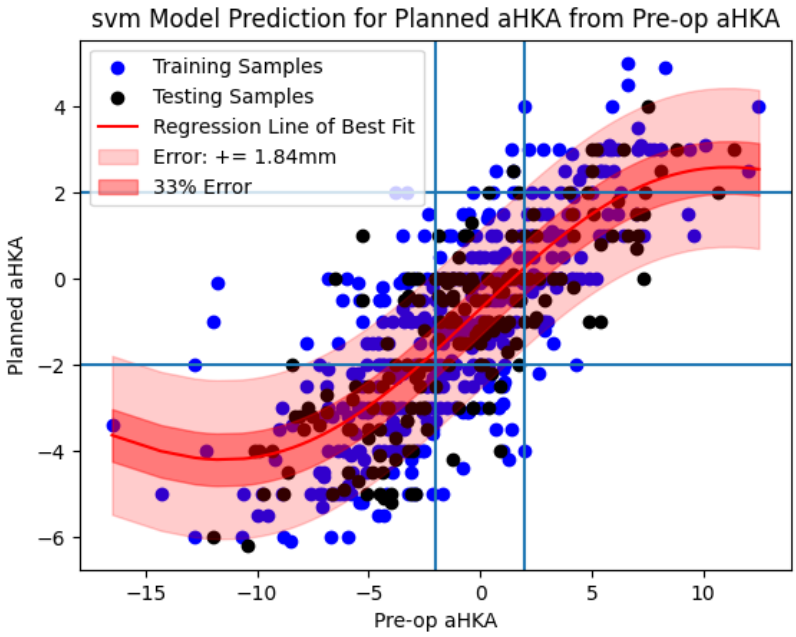

Figure 4: This is a regression trained using a support vector machine algorithm. The error is the mean squared distance from the testing set (black). The regression is trained on the training set (blue)

To create this regression, the pre and post-operative aHKA values were standardized using the Z-score method.
Then, the model is trained using a multi-layer perceptron (MLP) algorithm (see Sklearn Multi-layer Perceptrion).

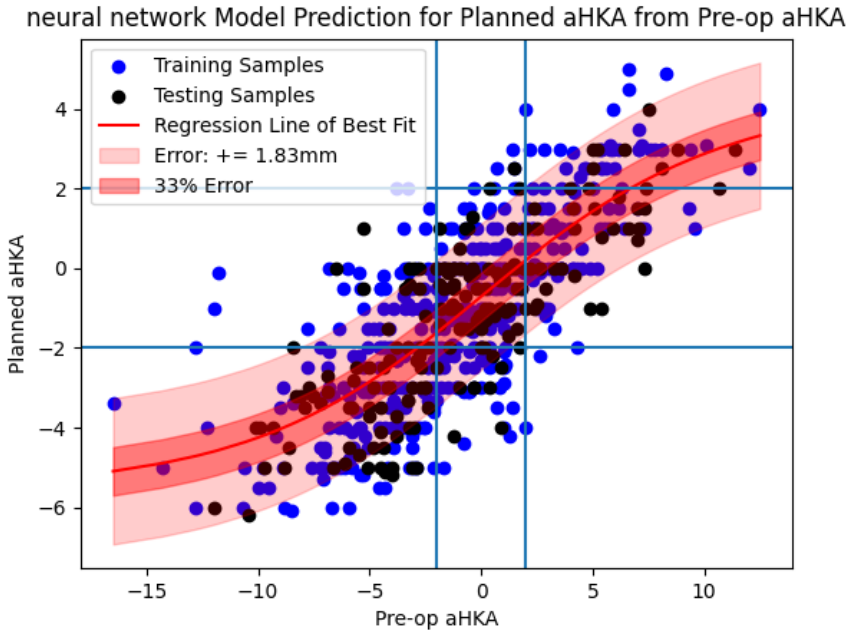

Figure 5: This is a regression trained using a deep learning algorithm on a MLP/neural network model. The error is the mean squared distance from the testing set (black). The regression is trained on the training set (blue)