King Mongkut's University of Technology **Name:** _____

Machine Learning **I.D. Number:** _____

Suthep Madarasmi, Ph.D.

Take Home Quiz 5 Due Sat Mar 11, 2023 **Score:** _____ / 65

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1. Calibrate Camera. 2 hrs. Using the "Calibrate Camera by ChatGPT" program shown in class, calibrate your laptop or mobile phone camera to find its intrinsic parameters using 10-15 checkerboard images. Make sure you are not using mirror images. If the processing is slow, it may help to reduce the size of each image to a width of around 1,000.

   1.1. *10 points.* Report the fx, fy, cx, cy, and lens distortion (k1, k2, k3, p1, p2) parameters found using left##.jpg, frame-##.png, and your camera's images.

   1.2. *10 points.* Show the Original and Undistorted image for *one* of your checkerboard images. Draw straight lines across the original image and undistorted image to see if the distortion has improved.

2. Using the Regression on diabetes data example:

   2.1. *5 points.* 1 hr. Is age highly correlated with total cholesterol / HDL (column 'S4')?

   2.2. *5 points.* 0.5 hr. Is blood pressure highly correlated with total cholesterol / HDL (column 'S4')?

   2.3. *15 points (4+3+3+5).* 1 hr. Report Linear fit results for y = ax + b where x is the blood sugar level

      i. Linear fit coefficients and intercept of the training data
      ii. What is the R^2 for the training data?
      iii. What is the R^2 for the prediction of y based on blood sugar level for the test data?
      iv. Show a scatter plot of the train set (x, y) as blue circles and predicted (x, y) as green circles. Also show the best fit line in red.

3. 2 hrs. Use the data provided in the shared file gasoline_use.txt to:

   3.1. *10 points.* Show the equation found by fitting the training data:

   $$y = f(x_1, x_2, x_3, x_4) = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4$$

   3.2. *5 points.* What is the R^2 for the prediction of y? Use testing data.

   3.3. *5 points.* What would happen to gasoline consumption if taxes are increased by $2.00? Use training data.