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6730 Project Assignment Report

1. I would like to explain the code about area_vs_volume function. This function is mainly showing the plot about the relationship between Lake George's areas and volumes. In this function, I create three subplots for demonstrating different information. In the first plot is showing the lake's volumes changes and the second plot is showing the lake's areas changes over these period. The input for x axis will be volumes and areas, and both plot will have the same y axis input which is the corresponding date. The third subplot will be the most interesting part, I calculate the difference of areas and volumes between each month. Then take the month's difference of areas divide the month's difference of volumes. Therefore, I can get to know from x axis for how many square meter of areas gains or lose while a liter of volume adds or lose, and the y axis will also be the corresponding date. So the larger number on x axis indicates that greater areas gains or lose when one liter of volume adds or lose in that month.

2. Complex model is the better model compare with the simple one. In the simple mode, we use constant evaporation rate for every month. However, it's not reasonable in the real world. Evaporation rate will change by the environment factor. In the complex model, I implement temperature, solar exposure, wind speed and humidity to determine the evaporation rate of each month. Furthermore, I utilized the evaluate_model function to figure out the model error for both model. Setting 64 evaporation rate in simple model will get the lower model error value. So I decide to go with this number doing the comparison. However, the lowest number of simple model still greater than the model error of complex model. Which mean that the expectation value from complex model is more similar to the real value.

Complex Model	2.684390292598175e+20
Simple Model (Evaporation rate: 64)	2.9367306044953087e+20

3. In question 4, my starting point will be the first volume in the data. I assume the lake's surface area being the largest area, as well as the catchment area, and if the forecasting model volume is negative, I'll adjust it to zero. Because it isn't reasonable for a negative lake volume. I also try to assume the surface area being the area which convert by volume to area function with the input of previous month's model volume. But this assumption will face some problem while the lake's volume is really low. When the volume hit to a specific point, the function will output negative area value which won't happen in the real world. Therefore, I didn't put this for my final assumption. Constant value of lake's largest area will be the better and reasonable assumption for catchment area and surface area in this model. Furthermore, I think the model can be more precisely if we have information about the depth of the lake. It can let the assumption of surface area being more accurate.