Group Project 4
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Analysis of Algorithms

1. A description for a linear program for finding the best fit curve for temperature data.

To solve this problem, we had to minimize the maximum absolute deviation for the given set of temperatures. In other words, we had to minimize the maximum given by the following equation.

$$T(d) = x_0 + x_1 \cdot d + x_2 \cdot \cos\left(\frac{2\pi d}{365.25}\right) + x_3 \cdot sin\left(\frac{2\pi d}{365.25}\right) + x_4 \cdot \cos\left(\frac{2\pi d}{365.25 \times 10.7}\right) + x_5 \cdot \sin\left(\frac{2\pi d}{365.25 \times 10.7}\right)$$

Since the equation is very long, a placeholder, appropriately named originalEquation, will take its place.

We can modify the equation to be $0 = originalEquation - T(d)$

which gives us $\min(\max(originalEquation - T(d))$

After this is turned from a $\min(\max())$ to a min problem, we will have the following equation with the given constraints.

$$\min t$$

$$s.t. originalEquation \leq t$$

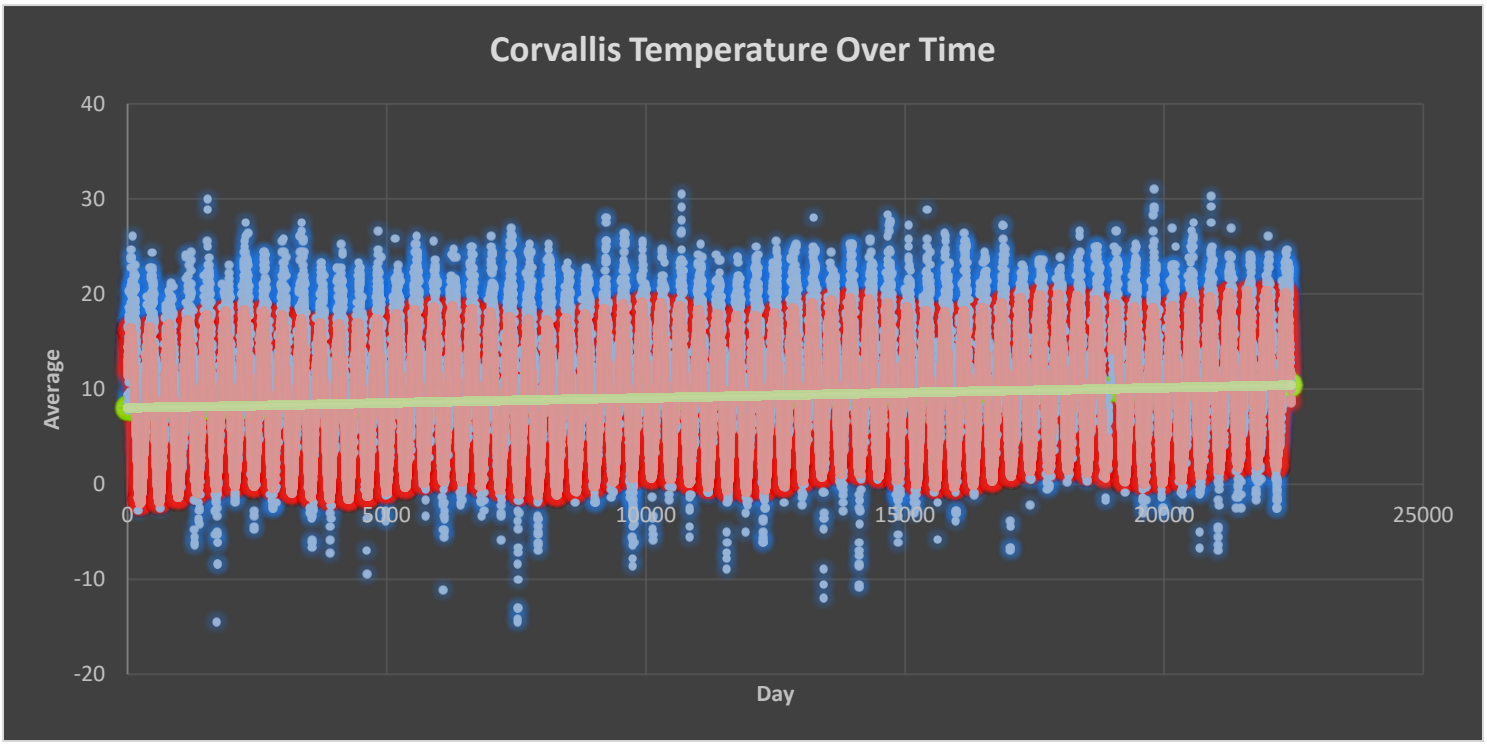
$$-originalEquation \leq t$$

To solve this, find the minimum of t given the constraints.

2. The values of all of the variables to your linear program in the optimal solution that your linear program solver finds for the Corvallis data. Solving this LP may take a while depending on your computer. Be patient. You may want to do testing on a small part of the data set. Include the output of the LP solver that you use (showing that an optimal solution was found).

x_0: 8.0214197
x_1: 0.00010694836
x_2: 4.2808907
x_3: 8.1868578
x_4: -0.79063079
x_5: -0.29536021

3. A single plot that contains:
• the raw data plotted as points,
• your best fit curve, and
• the linear part of the curve x0 + x1 · d.



The blue dots represent the given data points.
The red line represents the best fit curve.
The yellow line represents the linear part of the curve.

4. Based on the value x_1 how many degrees Celsius per century is Corvallis changing and is it a warming or cooling trend?

$$0.00010694836 * 36{,}500 = 3.9\ degrees\ Celsius$$

The number 36,500 signifies how many days there are in a century.