# Group Assignment 4

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## Description of Linear Program:

To find the daily average temperature at any location, we can use a linear function plus two sinusoidal functions. The first sinusoidal function models the temperature with the season and has a period of one year. The second sinusoidal function is modelled after the solar cycle and has a period of 10.7 years. Using *T* for temperature and *d* for days, we get the following function:

$$T(d) = x_0 + x_1 * d + x_2 * cos(\frac{2\Pi d}{365.25}) + x_3 * sin(\frac{2\Pi d}{365.25}) + x_4 * cos(\frac{2\Pi d}{365.25*10.7}) + x_5 * sin(\frac{2\Pi d}{365.25*10.7})$$

$x_0 + x_1 * d$ represents the linear trend for the function.

$x_2 * cos(\frac{2\Pi d}{365.25}) + x_3 * sin(\frac{2\Pi d}{365.25})$ represents the sinusoidal function for the seasonal pattern.

$x_4 * cos(\frac{2\Pi d}{365.25*10.7}) + x_5 * sin(\frac{2\Pi d}{365.25*10.7})$ represents the sinusoidal function for the solar cycle.

The values for $x_0,\ x_1,\ x_2,\ x_3,\ x_4,\ x_5$ all vary based on location. Using a linear programming solver, we will solve the function above and plot the best fit curve of the temperature data on a graph.

## Values of All Variables:

$Objective = 14.870473$

$x_0 = 6.221111$

$x_1 = 0.00025167514$

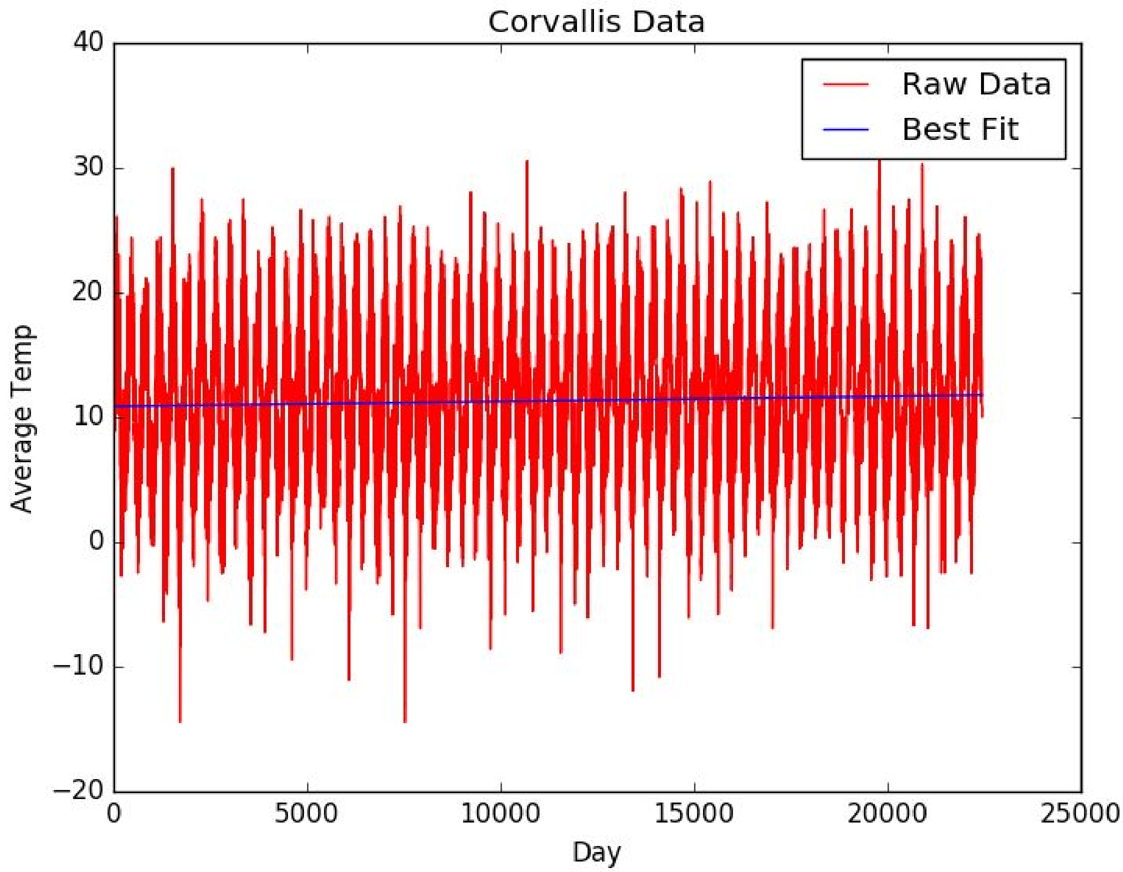
$x_2 = 0.009784343$

$x_3 = 8.9282845$

$x_4 = 0.0$

$x_5 = 0.054530602$

Plot:




Change:

Corvallis is changing about 1℃ per century. As you can see in the graph above, the average temperature is slowly increasing. The initial average temperature is about 10.86℃ and the final average temperature is around 11.76℃ for about 2/3rds of a century. This is a warming trend, and while pretty small over the course of a century, over the course of many centuries the effects might become noticeable.