Inference in Linear Gaussian Bayesian Network

Karthik Bangalore Mani
Department Of Computer Science
Illinois Institute of Technology

April 10, 2016

Abstract

The goal of this assigment is to predict the readings for temperature and humidity by estimating Linear Gaussian parameters for train datasets. There are 2 kinds of model, which are stationary at hour and day levels. The first model will have 5 parameters per sensor: μ_i, σ_i, β_0, β_1, σ. The second model will have similar parameters, except that every random variable will have it's own β_0, β_1.

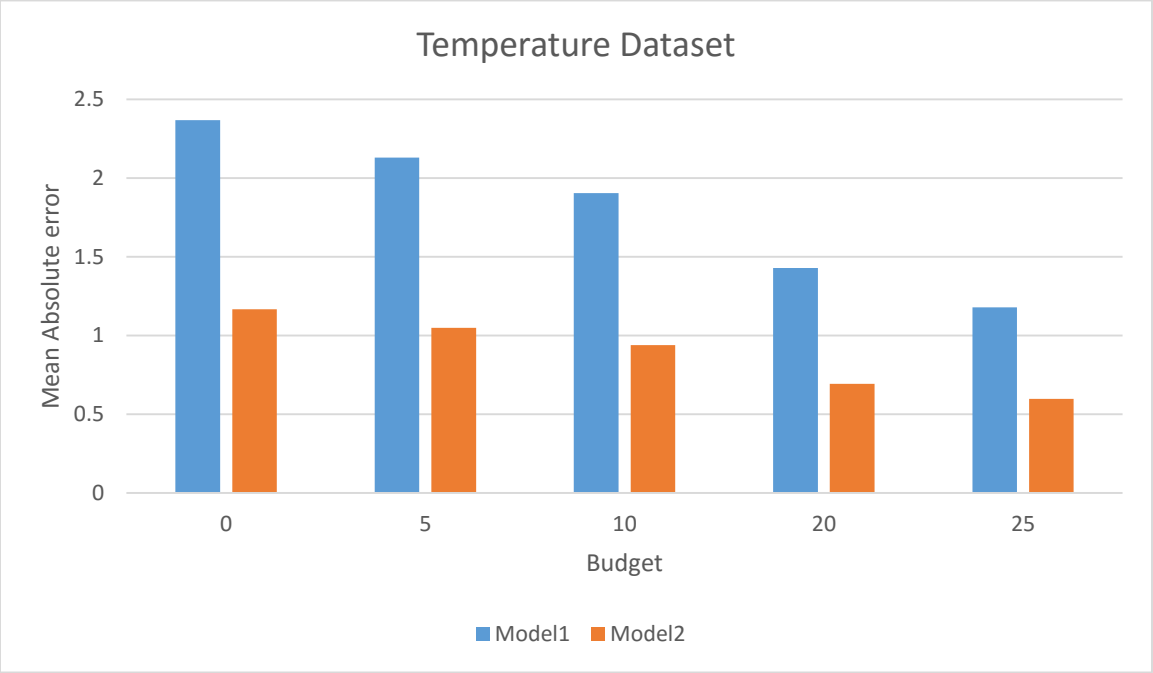
Implementation Details

Function	Description
get_data_matrix(file_path)	Strip out the first row and first column and return data matrix
create_matrix_for_regression(sensor_readings)	I/P : a np array [1,2,3,4] O/P : a np matrix of form |1 2| |2 3| |3 4|
compute_regression_coeffs(data_matrix)	I/P : a data_matrix O/P : The coefficients of the regressed model with a polynomial order of 1.
get_cond_variance(actual_lst,predicted_lst)	I/P : Actual and predicted readings. O/P : Conditional Variance, which is the variance of errors.
get_mean(beta_0,beta_1,prev_mean)	Mu_i = B_0 + B_1*Mu_i-1
get_var(cond_var,beta_1,prev_sigma)	sigma_i = cond_var + (B_1^2)*sigma_i-1
get_model_1_params(data_set)	
compute_regression_coeffs(data_matrix)	I/P : a data_matrix O/P : The coefficients of the regressed model with a polynomial order of 1.
get_cond_variance(actual_lst,predicted_lst)	I/P : Actual and predicted readings. O/P : Conditional Variance, which is the variance of errors.
get_model_2_matrix(data_set,train_days)	Fit the model 2 for the train set
chunks(_list,size)	Get Chunks of size size from a list _list
get_windows(no_of_sensors,no_of_cols,budget)	Get the window indices for each column/each time-stamp

Results and Discussion:

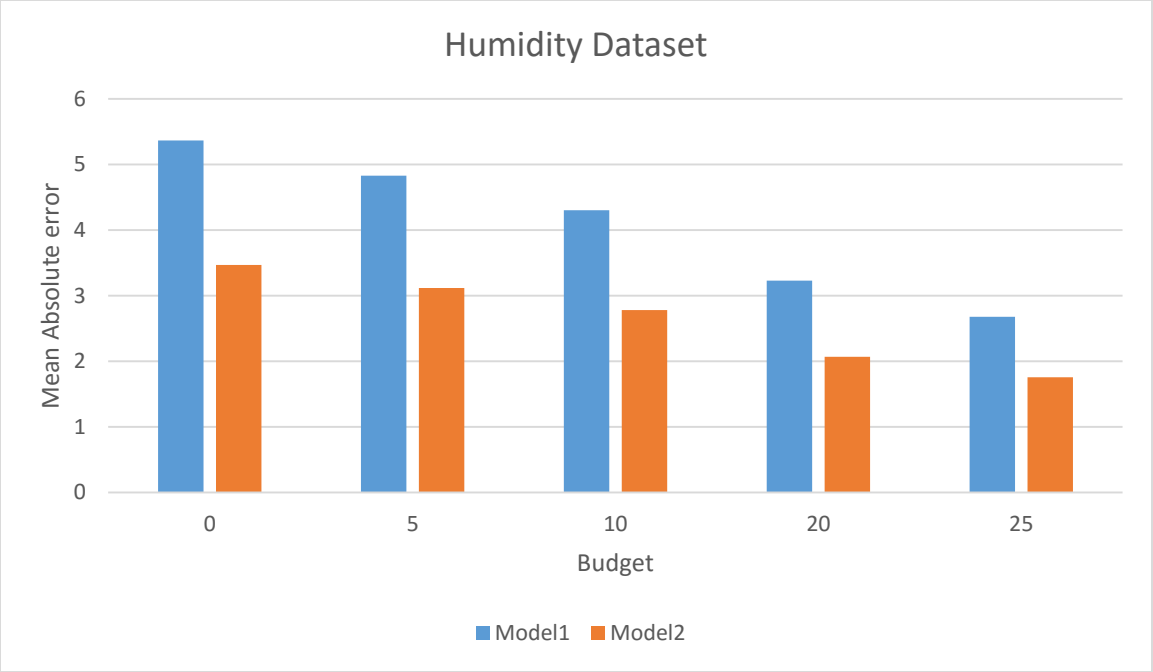
Window Sliding on Temperature:

- Model2 was the winner as it had lesser Mean Absolute error
- Upon increasing budgets, MAE was found to decrease



Window Sliding on Humidity:

- Again, Model2 was the winner as it had lesser Mean Absolute error
- Upon increasing budgets, MAE was found to decrease



Note : I could not complete inference using Variance approach due to lack of time.