I am submitting my topic and introduction for the MAT 300 final project for your approval. I have chosen to focus on the application of linear regression within the Kalman filter.

My project will explore how linear regression underpins the Kalman filter’s prediction step, specifically in modeling the relationship between observed measurements and the system’s state variables. I will collect a simulated dataset representing a simple dynamic system, such as a moving object’s position over time, with variables including time, noise level, and a categorical variable like sensor type (GPS or Lidar). The response variable will be the estimated position. My data will be generated using a simulation in Python or R, mimicking real-world sensor data with added noise, as this allows control over the variables and aligns with the Kalman filter’s assumptions. I aim to build a first order regression model with interaction terms, assess its fit using regression diagnostics, and perform a nested F-test to compare it with a reduced model. I predict that the model with interaction terms will better capture the dynamics of the system, improving the accuracy of position estimates.

I look forward to your feedback on this topic and introduction.

Sincerely,

Gary Hobson