Estimation Basics 2.0 (Duration 15 days)

Probability is a subject well understood by coding.

Listen to this specific video by Professor. Radhakant Padhi, IISc Bangalore.

https://www.youtube.com/watch?v=7FtOZFH2ZCU&list=PLbMVogVj5nJRj2MJ0AVwMO0uoaIuSMOSr&index=27

This lecture consists of various concepts required to understand the Kalman filtering in a probabilistic sense. The previous assignment was to give you an understanding of Kalman filtering in a control systems perspective.

Submit a document, explaining the topics he has covered in this particular lecture by taking a example of any of your favorite data (choose with no weights) given in this link

sda.berkeley.edu/GSS

(Note : In the top left you can see **Variable Selection.** Below that you can see various options from which you can choose the data of your favorite topic. Lets take Personal and Family information -> Marital status -> You can see a code followed by the explanation : Marital – Marital status. You can type MARITAL in the Tables option in the right side… ROW: …….. then in the Column option you can type AGEWED. Then if you click Run the Table, you will get a 2d data set.)

Develop codes for the following using the data taken from the above link : the codes have to be developed only in C++. (You can use Matlab to cross verify). Some might be simply definition and analytical (continuous sense), you can ignore that.

1. Sample Space and Event
    a. Disjoint, Exhaustive, Complementary events
2. Conditional probability
3. Random Variable
4. Cumulative Distribution Function
5. Probability density function
6. Expected value
7. Statistical moment
8. Variance Standard deviation
9. Gaussian Distribution
    a. PDF, CDF, Properties
10. Independence and Conditional Probability
11. Autocorrelation, Auto covariance
12. Cross Correlation, Cross Covariance
13. White Noise
14. Uncorrelated and orthogonal stochastic process

15. Vector Stochastic process

Make a consolidated report of all the including all the references.

Codes and graphs

1) You can use simple quadrature methods (trapezoidal or Hermite Simpson) to find the value of definite integrals.
2) Do not use any built-in commands or any sort of internet ready functions of C++ to generate the results
3) For plotting graphs, the x and y labels have to marked clearly with units specified. You can use any third party plotters to plot the results.
4) Upload the codes in git.