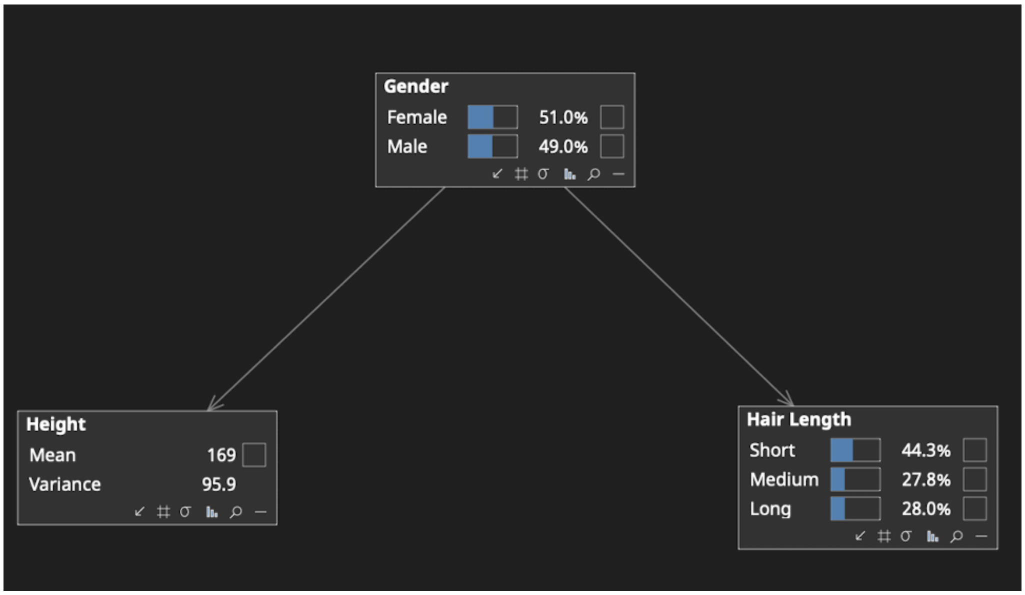
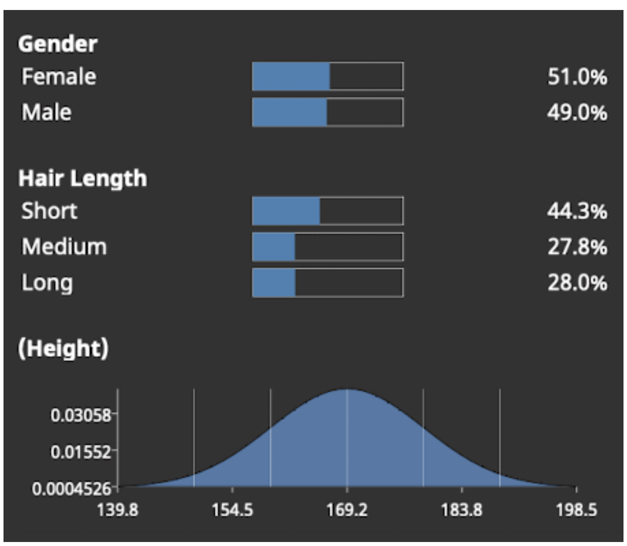
21MAT301 – MATHEMATICS FOR INTELLIGENT SYSTEMS – 5

Name: J Viswaksena Roll.No: AM.EN.U4AIE21035

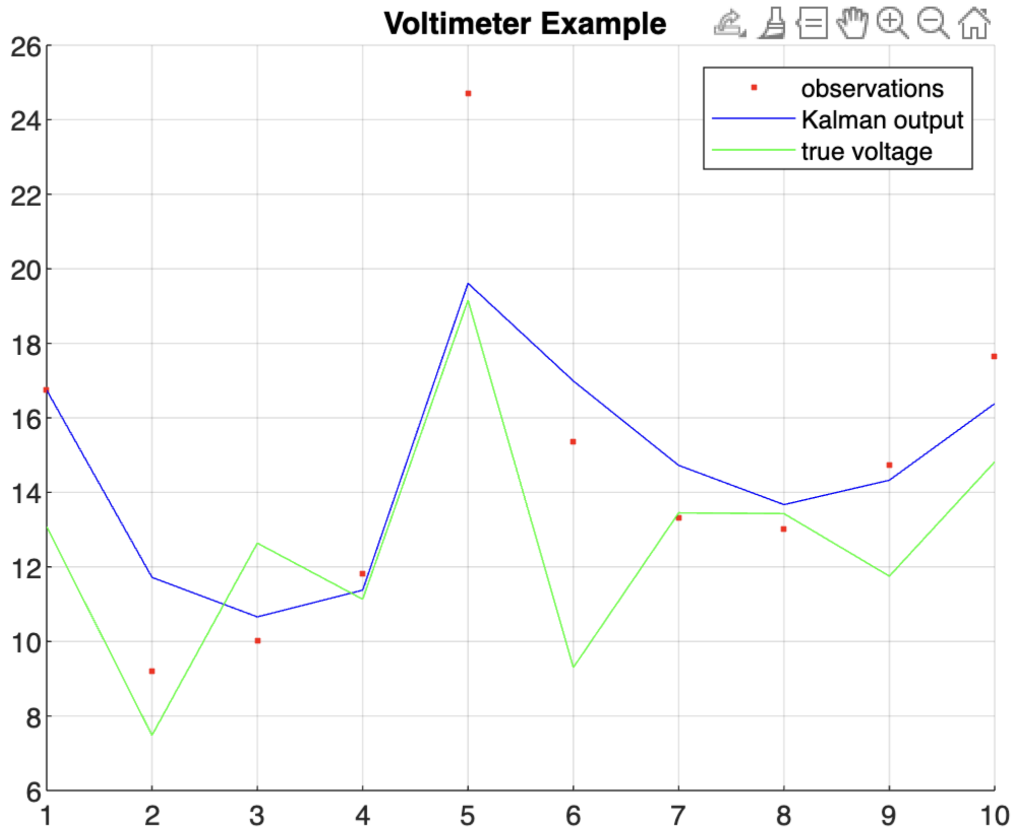
1. BAYES FILTER





The provided figures depict a Bayesian filter, where gender and hair length are discrete random variables, while height is a continuous variable. Analysis of the graph indicates that, when gender is considered as the observed variable, there is independence between height and hair length. Thus, modifications in the distributions of gender states, such as female and male, will inevitably influence the distributions of the corresponding states of hair length and height. Alterations in the gender distribution can result in corresponding adjustments to the distributions of both hair length and height.

2. KALMAN FILTER



The provided code illustrates the implementation of the Kalman filter algorithm in a linear system for voltage estimation. The system, characterized by a constant input of 12 volts, incorporates process noise and measurement error. The process noise, representing voltage deviation during operation, is set with a standard deviation of 2 volts (s.Q = 2^2), while the voltimeter's measurement error is modeled with a standard deviation of 2 volts (s.R = 2^2). The initial state of the system is indicated by NaN values.

The simulation involves ten iterations, each lasting one second, where random voltages are generated for each iteration. Measurement error is introduced using randn(). In each iteration, the kalmanf() function updates the filter's state estimate based on the current measurement. The resulting figure displays the true voltages (green line), measurements with observation noise (red dots), and estimated voltages from the Kalman filter (blue line). The legend() function labels the plots for clarity.

The graph visually demonstrates the impact of measurement noise on discrete and erroneous observations made by the sensor (red dots). In contrast, the Kalman filter output (blue line) provides a continuous and consistent estimation of the true voltage (green line) throughout the observed time period. The filter effectively mitigates the effects of noise, offering a more reliable and continuous measurement of the system's state.