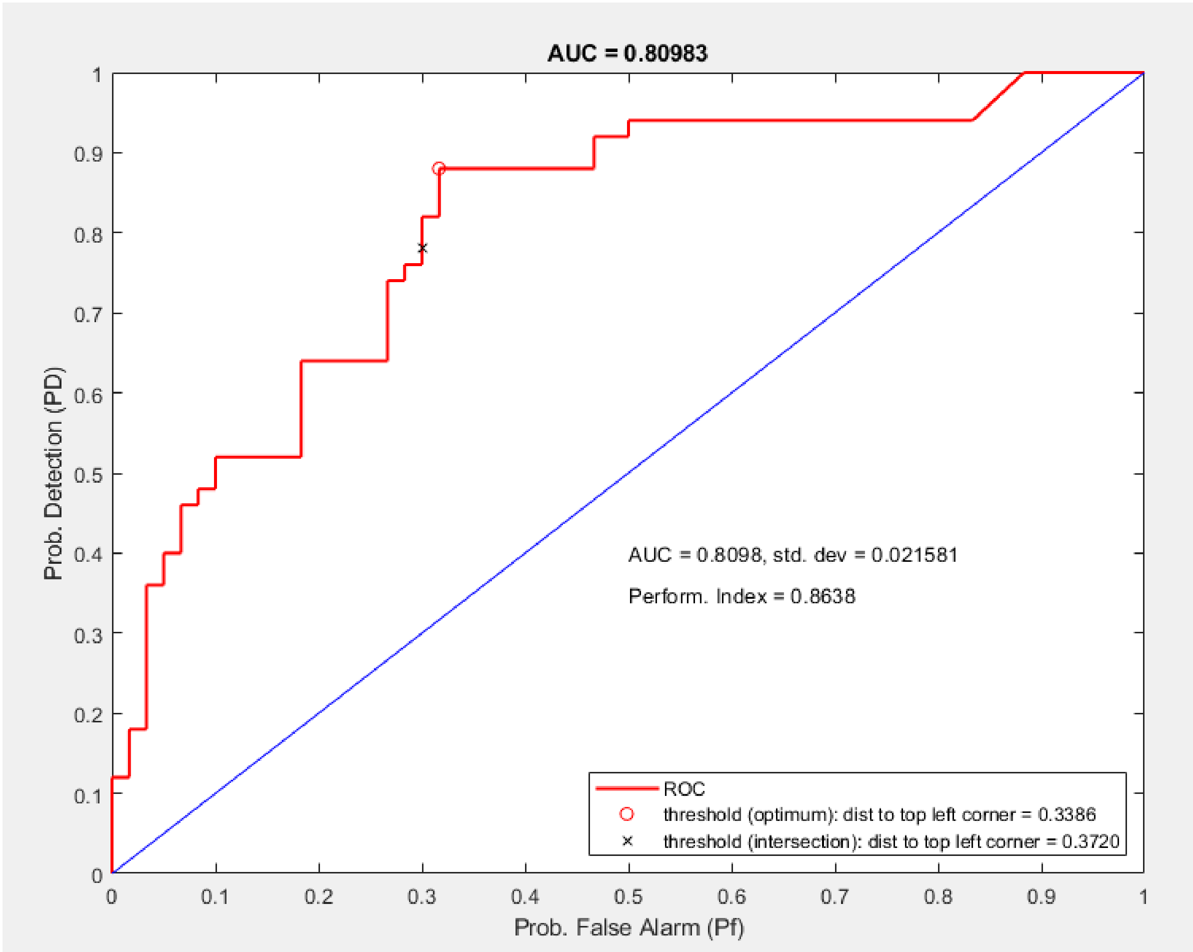
Hanh Do Phung



Threshold (vT) = 1.989 (optimum)

	Target Not Detected (D_n)	Target Detected (D_p)	Total Samples
Target Absent	41	19	60
Target Present	6	44	50
Total Decisions	47	63	110

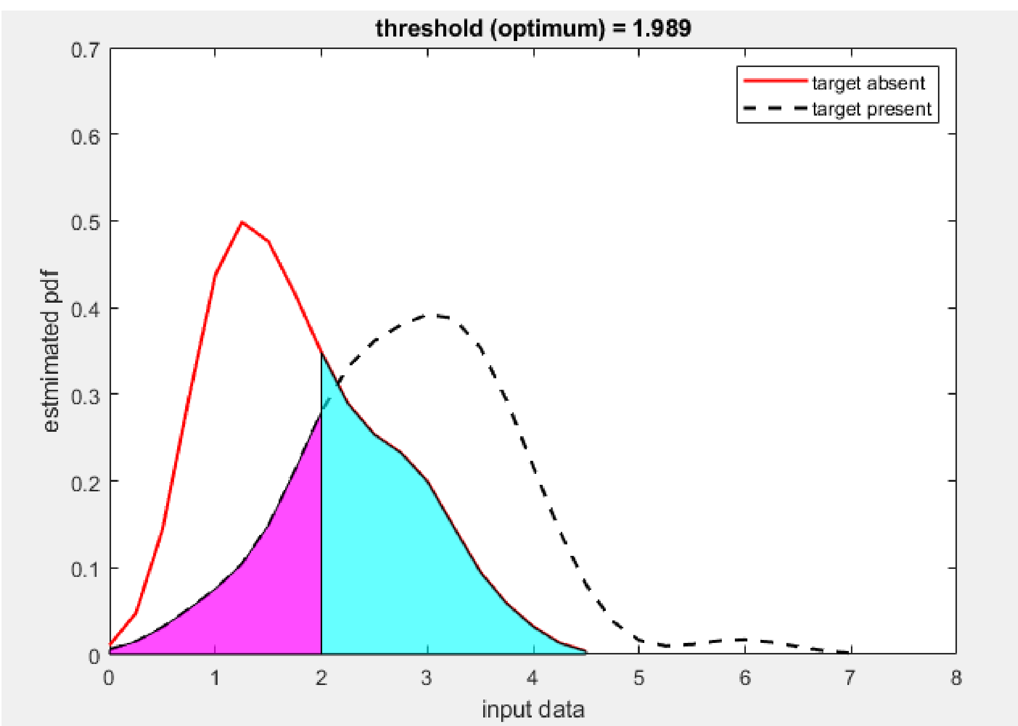
ERROR RATE = $\frac{NF+(N1-NC)}{N} = \frac{33}{110}$ PPV = $\frac{NC}{NF+NC} = \frac{44}{63}$

$$\text{Tx} = \begin{bmatrix} P(D_n|H_0) & P(D_n|H_1) \\ P(D_p|H_0) & P(D_p|H_1) \end{bmatrix} = \begin{bmatrix} F_V(v_T|H_0) & F_V(v_T|H_1) \\ S_V(v_T|H_0) & S_V(v_T|H_1) \end{bmatrix}$$

$$\text{Tx} = \begin{bmatrix} 1-P_F & P_M \\ P_F & 1-P_M \end{bmatrix} = \begin{bmatrix} 41 & 6 \\ 19 & 44 \end{bmatrix} \begin{bmatrix} 1/60 & 0 \\ 0 & 1/50 \end{bmatrix} = \begin{bmatrix} 41/60 & 6/50 \\ 19/60 & 44/50 \end{bmatrix}$$

$$a\ priori\ prob \rightarrow \begin{bmatrix} P(H_0) \\ P(H_1) \end{bmatrix} = \frac{1}{N} \begin{bmatrix} N_0 \\ N_1 \end{bmatrix} = \frac{1}{110} \begin{bmatrix} 60 \\ 50 \end{bmatrix}$$

$$\begin{bmatrix} P(D_n) \\ P(D_p) \end{bmatrix} = T_X \begin{bmatrix} P(H_0) \\ P(H_1) \end{bmatrix} = \frac{1}{110} \begin{bmatrix} 47 \\ 63 \end{bmatrix}$$



Conclusion:

The Optimum point, used as a threshold, is, as its name suggested, optimal in terms of having the best performance index comparing to the mid-point and intersection threshold. As seen in figure 1, the distance between the optimum point and top left corner is much smaller than that of the intersection point, suggesting a closer (Pf, Pd) value to ideal (pf as low as possibe