EE 567

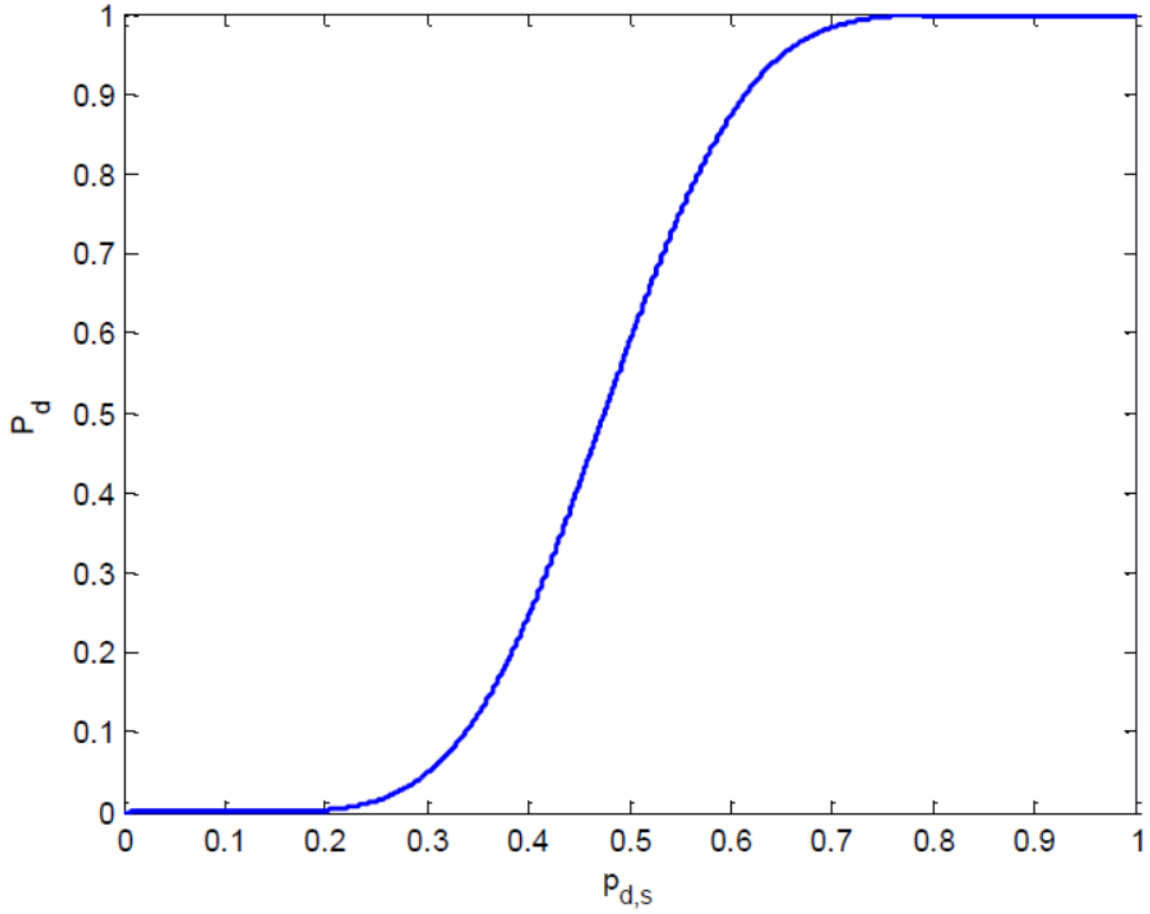
Homework 9 solution

Problem 1. In class we said that for M of N detection the overall probability of detection is

$$P_d = \sum_{k=M}^{N} \binom{N}{k} p_{d,s}^{k} (1 - p_{d,s})^{N-k}$$

where, $p_{d,s}$ is the probability of exceeding the detection threshold after the detector when a signal plus noise is present. Plot P_d vs. $p_{d,s}$ for $M = 10$ and $N = 20$. Your P_d should range from 0 to 0.99. Also, find the value of $p_{d,s}$ such that $P_d = 0.9$.

Solution:



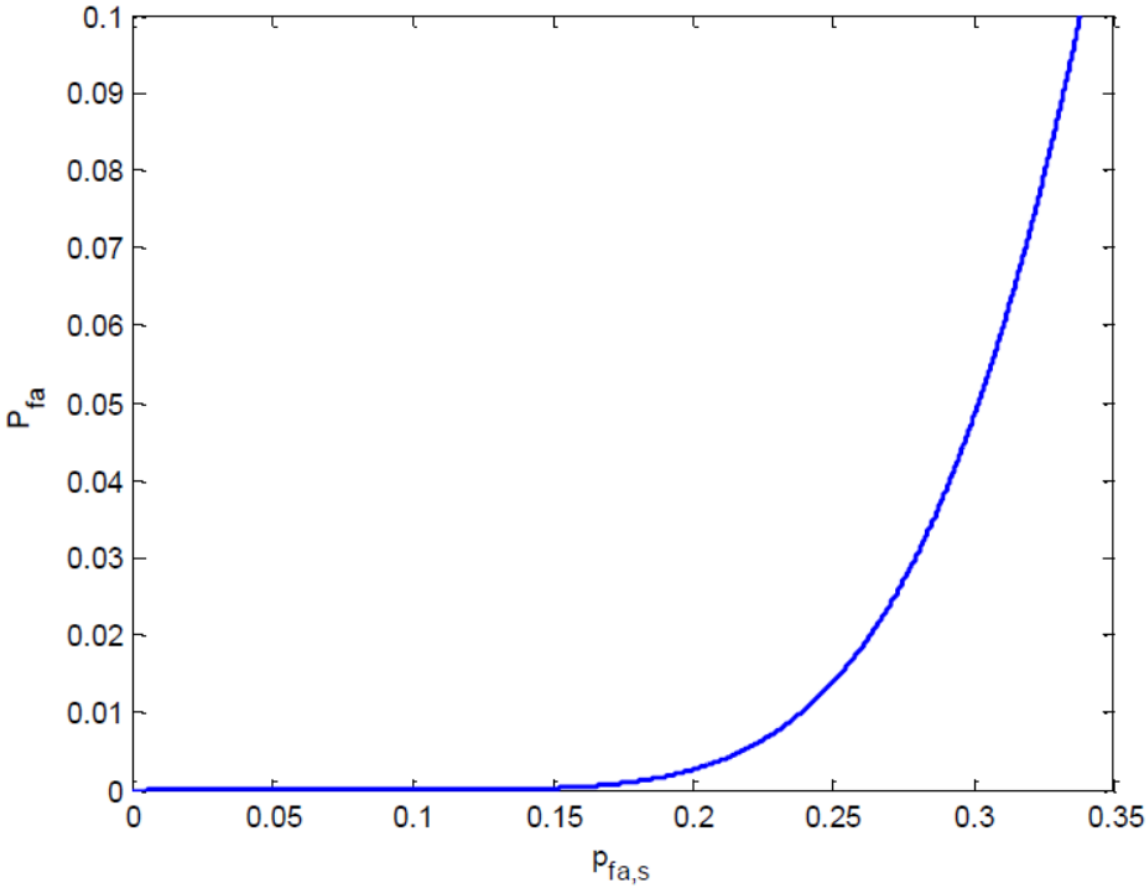
The value for P_{ds} is around 0.615

Problem 2. In class we said that for M of N detection the overall probability of false alarm is

$$P_{fa} = \sum_{k=M}^{N} \binom{N}{k} p_{fa,s}^{k} (1 - p_{fa,s})^{N-k}$$

where, $p_{fa,s}$ is the probability of exceeding the detection threshold after the detector when only noise is present. Plot P_{fa} vs. $p_{fa,s}$ for $M = 10$ and $N = 20$. Your P_{fa} should range from 0 to 0.10. Also, find the value of $p_{fa,s}$ such that $P_{fa} = 10^{-5}$.

Solution:



The value for $P_{fa,s}$ is around 0.104