ComS 573 Machine Learning

Problem Set 2

Note: Please do not hesitate to contact the instructor or the TA if you have difficulty understanding or getting started with solving any of the problems.

1. (20 pts.) Let $\vec{x} = (x_1, \ldots, x_d)^t$ be a d-dimensional binary (0 or 1) vector with a multivariate Bernoulli distribution
$$P(\vec{x}|\vec{\theta}) = \prod_{i=1}^{d} \theta_i^{x_i}(1-\theta_i)^{1-x_i},$$
where $\vec{\theta} = (\theta_1, \ldots, \theta_d)^t$ is an unknown parameter vector, θ_i being the probability that $x_i = 1$. Given i.i.d. data set $D = \{\vec{x}_1, \ldots, \vec{x}_n\}$, *derive* the maximum-likelihood estimate for $\vec{\theta}$.

2. (10 pts.) Assume that a classifier correctly classifies 900 of the 1000 examples in the test set. What is the estimated accuracy of the classifier? Give 95% confidence interval.