CS 512, Spring 2014

Assignment 1

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Due Monday January 27th

1 (*) 2.1

Verify $\sum_{x=0}^{1} p(x|\mu) = 1$
Proof. $\sum_{x=0}^{1} p(x|\mu) = p(x=0|\mu) + p(x=1|\mu) = \mu + 1 - \mu = 1$

Verify: $\mathbb{E}[x] = \mu$
Proof. $\mathbb{E}[x] = \sum_{x} x \ \ p(x|\mu) = 1 * \mu + 0 * (1-\mu) = \mu$

Verify $var[x] = \mu(1-\mu)$
Proof.
$var(x) = \mathbb{E}[(x - E[x])^2]$
$= (1-\mu)(0-\mu)^2 + \mu(1-\mu)^2$
$= (1-\mu)(\mu)^2 + \mu(1-\mu)^2$
$= \mu - \mu^2 = \mu(1-\mu)$

Show entropy of H[x] of a Bernoulli distributed random variable x is given by : $H[x] = -\mu \ ln\mu - (1-\mu)ln(1-\mu)$
By definition of entropy: $H[x] = -\sum_{x} p(x|\mu) \ ln[p(x|\mu)]$
$= -[(1-\mu)ln(1-\mu) + (\mu \ ln\mu)] = -\mu \ ln\mu - (1-\mu)ln(1-\mu)$