Brandon Botzer

AI-879

Problem 6.3

Describe a regression model that relates univariate binary discrete data x ∈ {0, 1} to a univariate continuous world state w ∈ [−∞, ∞]. Use a generative formulation in which P r(x|w) and P r(w) are modeled.

A risk formula (ie. credit score) could be a similar use case to this. A good or bad score could map to any given range of values $\{-\infty, \infty\}$ based on how the risk score is calculated.

The problem is structurally similar to the last but with a change in the denominator.

In total, the probability distribution over the data x could use the Bernoulli distribution where: $P(x|w, \theta) = Bern[\lambda]$.

A prior distribution would need to be chosen. One such could be a univariate normal with variance $\sigma^2$and mean μ: $P(w) = Norm_w[\sigma^2, \mu]$.

The parameters θ would need to be fit from training data examples for each class $\{x_i, w_i\}_{i=1}^{I}$. It may be best to use a sort of logit function ($\log\left(\frac{p}{1-p}\right)$) for this task since we would be mapping the predictor variables back into some linear relationship.

The large change in Baye's rule is in the denominator as $w \in \{-\infty, \infty\}$:

$$P(w|x) = \frac{P(x|w)P(w)}{\int_{-\infty}^{\infty} P(x|w)P(w)dw}$$