Assignment 1: Corrections, Addenda, FAQ

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Q1 Decision Trees and Overfitting

Q2 Entropy, Conditional Entropy, and Information Gain

- Under properties of entropy the chain rule is incorrectly defined (pg 3). The chain rule is in fact

$$H(X, Y) = H(X) + H(Y|X) = H(Y) + H(X|Y)$$

- At the beginning of Q2.2 (derivation of entropy) there is a typographical error that reads "...must be within a multiplicative factor of $-\sum_i \log p_i \log p_i$." This should read "...must be within a multiplicative factor of $-\sum_i p_i \log p_i$."

Q3 Probability

- For part 1, $p(A|B, A)$ should read $P(A|B, A)$.

- For part 2, $p(A, B|C) = p(A|C)p(B|C)$ should read $P(A, B|C) = P(A|C)P(B|C)$. We want to make statements about probabilities, not PDFs.

- When proving something using only the axioms of probability remember the following:

  1. You can use arguments from Boolean logic, like $(A \lor \neg A) = True$ in your proof. The axioms of probability are simply conditions placed on a function mapping logical statements to real numbers.
  2. $P(A|B)$ is just shorthand for $P(A, B)/P(B)$.

Q4 Gaussians

Q5 Maximum Likelihood and Maximum a Posteriori

- In the definition of the Poisson distribution, $p(x; \lambda)$ should read $p(x|\lambda)$.

- $\Gamma(r)$ is the Gamma function, the factorial function extended to the positive real numbers. If r is integral then $\Gamma(r) = (r - 1)!$. You don't need to know this to solve any of the questions.

- If $X \sim \text{Poisson}(\lambda)$ then $E[X] = Var[X] = \lambda$. You may or may not need this to solve the questions.