



Bookmarks

▶ Unit 0:
Overview

▶ Entrance
Survey

▼ Unit 1:
Probability
models and
axioms

Lec. 1: Probability
models and
axioms

Exercises 1 due Feb 10,
2016 at 23:59 UTC

Mathematical
background: Sets;
sequences, limits,
and series;
(un)countable sets.

Solved problems

Problem Set 1

Problem Set 1 due Feb
10, 2016 at 23:59 UTC

▶ Unit 2:
Conditioning
and
independence

▶ Unit 3:
Counting

▶ Unit 4: Discrete
random
variables

▶ Exam 1

Unit 7: Bayesian inference > Problem Set 7a > Problem 3 Vertical: Hypothesis test with a continuous observation



Bookmark

Problem 3: Hypothesis test with a continuous observation

(5/5 points)

Let Θ be a Bernoulli random variable that indicates which one of two hypotheses is true, and let $\mathbf{P}(\Theta = 1) = p$. Under the hypothesis $\Theta = 0$, the random variable X is uniformly distributed over the interval $[0, 1]$. Under the alternative hypothesis $\Theta = 1$, the PDF of X is given by

$$f_{X|\Theta}(x | 1) = \begin{cases} 2x, & \text{if } 0 \leq x \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$

Consider the MAP rule for deciding between the two hypotheses, given that $X = x$.

1. Suppose for this part of the problem that $p = 3/5$. The MAP rule can choose in favor of the hypothesis $\Theta = 1$ if and only if $x \geq c_1$. Find the value of c_1 .

$c_1 =$



2. Assume now that p is general such that $0 \leq p \leq 1$. It turns out that there exists a constant c such that the MAP rule always decides in favor of the hypothesis $\Theta = 0$ if and only if $p < c$. Find c .

$c =$



3. For this part of the problem, assume again that $p = 3/5$. Find the conditional probability of error for the MAP decision rule given that the hypothesis $\Theta = 0$ is true.

$\mathbf{P}(\text{error} | \Theta = 0) =$



4. Find the probability of error associated with the MAP rule as a function of p . Express your answer in terms of p using standard notation.

- ▶ Unit 5:
Continuous
random
variables

When $p \leq 1/3$, $\mathbf{P}(\text{error}) =$ ✓

When $p \geq 1/3$, $\mathbf{P}(\text{error}) =$ ✓

- ▶ Unit 6: Further
topics on
random
variables

You have used 1 of 2 submissions

- ▶ Unit 7:
Bayesian
inference

DISCUSSION

Click "Show Discussion" below to see discussions on this problem.

© All Rights Reserved



© edX Inc. All rights reserved except where noted. EdX, Open edX and the edX and Open EdX logos are registered trademarks or trademarks of edX Inc.

POWERED BY
OPENedX

