

Probability and Stochastic Processes

A Friendly Introduction for Electrical and Computer Engineers

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Errata for the first printing October 28, 1998

Despite our best efforts to eliminate typographical errors, several have been found. If you find others, please let us know at

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Note that in the following, list, the labels are intended to be read in the following way:

- **Page 4** Line +6 means 6 lines down from the top of page 4.
- **Page 8** Line -5 means 5 lines up from the bottom of page 8.
- **Page 23** Def 1.8, Line +4 means the fourth line of Definition 1.8. Similarly, line numbering within a theorem, problem, or figure caption starts with the first line of that item.

Here is the actual correction list for the first printing:

- **Page xi** Line -8: Starting quotes ” should be “.
- **Page xii** Line +11: *Word Wide Web* should be *World Wide Web*
- **Page 19** Theorem 1.10: The words *Law of Total Probability* should be boldfaced **Law of Total Probability**
- **Page 23** Line -14 (just preceding Definition 1.8) *mutually exclusive sets* should be *independent events*
- **Page 23** Def 1.8, Line +4: A_{n+1} should be A_n
- **Page 28** Line -6: *for the selecting* should be *for selecting*
- **Page 31** Line +2: $M - N$ bits should be $N - M$ bits
- **Page 38** Problem 1.4.7, Line 3: $i > n$ should be $i > m$
- **Page 61** Line -1: The displayed equation at the bottom of the page should be

$$\sum_{x=1}^{\infty} xq^{x-1} = \frac{1}{(1-q)^2} = \frac{1}{p^2}$$

- **Page 81** Problem 2.2.9: *six tries* should be $n = 6$ *tries*
- **Page 81** Problem 2.3.6: *random variable, K* should be *random variable, B*
- **Page 84** Problem 2.6.6: *geometricrandom* should be *geometric random*
- **Page 85** Problem 2.7.6: *geometricrandom* should be *geometric random*
- **Page 85** Problem 2.8.6: In part (a), the repeated statement of the PMF $P_X(x)$ is redundant
- **Page 87** Line -12: *This Chapter* should be *This chapter*
- **Page 96** Line -4: *Corresponding to the Theorem* should be *Corresponding to Theorem*
- **Page 138** Theorem 4.13 Line 3: *and $\sigma\sqrt{a}$* should be *and $a\sigma$*
- **Page 138** Line -8: *tht* should be *that*
- **Page 148** Theorem 4.18: Part (d) should read $f_X(x_0) = q\delta(0)$.
- **Page 159** Problem 4.1.1: Part (b) should be *What is $P[-1/2 < X \leq 3/4]$.*
- **Page 161** Problem 4.4.11: The difficulty should be $\blacklozenge\blacklozenge$
- **Page 171** Line 8: The displayed equations marked (Figure 5.2b), (Figure 5.2c), and (Figure 5.2d) have the wrong integral limits. The three equations should read

$$F_{X,Y}(x,y) = \int_0^y \int_v^x 2 \, du \, dv = 2xy - y^2 \quad (\text{Figure 5.2b})$$

$$F_{X,Y}(x,y) = \int_0^x \int_v^x 2 \, du \, dv = x^2 \quad (\text{Figure 5.2c})$$

$$F_{X,Y}(x,y) = \int_0^y \int_v^1 2 \, du \, dv = 2y - y^2 \quad (\text{Figure 5.2d})$$

- **Page 199** Problem 5.8.3: In part (a), *function?* should be deleted
- **Page 200** Problem 5.8.7: The problem should start with *Consider random variables $X, Y,$ and W from ...*
- **Page 200** Problem 5.9.3, Line +2: $\text{Var}[y]$ should be $\text{Var}[Y]$
- **Page 200** Problem 5.10.2, Line +1: *Let XX_1, \dots, X_n* should be *Let X_1, \dots, X_n*

- **Page 270** Theorem 8.6, Line +1: Theorem 8.6 should start *If X has finite variance, then for any constant $c \dots$*
- **Page 270** Line +5: *Theorem 8.6(a)* should be *Theorem 8.6*
- **Page 270** Line +6: The displayed equation should read

$$P[|M_n(X) - \mu_X| \geq c] = 1 - P[|M_n(X) - \mu_X| < c]$$

- **Page 276** Problem 8.2.2, Line +3: *X is within k standard deviations of \dots* should read *X is more than k standard deviations from \dots*
- **Page 276** Problem 8.2.3, Line +3: *standard deviations of \dots* should read *standard deviations from \dots*
- **Page 312** Theorem 9.4 Should start: *If X has finite variance, then the sample mean \dots*
- **Page 317** Problem 9.2.1: λ_0 and λ_1 should be α_0 and α_1
- **Page 317** Problem 9.3.1, Line -3: *What is the acceptance region* should be *What are the acceptance regions*
- **Page 318** Just preceding the figure in Problem 9.3.2, s_{111} should be s_{111}
- **Page 318** Problem 9.3.6: In part (a), *Sketch the decision regions* should be *Sketch the acceptance regions*
- **Page 318** Problem 9.3.7, Line -2: *when $\sqrt{E} = 1$, and \dots* should be *when $\sigma = 0.8$, $E = 1$,*
- **Page 319** Problem 9.4.2, part (b): $\hat{X}_M(y)$ should be $\hat{x}_M(y)$
- **Page 319** Problem 9.4.3 part (c): $\sigma_{X,Y}$ should be $\text{Cov}[X, Y]$
- **Page 319** Problem 9.4.3 part (e): *pmf* should be *PMF*
- **Page 319** Problem 9.4.3 part (g): $e_{\text{MMSE}}(-3)$ should be $\hat{e}_M(-3)$
- **Page 319** Problem 9.4.4 part (b): $\hat{u}(V)$ should be $\hat{U}_L(V)$
- **Page 319** Problem 9.5.1: The displayed equation should read

$$f_V(v) = \begin{cases} 1/12 & -6 \leq v \leq 6 \\ 0 & \text{otherwise} \end{cases}$$

- **Page 324** Table 10.1, line +7: *hline* $\cos 2\pi f_0 \tau$ should be $\cos 2\pi f_0 \tau$

- **Page 326** Theorem 10.1 Proof, Line 3, Line 5, Line 8: each instance of $R_Y(t, t + \tau)$ should be $R_Y(t, \tau)$
- **Page 332** Line -14, Line -9, Line -8, Line -7: each instance of $R_Y(t, t + \tau)$ should be $R_Y(t, \tau)$
- **Page 332** Lines -12 and -11: $R_{NX}(t, t + \tau)$ should be $R_{NX}(t, \tau)$
- **Page 332** Lines -12 and -11: $R_{XN}(t, t + \tau)$ should be $R_{XN}(t, \tau)$
- **Page 333** Theorem 10.6, Line +3: $R_{XY}(t, t + \tau)$ should be $R_{XY}(t, \tau)$
- **Page 333** Theorem 10.6 Proof, Line +3: $R_{XY}(t, t + \tau)$ should be $R_{XY}(t, \tau)$
- **Page 339** Quiz 10.5, Line 3: $R_Y(t, t + \tau)$ should be $R_Y(t, \tau)$
- **Page 342** Problem 10.1.1, Line +3: IS should be Is
- **Page 342** Problem 10.2.1: Parts (a) and (b) should be reversed.
- **Page 343** Problem 10.4.1, Line +2: $C_X(t, t + \tau)$ should be $C_X(t, \tau)$
- **Page 378** Theorem 11.25: In the displayed equation, $R(t)$ should be $R_j(t)$.
- **Page 387** Theorem 11.30: In the displayed equation, in both the numerator and denominator of the right side, the starting index $j = 1$ should be $j = 0$
- **Page 387** Line -1: *aGeneral* should be a *General*
- **Page 392** Problem 11.1.2, Line 3: In the displayed equation preceding part (a), the denominator on the right side should be $j!$ instead $n!$
- **Page 394** Problem 11.4.1: The ● difficulty symbol is missing
- **Page 394** Problem 11.8.1: The ● difficulty symbol is missing
- **Page 394** Problem 11.8.3, Line -5: (*measured in minutes*) should be (*measured in seconds*)
- **Page 394** Problem 11.8.3, Line -4: *2 minutes* should be *120 seconds*
- **Page 394** Problem 11.9.1: The difficulty should be ■ instead of ◆
- **Page 395** Problem 11.11.6: The final sentence should read *Find the limiting state probabilities for this queue when the arrivals are Poisson with rate λ and service times are exponential with mean $1/\mu$.*