Reading Guide for Ghahramani: *Fundamentals of Probability*

I list here the parts of the textbook that directly support the material that I will have delivered in the lectures by Feb. 25.

Sections 1.1, 1.2. From beginning to on page 3 to page 5, up to and including the paragraph after Example 1.6. Read the rest of this section, if the notation of set theory is unfamiliar. *Comment: I write "$A \cap B$" where the book writes "AB".*

Section 1.3. Page 12. Definition (Probability Axioms). The examples on pages 15—17. *Comment: These examples illustrate basic patters of notation that all probabilists use. All of your work (quizzes, homework and tests) should conform to these usages.*

Section 1.4. Page 18-19: Theorems 1.4 and 1.6.

Sections 1.5, 1.6, 1.7. OMIT for now.

Sections 2.1, 2.2. This is not about probability, but the principles discussed here have direct applications to probability: a) number of elements in the product of several sets (Theorems 2.1 and 2.2), b) number of subsets of a set (Theorem 2.3), and c)the idea of a tree diagram. *Comment: I used tree diagrams to construct probability spaces in Lecture 2. My diagrams were labeled with outcomes AND probabilities. This is not presented in Section 2.2.*

Sections 2.3, 2.4. Each of these sections contains an important definition, followed by examples that illustrate the definition prior to applications in probability and then examples that show applications within probability. *Comment: Permutations and combinations belong to the general mathematical discipline of combinatorics. You may already have met them in other math courses.*

Section 2.5. OMIT for now.

Section 3.1. Definition (on page 76). Examples.

Section 3.2. Equations (3.4) and (3.5) (on page 85). Examples.

Section 3.3. Theorems 3.3 (page 88) and 3.4 (page 93). Idea of a "partition." Examples.

Section 3.4. Theorems 3.5 (page 101). Examples. *Comment: My notes supplement the book's treatment of Bayes' Theorem by showing how the same problems may be approached with tables.*

Section 3.5. Definition (page 108). Examples.

Section 3.6. OMIT for now.

Section 4.1. Definition on page 140. Examples 4.1, 4.3 and 4.4. *Comment: The definition in the book is intended to cover BOTH discrete and continuous random variables. I have been avoiding the continuous case for the time being. Thus, the clause in the definition referring to intervals in R can be ignored for the time being.*

Section 4.2. OMIT for now.

Section 4.3. Definition on page 153. Examples. *Comment: I introduced this idea in this definition in Lecture 11 for the first time. I think the book leaves the precise relationship between the pmf of a random variable and the pmf of a probability space somewhat hazy. Probabilists, it seems to me, tend to leave the probability space on which a random variable is defined in the background.*

Section 4.4. Discussion of expectation on pages 159-160. Definition on page 160. Examples 4.14, 4.15, 4.16, 4.17, 4.20, 4.22.

Section 4.5. Discussion of variance on pages 175-176. Definition on page 176. Example 4.26. Theorem 4.3. Example 4.27.

Section 4.6. OMIT for now.

Section 5.1. Theorem 5.1 and the definition following. Examples 5.2, 5.3, 5.4, 5.5, 5.6, 5.7. Page 194-5 (expectation and variance of $X \sim$ binomial(n,p))

Section 5.2. Definition of Poisson random variable (p. 202), its expectation and variance (p. 202-203), examples on p. 203, and Examples 5.10, 5.11, 5.12 and 5.13.

Section 5.3.

- Geometric random variable (p. 215) and its expectation and variance (p. 216). Examples 5.18, 5.19.
- Hypergeometric random variable (p. 220) and its expectation and variance (p. 221). Examples 5.23, 5.24.