

Unit 2: Probability and distributions

3. Probability and conditional probability

Sta 101 - Spring 2015

Duke University, Department of Statistical Science

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1. Housekeeping

2. Main ideas

1. Disjoint and independent does not mean the same thing



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- ▶ *Disjoint (mutually exclusive) outcomes* cannot happen at the same time
 - A voter cannot register as a Democrat and a Republican at the same time
 - But s/he might be a Republican and a Moderate at the same time – *non-disjoint outcomes*
 - For disjoint A and B: $P(A \text{ and } B) = 0$

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 - A voter cannot register as a Democrat and a Republican at the same time
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 - For disjoint A and B: $P(A \text{ and } B) = 0$
- ▶ If A and B are *Independent events*, having information on A does not tell us anything about B (and vice versa)
 - If A and B are independent:
 - $P(A | B) = P(A)$
 - $P(A \text{ and } B) = P(A) \times P(B)$

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- ▶ ... can be rewritten as: $P(A \text{ and } B) = P(A | B) \times P(B)$

For disjoint outcomes:

- ▶ We know $P(A | B) = 0$, since if B happened A could not have happened
- ▶ Then, $P(A \text{ and } B) = P(A | B) \times P(B) = 0 \times P(B) = 0$

For independent events:

- ▶ We know $P(A | B) = P(A)$, since knowing B doesn't tell us anything about A
- ▶ Then, $P(A \text{ and } B) = P(A | B) \times P(B) = P(A) \times P(B)$

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3. ??
4. ??
5. ??
6. ??
7. ??