Stat 104 – Lecture 12

Probability Rules

- Complementary Event – collection of outcomes not in the Event
  - Event: Saved
  - Complementary event: Lost
- Complement rule
  - The probability of a complementary event occurs is 1 minus the event's probability.
  - $P(A^C) = 1 - P(A)$

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Addition Rule

- P(A or B) = P(A) + P(B) – P(A and B)
- P(Saved or First Class) = P(Saved) + P(First Class) – P(Saved and First Class) =

706/2223 + 329/2223 – 199/2223 = 0.376 or 37.6%

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Multiplication Rule

- P(A and B) = P(A)*P(B|A)
- P(First Class and Saved) = P(First Class)*P(Saved|First Class) = (329/2223)*0.605 = 0.09 or 9%
- P(First Class and Saved) = 199/2223 = 0.09 or 9%

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Special Addition Rule

- Disjoint (mutually exclusive) events – no outcomes in common.
  - P(A and B) = 0
- Addition Rule for disjoint events.
  - P(A or B) = P(A) + P(B)
  - P(First or Second) = P(First) + P(Second) = 329/2223 + 285/2223 = 614/2223 = 0.276 or 27.6%

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Independent Events

- Two events are independent if the probability of the occurrence of one event does not effect nor is it affected by the occurrence of the other event.
- $P(A) = P(A|B) = P(A|B^C)$

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Not independent events

- Saved and First Class are not independent events because:
  - P(Saved) = 0.318
  - P(Saved|First Class) = 0.605
  - The two probabilities are not equal.

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Independent Trials

- Independent trials – sampling with replacement.
- Mix population, draw an item from the population, return the item before the next mix and draw.

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Independent Trials

- Multiplication rule for independent trials.

  P(outcome 1st and outcome 2nd) = P(outcome 1st)*P(outcome 2nd)

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Example

- What is the chance that two people in a row win bonus points?
  - P(win 1st) = P(Blue or Red) = P(Blue)+P(Red) = 0.4
  - P(win 2st) = P(Blue or Red) = P(Blue)+P(Red) = 0.4
  - P(win 1st and win 2nd)=P(win 1st)*P(win 2nd) = 0.4*0.4 = 0.16 or 16%

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