Political Science 209 - Fall 2018

Probability II

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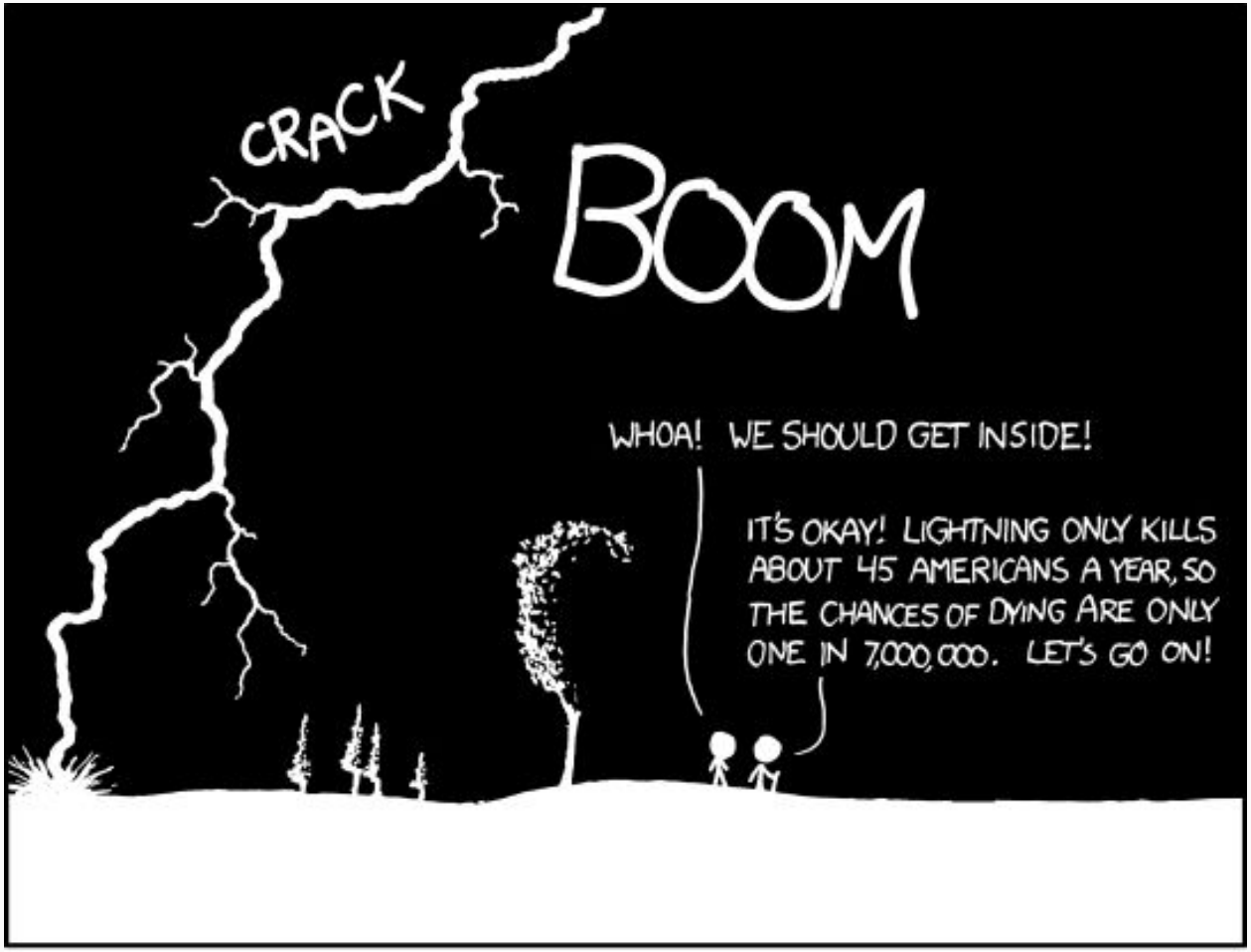
Conditional Probability



Conditional Probability

Sometimes information about one event can help inform us about likelihood of another event

Examples?

Conditional Probability

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Examples?

- What is the probability of rolling a 5 and then a 6?
- What is the probability of rolling a 5 and then a 6 given that we rolled a 5 first?

Conditional Probability

If it is cloudy outside, gives us additional information about likelihood of rain

If we know that one party will win the House, makes it more likely that party will win certain Senate races

Independence

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Independence of two events implies that information about one event does not help us in knowing whether the second event will occur.

Independence

For many real world examples, independence does not hold

Knowledge about other events allows us to improve guesses/probability calculations

Conditional Probability

$P(A \mid B)$

Probability of A given/conditional that B has happened

Conditional Probability

$$P(A \mid B) = \frac{P(A and B)}{P(B)}$$

Probability of A and B happening (joint) divided by probability of B happening (marginal)

Conditional Probability

$$P(\text{rolled 5 then 6}) = ?$$

Conditional Probability

$$\text{P(rolled 5 then 6)} = ?$$

$$\text{P(rolled 5 then 6)} = \frac{1}{36}$$

$$\text{P(rolled 5 then 6} \mid \text{5 first)} = \frac{P(5 then 6)}{P(6)}$$

Conditional Probability

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$$\text{P(rolled 5 then 6)} = \frac{1}{36}$$

$$\text{P(rolled 5 then 6} \mid \text{5 first)} = \frac{P(5 then 6)}{P(6)}$$

$$\frac{\frac{1}{36}}{\frac{1}{6}} = \frac{1}{6}$$

Conditional Probability

The probability that it is Friday and that a student is absent is 0.03. What is the probability that student is absent, given that it is Friday?

$P(\text{absent} \mid \text{Friday}) = ?$

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$$P(\text{absent} \mid \text{Friday}) = ?$$

$$P(\text{absent} \mid \text{Friday}) = \frac{0.03}{0.2} = 0.15$$