Introduction to **Probability**

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50% chance for both H or T

Probability

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What is the chance of both being Heads?

Probability

- Probability is a numerical way of describing how likely something is going to happen.

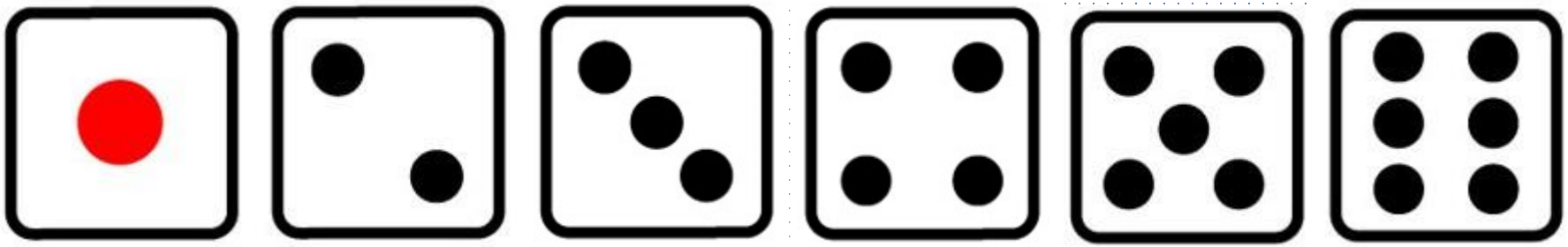
1st	2nd
H	H
H	T
T	H
T	T

4

What is the chance of both being Heads?

$$1/4 = 0.25 \text{ or } 25\%$$

Probability

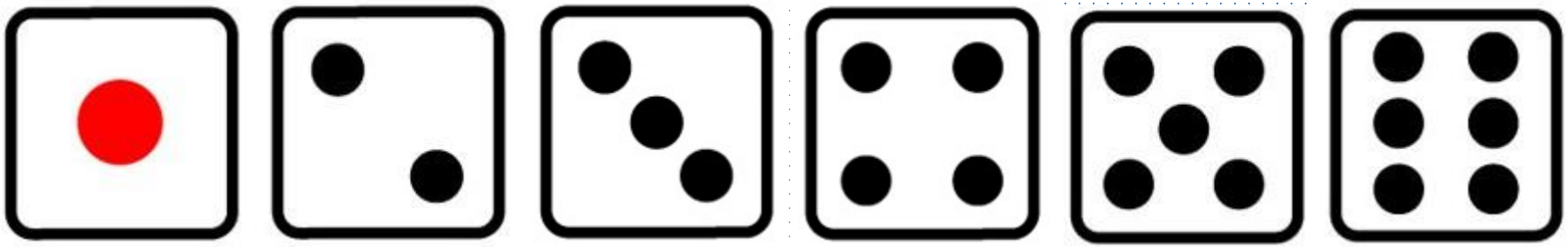


What is the probability of getting an even number?

1 2 3 4 5 6

P(even) = 3/6 = 0.5 or 50%

Maximum and Minimum Probability

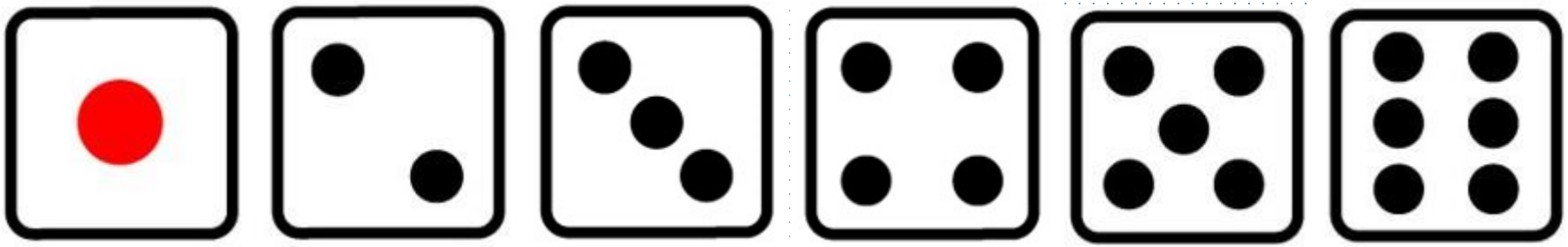


What is the probability of getting an 8?

1 2 3 4 5 6

P(8) = 0/6 = 0.0 or 0%

Maximum and Minimum Probability

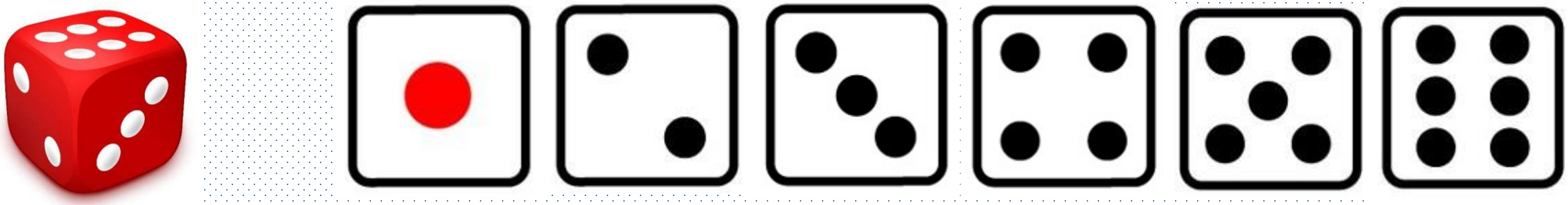


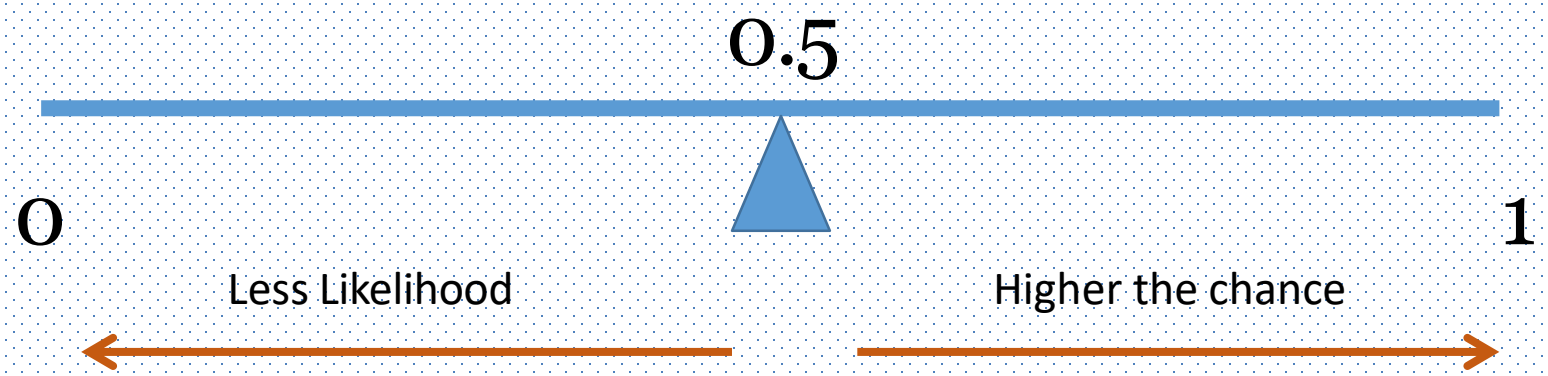
What is the probability of getting a number between 1 and 6?

1 2 3 4 5 6

P(between 1 and 6) = 6/6 = 1.0 or 100%

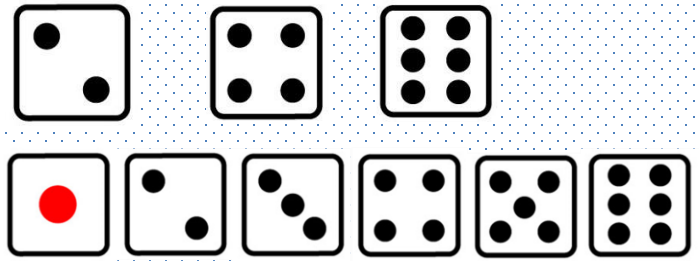
Maximum and Minimum Probability





Probability Terms

Experiment	Repeatable Process with defined set of results
Outcome	Result of an experiment
Event	Set of one ore more outcomes.
Sample Space	All possible outcomes
Sample Point	One possible outcome



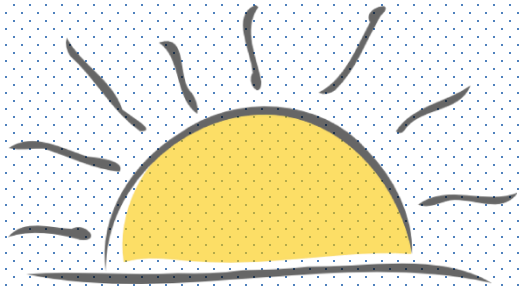
Conditional Probability

Conditional Probability

A measure of the probability of an event (some particular situation occurring) given that another event has occurred.

-- Wikipedia

Why it is important?



P(Rain| Cloudy)

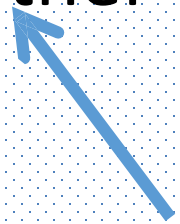
P(Rain| Sunny)

Conditional Probability

Rain

A measure of the probability of an event (some particular situation occurring) given that another event has occurred.

-- Wikipedia



Weather Condition

Conditional Probability

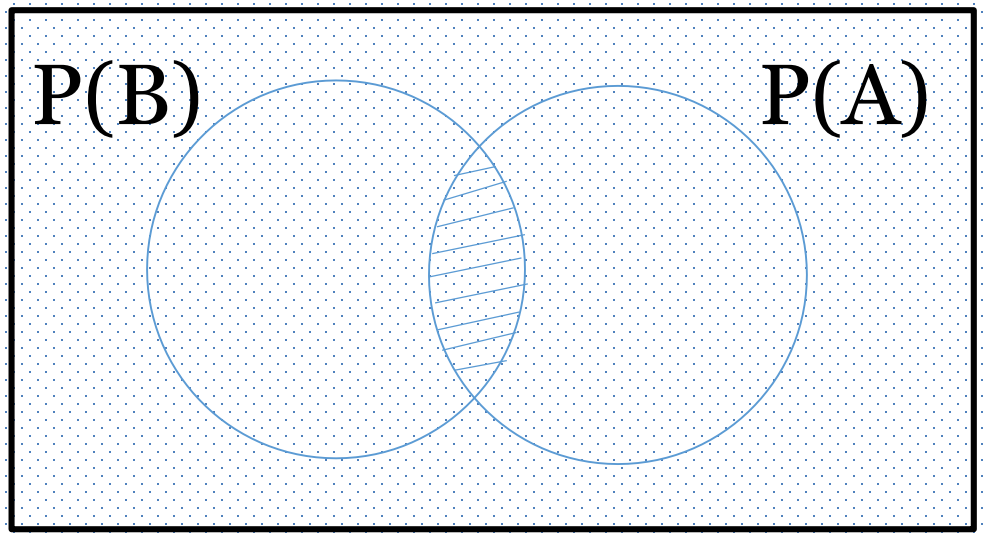
$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

A → Event whose probability we need to find
e.g. Will it rain?

B → Even that has already occurred
e.g. It's already cloudy

Conditional Probability

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



A → Event whose probability we need to find
e.g. Will it rain?

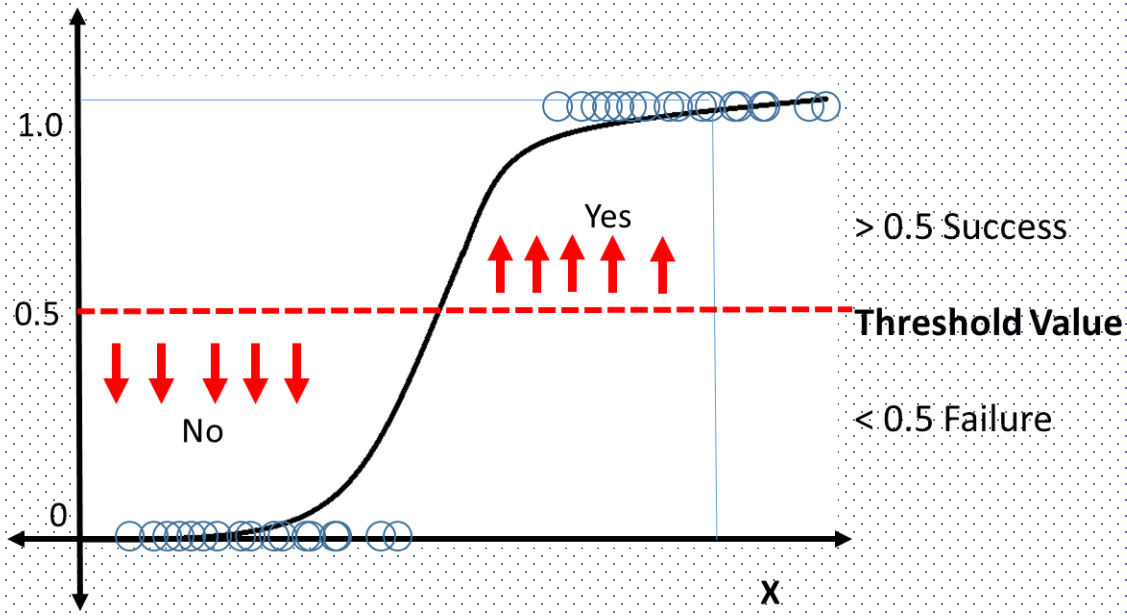
B → Even that has already occurred
e.g. It's already cloudy

How it is used in Data Science and Machine Learning?

Will this customer buy this product?

Will this customer default the loan?

Will the loan of this customer be approved?



Random Variables

Algebraic Variables

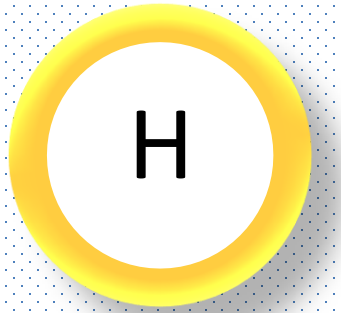
$X - 4 = 0$ $\qquad\qquad$ $X = 4$

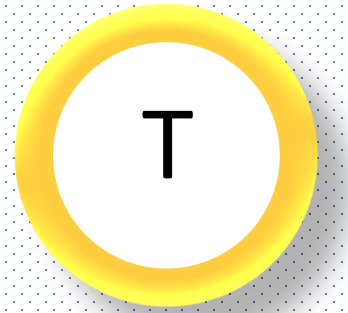
$y = x + 7$ $\qquad\qquad$ $y = 11$

Random Process

Know the possible outcomes but can not say with 100% confidence which one will happen every time the process is executed.

We know the possible outcomes but which one?





Outcome as a variable

$X = \{H, T\}$

$X = \{1, 2, 3, 4, 5, 6\}$

Modelling Random Variables

$X = \{1, 2, 3, 4, 5, 6\}$

Y = function of X such that sum of two dice is even

P(Y is even)

Modelling Random Variables

Dice1 →

← Dice2	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

P(2) = 1/36

P(4) = 3/36

P(6) = 5/36

P(8) = 5/36

P(10) = 3/36

P(12) = 1/36

P(Y is even) = 18/36 = 0.5

Random Variable Type

- Discrete
- Continuous

Thank You!