Contents

As of June 19, 2022

Contents

file <- “210_bayes_summary.md”

PURPOSE: Summary of Bayes.

:::TODO::: - set matrix A equal to matrix B, in equation. - in math mode double / ends the line - in non-math mode us p a r - under Event Space add to 2nd line `first flip is H` - short text needs to be verbatum - powerset

% comment in .tex, but not comment to pandoc - WILL appear in .pdf

Sample Space

All possible outcomes from 1 experiment.

Ex: toss 2 coins S = {HH,HT, TH, TT}

Event Space

This actually a bit more complicated:

$$E_1 = HE_2 = HH, HT \tag{1}$$

In general, E subset of powerset (S)

$$X \in \mathcal{P}(A)$$

|number of elments | = 2^k

Bayes Rule:

A = Event B = Event

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

Joint Probability:

$$P(A \cap B)$$

Conditional:

$$P(A \mid B)$$

Law of Total Probability:

$$P(A) = \sum_{i=1}^{n} P(A \mid B_i)P(B_i)$$

Likelihood

Often probability of event B, $P(B)$ is unknown, but we do have information about another event A and its affect on B. $P(B|A = known)$

We can try to learn something from $P(B \mid A)$ by treating B as a variable and trying to construct a function to compare different values of A. $f_A(B)$ In words, given event A what is llikelihood of B

$$L(A|B = unknown) = P(B = unknown|A)$$

Fake or Real News ?

Suppose we examine $N = 150$ news articles and record the following information:

A = event article uses !

B = event article is fake

Join probability

$$P(A \cap B)$$

```
\begin{matrix}
44 & 88\\
16 & 2
\end{matrix}
```

Or as a proportion of total:

```
\begin{matrix}
    \frac{44}{150} & \frac{88}{150}\\
    \frac{16}{ 150 } & \frac{2}{150}
\end{matrix}
```