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Bayes Learning-Probabilistic-Graphical-Models-in-R.

- · (Pierre-Simon Laplace,1749-1827) : -

Essai philosophique sur lesprobabilités,1814

1

2 0 1 2 1 2 3 4 5 6 $P(N, D)$

marginalization

$P(X, Y)$ $P(X)$

$$P(X) = \sum_{y} P(X, Y)$$

Y

$P(X) = \int_{y} P(X, y)\mathrm{d}y$

2

2.1

$P(X|Y) = \frac{P(X,Y)}{P(Y)}$ $P(Y|X) = \frac{P(X,Y)}{P(X)}$

2.2

$P(X|Y) = \frac{P(Y|X) \cdot P(X)}{P(Y)}$

$P(X|Y)$ Y X $P(X)$

3

-
-

M $working, broken$

- $P(M = working) = 0.99$
- $P(M = broken) = 0.01$

3.1 R

3.1.1

```
prior <- c(working=0.99, broken=0.01)
likelihood <- rbind(
    working = c(good = 0.99, bad = 0.01),broken = c(good = 0.6, bad = 0.4)
)
data <- c("bad", "bad", "bad", "bad")
```

3.1.2

```
bayes <-function(prior, likelihood, data)
{
posterior <-matrix(0, nrow =length(data), ncol =length(prior))
dimnames(posterior) <-list(data, names(prior))
initial_prior <-prior
for (i in 1:length(data))
{
posterior[i, ] <-
prior *likelihood[, data[i]]/
sum(prior *likelihood[, data[i]])
prior <-posterior[i, ]
}
return(rbind(initial_prior, posterior))
}
```

3.1.3

```
matplot(bayes(prior, likelihood, data), t ='b',
        lty =1, pch =20,
        col =c(3, 2))
```