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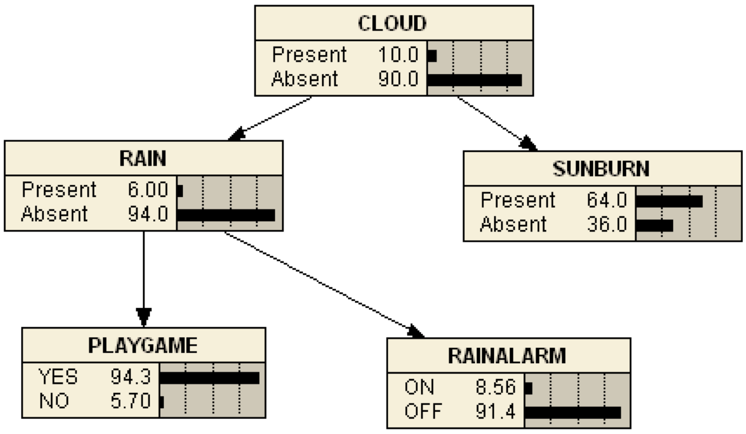
Prac 10



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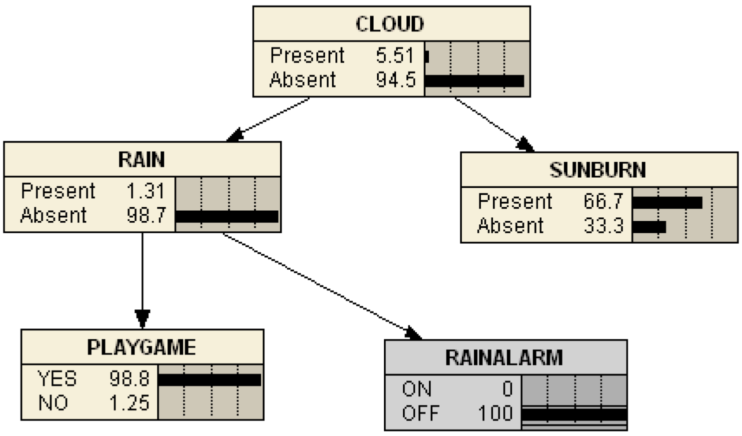
If the rain alarm does NOT go off = GOSE ON



Because the rain alarm is off, thus the rain absent becomes 98.7% is reasonable.

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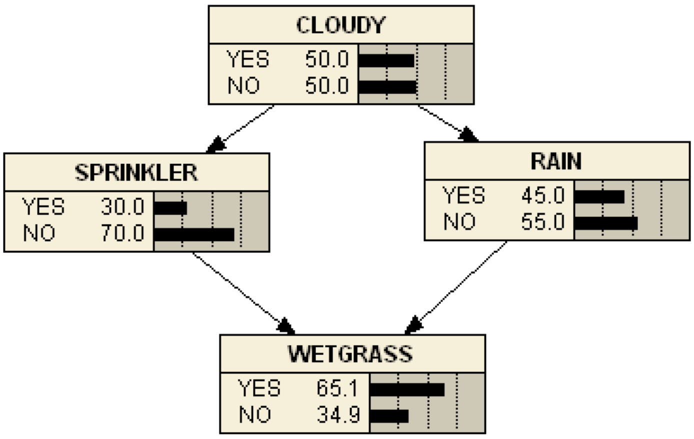


$$P(C \mid W) = \frac{P(W \mid C) \cdot P(C)}{P(W)}$$

$P(W|R,S) = 0.95$

$P(W|R,\sim S) = 0.9$

$P(W|\sim R,S) = 0.9$

$P(W|\sim R,\sim S) = 0.1$

$P(R,S|C) = P(R|C)P(S|C) = 0.8 \times 0.1 = 0.08$

$P(\sim R,S|C) = P(\sim R|C)P(S|C) = 0.2 \times 0.1 = 0.02$

$P(R,\sim S|C) = P(R|C)P(\sim S|C) = 0.8 \times 0.9 = 0.72$

$P(\sim R,\sim S|C) = P(\sim R|C)P(\sim S|C) = 0.2 \times 0.9 = 0.18$

$P(R,S|\sim C) = P(R|\sim C)P(S|\sim C) = 0.1 \times 0.5 = 0.05$

$P(\sim R,S|\sim C) = P(\sim R|\sim C)P(S|\sim C) = 0.9 \times 0.5 = 0.45$

$P(R,\sim S|\sim C) = P(R|\sim C)P(\sim S|\sim C) = 0.1 \times 0.5 = 0.05$

$P(\sim R,\sim S|\sim C) = P(\sim R|\sim C)P(\sim S|\sim C) = 0.9 \times 0.5 = 0.45$

$\because P(C) = P(\sim C) = 0.5$

$$\frac{P(W|C)\cancel{P(C)}}{P(W|C)\cancel{P(C)} + P(W|\sim C)\cancel{P(\sim C)}}$$

$$P(W|C) = P(W|R,S)P(R,S|C) + P(W|\sim R,S)P(\sim R,S|C) + P(W|R,\sim S)P(R,\sim S|C) + P(W|\sim R,\sim S)P(\sim R,\sim S|C)$$

$$= 0.95\times 0.08 + 0.9\times 0.02 + 0.9\times 0.72 + 0.1\times 0.18$$

$$= 0.076 + 0.018 + 0.648 + 0.018$$

$$= 0.76$$

$$P(W|\sim C) = P(W|R,S)P(R,S|\sim C) + P(W|\sim R,S)P(\sim R,S|\sim C) + P(W|R,\sim S)P(R,\sim S|\sim C) + P(W|\sim R,\sim S)P(\sim R,\sim S|\sim C)$$

$$= 0.95\times 0.05 + 0.9\times 0.45 + 0.9\times 0.05 + 0.1\times 0.45$$

$$= 0.0475 + 0.405 + 0.045 + 0.045$$

$$= 0.5425$$

$$\text{Answer} = \frac{0.76}{0.76 + 0.5425} = \frac{0.76}{1.3025} \approx 0.583$$

Prac 11

Formula used to calculate information of Posterior:

$$\text{(16.6)} \quad \mu_N = \frac{\sigma^2}{N\sigma_0^2 + \sigma^2}\mu_0 + \frac{N\sigma_0^2}{N\sigma_0^2 + \sigma^2} m$$

$$\text{(16.7)} \quad \frac{1}{\sigma_N^2} = \frac{1}{\sigma_0^2} + \frac{N}{\sigma^2}$$

$\sigma_0^2 = 1$

$\mu 0 = 1$

N: no. of data = 150

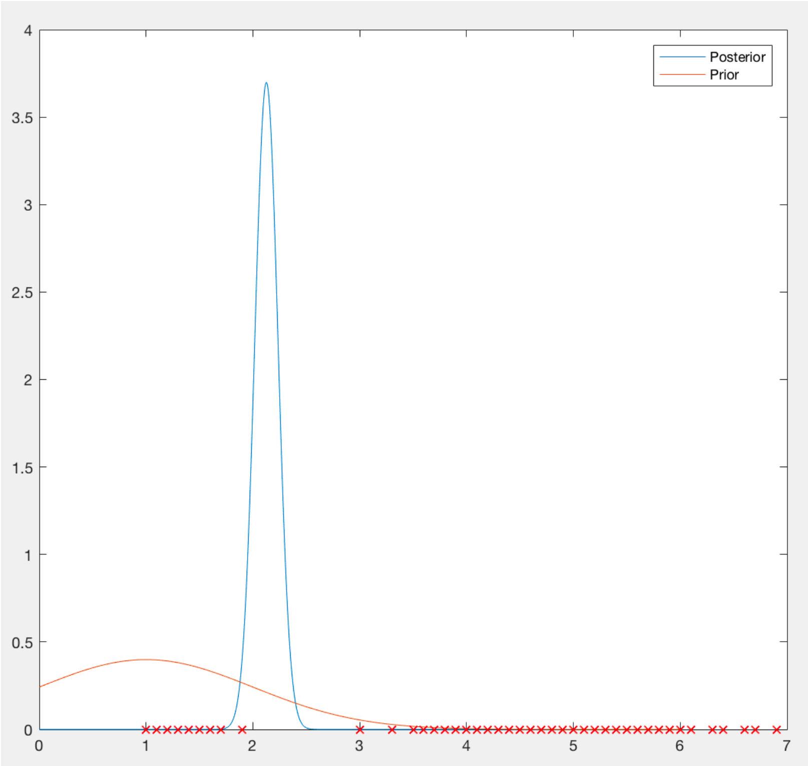
m: mean of data

σ^2*: standard deviation of data*

```
data = meas(:,3);
%% data info
my_mean = 1;
my_var = 1;
data_mean = mean(data);
data_std = std(data);
%% posterior distributions
mu_N=(data_std/(150*1+data_std))*1+(150*1/(150*data_std+data_std))*data_mean;
std_N =sqrt(1/(1/1 + size(data,1)/data_std));
%% Plot Posterior
x = linspace(0,6,1000);
y = normpdf(x,mu_N,std_N);
p1 = plot(x,y);
hold on;
%% Plot Prior
x2 = linspace(0,6,1000);
y2 = normpdf(x2,1,1);
p2 = plot(x2,y2);
hold on;
%% Plot data
plot(data,0,'rx');
hold off;
legend([p1 p2],'Posterior','Prior')
```

Name ▲	Value
data	150x1 double
data_mean	3.7580
data_std	1.7653
meas	150x4 double
mu_N	2.1264
my_mean	1
my_var	1
p1	1x1 Line
p2	1x1 Line
std_N	0.1079
x	1x1000 double
x2	1x1000 double
y	1x1000 double
y2	1x1000 double

The std of Posterior is less than the std(s) of prior and data. Thus the graph is skinner.



(Red-Crosses are data)