# DECISION TREE USING GINI INDEX.

| Weekend | Weather | Parents | Money | Decision |
|---|---|---|---|---|
| $W_1$ | Sunny | Y | R | Cinema |
| $W_2$ | Sunny | N | R | Tennis |
| $W_3$ | Windy | Y | R | Cinema |
| $W_4$ | Rainy | Y | P | Cinema |
| $W_5$ | Rainy | N | R | Stay In |
| $W_6$ | Rainy | Y | P | Cinema |
| $W_7$ | Windy | N | P | Cinema |
| $W_8$ | Windy | N | R | Shopping |
| $W_9$ | Windy | Y | R | Cinema |
| $W_{10}$ | Sunny | N | R | Tennis |

**Decision**

Cinema, Tennis, Shopping, StayIn

$$1 - \left[\left(\frac{6}{10}\right)^2 + \left(\frac{2}{10}\right)^2 + \left(\frac{1}{10}\right)^2 + \left(\frac{1}{10}\right)^2\right]$$

$= 1 - [0.36 + 0.04 + 0.01 + 0.01]$

$= 1 - 0.42 = 0.58.$

**Parents**

Yes (5), No (5).

$$1 - \left[\left(\frac{5}{5}\right)^2\right]$$

$= 1 - 1 = 0.$

$$1 - \left[\left(\frac{1}{5}\right)^2 + \left(\frac{2}{5}\right)^2 + \left(\frac{1}{5}\right)^2 + \left(\frac{1}{5}\right)^2\right]$$

$= 1 - [0.04 + 0.16 + 0.04 + 0.04]$

$= 1 - 0.28$

$= 0.72$

**Money**

Rich (7), Poor (3). $\longrightarrow 1 - \left[\left(\frac{3}{3}\right)^2\right] = 0.$

$$1 - \left[\left(\frac{3}{7}\right)^2 + \left(\frac{2}{7}\right)^2 + \left(\frac{1}{7}\right)^2 + \left(\frac{1}{7}\right)^2\right]$$

$1 - [0.18 + 0.08 + 0.02 + 0.02]$

$= 1 - 0.3$

$= 0.7$

Weighted Index $= \frac{7}{10} \times 0.7 + \frac{3}{10} \times 0.$

$= \boxed{0.49.}$

Weighted Index

$= \frac{5}{10} \times 0 + \frac{5}{10} \times 0.72$

$= \boxed{0.36}$

Weather.

Sunny, Windy, Rainy ⟶ $1-\left[\left(\frac{2}{3}\right)^2+\left(\frac{1}{3}\right)^2\right]$

(3) (4) (3).

$= 0.44.$

$1-\left[\left(\frac{1}{3}\right)^2+\left(\frac{2}{3}\right)^2\right]$ $\qquad$ $1-\left[\left(\frac{3}{4}\right)^2+\left(\frac{1}{4}\right)^2\right]$

$= 1-[0.11+0.44]$ $\qquad$ $= 0.375$

$= 0.45$

WI:

$\frac{3}{10} \times 0.45 + \frac{4}{10} \times 0.375 + \frac{3}{10} \times 0.44.$

$= 0.135 + 0.15 + 0.132$

$= \boxed{0.417}$

For Parents = Y, Decision = Cinema

for Parents = N,

Weather = Sunny, Decision = Tennis.

$1-\left[\left(\frac{2}{2}\right)^2\right] = 0.$

Weather = Rainy, Decision = Stay In

$1-\left[\left(\frac{1}{1}\right)^2\right] = 0.$

Weather = Windy, Decision = Cinema, Shopping.

$1-\left[\left(\frac{1}{2}\right)^2+\left(\frac{1}{2}\right)^2\right] = 1/2.$

$WI = 0 \times \frac{2}{5} + 0 \times \frac{1}{5} + 0.5 \times \frac{2}{5}$

$= \boxed{0.2}$

For Money = R. (Parents = No).

$$1 - \left[\left(\frac{2}{4}\right)^2 + \left(\frac{1}{4}\right)^2 + \left(\frac{1}{4}\right)^2\right] = 0.625.$$

Money = P

$$1 - \left[\left(\frac{1}{1}\right)^2\right] = 0.$$

$$\frac{4}{6} \times 0.625 + \frac{1}{6} \times 0.$$

$$= \boxed{0.5}$$

For Parent = No,

W = Sunny, Decision = Tennis.

W = Rainy, Decision = Stay In

W = Windy, Decision = Cinema, Shopping.