

Nama	Usia	Berat	Kelamin	Hipertensi
Ali	muda	overweight	pria	ya
Edi	muda	underweight	pria	tidak
Annie	muda	average	wanita	tidak
Budiman	tua	overweight	pria	tidak
Herman	tua	overweight	pria	ya
Didi	muda	underweight	pria	tidak
Rina	tua	overweight	wanita	ya
Gatot	tua	average	pria	tidak

o) Entropy Hipertensi

$$P_{ya} = 3/8 = 0,375$$

$$P_{tidak} = 5/8 = 0,625$$

$$\begin{aligned} \text{Entropy} &= - P_{\ominus} \log_2 P_{\ominus} - P_{\oplus} \log_2 P_{\oplus} \\ &= -0,625 \log_2(0,625) - 0,375 \log_2(0,375) \\ &= -0,625 \cancel{\times} -0,678 - 0,375 \cancel{\times} -1,415 \\ &= 0,424 + 0,530 = \underline{0,954} \text{ | entropy parent} \end{aligned}$$

o) Entropy usia

- muda 4

$$P(\text{muda}, ya) = 1/4 = 0,25$$

$$P(\text{muda}, \text{tidak}) = 3/4 = 0,75$$

$$\begin{aligned} \text{Entropy muda} &= - P_{\ominus} \log_2 P_{\ominus} - P_{\oplus} \log_2 P_{\oplus} \\ &= -0,75 \log_2(0,75) - 0,25 \log_2(0,25) \\ &= -0,75 \cancel{\times} -0,415 - 0,25 \cancel{\times} (-2) \\ &= 0,311 + 0,5 = 0,811 \end{aligned}$$

- tua 4

$$P(\text{tua}, \text{ya}) = 2/4 = 0,5$$

$$P(\text{tua}, \text{tidak}) = 2/4 = 0,5$$

$$\text{Entropy tua} = - P_0 \log_2 P_0 - P_+ \log_2 P_+$$

$$= -0,5 \log_2(0,5) - 0,5 \log_2(0,5)$$

$$= -0,5 * -1 - 0,5 * -1$$

$$= 0,5 + 0,5 = 1$$

$$\text{Entropy usia} = 4/8 * 0,811 + 4/8 * 1$$

$$= 0,405 + 0,15 = 0,905$$

$$\text{Information gain} = 0,954 - 0,905$$

$$= \underline{0,049} \text{ IC (Hipertensi, usia)}$$

o) Entropy berat

- overweight 4

$$P(\text{over}, \text{ya}) = 3/4 = 0,75$$

$$P(\text{over}, \text{tidak}) = 1/4 = 0,25$$

$$\text{Entropy over} = - P_0 \log_2 P_0 - P_+ \log_2 P_+$$

$$= -0,25 \log_2(0,25) - 0,75 \log_2(0,75)$$

$$= -0,25 * 2 - 0,75 * -0,415$$

$$= 0,5 + 0,311 = 0,81$$

- underweight 2

$$P(\text{under}, \text{ya}) = 0$$

$$P(\text{under}, \text{tidak}) = 2/2 = 1$$

$$\text{Entropy under} = - P_0 \log_2 P_0 - P_+ \log_2 P_+$$

$$= -1 \log_2(1) - 0 \log_2(0)$$

$$= 0$$

- average 2

$$P(\text{ave}, \text{ya}) = 0$$

$$P(\text{ave}, \text{tidak}) = 2/2 = 1$$

$$\text{Entropy ave} = 0$$

$$\text{entropy berat} = \frac{4}{8} * 0,81 + \frac{2}{8} * 0 + \frac{2}{8} * 0 \\ = 0,405$$

$$\text{information gain} = 0,954 - 0,405 \\ = 0,549 \quad | \text{IG (hipertensi, berat)}$$

② Kelamin

- Pria 6

$$P(\text{pria}, \text{ya}) = 2/6 = 0,333$$

$$P(\text{pria}, \text{tidak}) = 4/6 = 0,667$$

$$\begin{aligned} \text{Entropy pria} &= - P\ominus \log_2 P\ominus - P\oplus \log_2 P\oplus \\ &= -0,667 \log_2 (0,667) - 0,333 \log_2 (0,333) \\ &= -0,667 * -0,584 - 0,333 * -1,586 \\ &= 0,389 + 0,528 \\ &= 0,917 \end{aligned}$$

- Wanita 2

$$P(\text{wanita}, \text{ya}) = 1/2 = 0,5$$

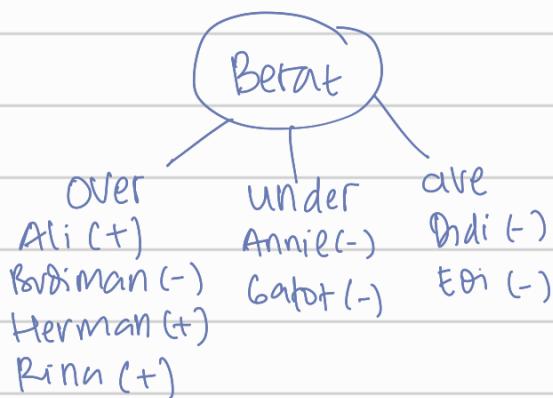
$$P(\text{wanita}, \text{tidak}) = 1/2 = 0,5$$

$$\begin{aligned} \text{Entropy wanita} &= - P\ominus \log_2 P\ominus - P\oplus \log_2 P\oplus \\ &= -0,5 \log_2 (0,5) - 0,5 \log_2 (0,5) \\ &= -0,5 * -1 - 0,5 * -1 \\ &= 0,5 + 0,5 = 1 \end{aligned}$$

$$\begin{aligned} \text{Entropy kelamin} &= \frac{6}{8} * 0,917 + \frac{2}{8} * 1 \\ &= 0,688 + 0,25 = 0,938 \end{aligned}$$

$$\begin{aligned} \text{information gain} &= 0,954 - 0,938 \\ &= 0,016 \quad | \text{IG (hipertensi, kelamin)} \end{aligned}$$

Nilai IG terbesar adalah Berat maka ini jadi Root



Nama	Usia	Berat	Kelamin	Hipertensi
Ali	muda	overweight	pria	ya
Budiman	tua	overweight	pria	tidak
Herman	tua	overweight	pria	ya
Rina	tua	overweight	wanita	ya

Overweight mempunyai + dan - maka punya leaf node

o) Entropy over-usia

- Entropy over-muda = 1

$$P(\text{over, muda, ya}) = 1 \quad P(\text{over, muda, tidak}) = 0$$

$$\text{entropy (over muda)} = 0$$

- Entropy over tua = 3

$$P(\text{over, tua, ya}) = 2/3 = 0,667$$

$$P(\text{over, tua, tidak}) = 1/3 = 0,333$$

$$\begin{aligned}
 P(\text{over, tua}) &= -P_{\text{ya}} \log_2 P_{\text{ya}} - P_{\text{tidak}} \log_2 P_{\text{tidak}} \\
 &= -0,333 \log_2 (0,333) - 0,667 \log_2 (0,667) \\
 &= -0,333 \nparallel -1,586 - 0,667 \nparallel -0,584 \\
 &= 0,528 \nparallel 0,389 \\
 &= 0,917
 \end{aligned}$$

$$\begin{aligned}
 \text{Entropy (over, usia)} &= \frac{1}{4} \nparallel 0 + 3/4 \nparallel 0,917 \\
 &= 0,688
 \end{aligned}$$

$$IG = \text{entropy (over)} - \text{Entropy (over, usia)}$$

$$= 0,81 - 0,688$$

$$= 0,122$$

o) Entropy (over, kelamin)

- Entropy over-pria = 3

$$P(\text{over}, \text{pria}, \text{ya}) = \frac{2}{3} = 0,667$$

$$P(\text{over}, \text{pria}, \text{tidak}) = \frac{1}{3} = 0,333$$

$$P(\text{over}, \text{pria}) = - P_{\ominus} \log_2 P_{\ominus} - P_{\oplus} \log_2 P_{\oplus}$$

$$= -0,333 \log_2 (0,333) - 0,667 \log_2 (0,667)$$

$$= -0,333 + -1,586 - 0,667 + -0,584$$

$$= 0,528 + 0,389$$

$$= 0,917$$

- Entropy over-wanita = 1

$$P(\text{over}, \text{wanita}, \text{ya}) = 1$$

$$P(\text{over}, \text{wanita}, \text{tidak}) = 0$$

$$\text{Entropy} = 0$$

$$\begin{aligned} \text{Entropy}(\text{over}, \text{kelamin}) &= \frac{1}{4} * 0 + \frac{3}{4} * 0,917 \\ &= 0,688 \end{aligned}$$

$$IG = \text{entropy}(\text{over}) - \text{Entropy}(\text{over}, \text{kelamin})$$

$$= 0,81 - 0,688$$

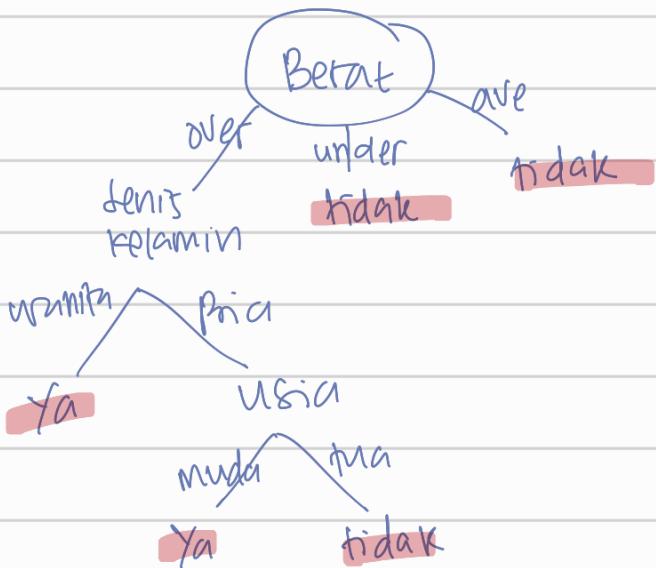
$$= 0,122$$

Nilai IG keduanya sama, sehingga tidak ada tara lain selain menggunakan menanyakan pengetahuan pakar atau percaya diri pada hasil acak



Pria mempunyai + dan -

Nama	Usia	Kelamin	Hipertensi
Ali	muda	pria	ya
Budiman	tua	pria	tidak
Herman	tua	pria	ya



Pada usia = tua ada 1 data yg menyatakan ya dan 1 data menyatakan tidak. Pilihan hanya dapat difentukkan dengan campur tangan seorang pakar.

RULE

R1 : If berat = average or berat = under weight THEN
hipertensi = tidak

R2 : If berat = overweight and kelamin = wanita THEN
hipertensi = ya

R3 : If berat = overweight and kelamin = pria and usia = muda THEN
hipertensi = ya

R4 : If berat = overweight and kelamin = pria and usia = tua THEN
hipertensi = tidak

Hasil Prediksi pada Data Training

Nama	Usia	Berat	Kelamin	Hipertensi	Prediksi
Ali	muda	overweight	pria	ya	ya
Edi	muda	underweight	pria	tidak	tidak
Annie	muda	average	wanita	tidak	tidak
Budiman	tua	overweight	pria	tidak	tidak
Herman	tua	overweight	pria	ya	tidak
Didi	muda	underweight	pria	tidak	tidak
Rina	tua	overweight	wanita	ya	ya
Gatot	tua	average	pria	tidak	tidak

$$\text{Kesalahan (e)} = \frac{1}{8} \times 100\% = 12,5\%$$