

Subyek :

Tanggal :

Ming	Sen	Sel	Rab	Kam	Jum	Sab
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Nama : Fachrun Nisa'

NIM : 3022010010

Prodi : Sistem Informatika

① Diketahui data berikut :

Online Course	Education Background	Working Status	Class
Y	Maths	NW	Pass
N	Maths	W	Fail
Y	Maths	W	Fail
Y	CS	NW	Pass
N	Other	W	Fail
Y	Other	W	Fail
Y	Maths	NW	Pass
Y	CS	NW	Pass
N	Maths	W	Pass
N	CS	W	Pass
Y	CS	W	Pass
N	Maths	NW	Pass
Y	Other	W	Fail
N	Other	NW	Fail
N	Maths	W	Fail



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## Menghitung Entropy dan Information Gain

Online Course	Pass	Fail	Total
Y	5	3	8
N	3	4	7
Total	8	7	15

$$\begin{aligned}E(Y) &= -\frac{5}{8} \times \log_2\left(\frac{5}{8}\right) - \frac{3}{8} \times \log_2\left(\frac{3}{8}\right) \\&= -0,625 \times \log_2(0,625) - 0,375 \\&\quad \times \log_2(0,375) \\&= -0,625 \times (-0,678) - 0,375 \times \\&\quad (-1,415) \\&= 0,954375\end{aligned}$$

$$\begin{aligned}E(N) &= -\frac{3}{7} \times \log_2\left(\frac{3}{7}\right) - \frac{4}{7} \times \log_2\left(\frac{4}{7}\right) \\&= -0,428 \times \log_2(0,428) - 0,571 \times \\&\quad \log_2(0,571) \\&= -0,428 \times (-1,215) - 0,571 \times \\&\quad (-0,816) \\&= 0,985956\end{aligned}$$

$$\begin{aligned}a) E(\text{Online Course}) &= p(Y) \times E(Y) + p(N) \times E(N) \\&= \frac{8}{15} \times (0,954375) + \frac{7}{15} \times \\&\quad (0,985956) \\&= 0,9691128\end{aligned}$$



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Education Background	Pass	Fail	Total
Maths	4	3	7
CS	4	0	4
Other	6	4	10
Total	14	7	21

$$\begin{aligned}
 E(\text{Maths}) &= -\frac{4}{7} \times \log_2\left(\frac{4}{7}\right) - \frac{3}{7} \times \log_2\left(\frac{3}{7}\right) \\
 &= -0,571 \times \log_2(0,571) - 0,428 \\
 &\quad \times \log_2(0,428) \\
 &= -0,571 \times (-0,816) - 0,428 \times \\
 &\quad (-1,215) \\
 &= 0,985956 //
 \end{aligned}$$

$$\begin{aligned}
 E(\text{CS}) &= -\frac{4}{4} \times \log_2\left(\frac{4}{4}\right) - \frac{0}{4} \times \log_2\left(\frac{0}{4}\right) \\
 &= -1 \times \log_2(1) - 0 \times \log_2(0) \\
 &= -1 \times 0 - 0 \\
 &= 0 //
 \end{aligned}$$

$$\begin{aligned}
 E(\text{Other}) &= -\frac{6}{10} \times \log_2\left(\frac{6}{10}\right) - \frac{4}{10} \times \log_2\left(\frac{4}{10}\right) \\
 &= 0 \times \log_2(0) - 1 \times \log_2(1) \\
 &= 0 - 1 \times 0 \\
 &= 0 //
 \end{aligned}$$

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⑤ E (Education Background)  
Information Gain

$$\begin{aligned}
 &= P(\text{Maths}) \times E(\text{Maths}) + P(\text{CS}) \times E(\text{CS}) + P(\text{Other}) \times E(\text{Other}) \\
 &= \frac{7}{15} \times (0,985956) + \frac{4}{15} \times (0) + \frac{4}{15} \times 0 \\
 &= 0,460126 + 0 + 0 \\
 &= 0,460126 //
 \end{aligned}$$

Working Status	Pass	Fail	Total
NW	5	1	6
W	3	6	9
Total	8	7	15

$$\begin{aligned}
 E(\text{NW}) &= -\frac{5}{6} \times \log_2\left(\frac{5}{6}\right) - \frac{1}{6} \times \log_2\left(\frac{1}{6}\right) \\
 &= -0,83 \times (-0,263) - 0,16 \times (-2,505) \\
 &= 0,63189 //
 \end{aligned}$$

$$\begin{aligned}
 E(\text{W}) &= -\frac{3}{9} \times \log_2\left(\frac{3}{9}\right) - \frac{6}{9} \times \log_2\left(\frac{6}{9}\right) \\
 &= -0,33 \times (-1,585) - 0,66 \times (-0,585) \\
 &= 0,13695 //
 \end{aligned}$$



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(C)  $E(\text{working status})$  Information Gain:

$$\begin{aligned} &= p(NW) \times E(NW) + p(W) \times E(W) \\ &= \frac{6}{15} \times (0,63189) + \frac{9}{15} \times (0,13695) \\ &= 0,252756 + 0,08217 \\ &= 0,334926 // \end{aligned}$$

Urutan atribut berdasarkan information gain:

1. Online Course
2. Education Background.
3. working status.



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2 Diketahui :

True Class	Predicted Class	
	Yes	No
Yes	TP	FN
No	FP	TN

		Predicted class		
		C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
Actual Class	C <sub>1</sub>	40	8	7
	C <sub>2</sub>	16	130	10
	C <sub>3</sub>	26	5	120

a) Akurasi classifier

Actual Class	Predicted Class	
	1-Yes	2 & 3 - No
1-Yes	TP-40	FN-15
2 & 3 No	FP-42	TN-265

$$\begin{aligned}
 \text{① Akurasi} &= \frac{TP + TN}{TP + FN + FP + TN} \\
 &= \frac{40 + 265}{40 + 15 + 42 + 268} \\
 &= \frac{305}{362} = 0,84 //
 \end{aligned}$$

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Actual Class	Predicted Class	
	2-Yes	1&3-No
2-Yes	TP-130	FN-26
1&3-No	FP-13	TN-198

$$\begin{aligned} &= \frac{130 + 198}{130 + 26 + 13 + 198} \\ &= \frac{328}{367} \\ &= 0,89 // \end{aligned}$$

Actual Class	Predicted Class	
	3-Yes	1&2-No
3-Yes	TP-20	FN-31
1&2-No	FP-17	TN-225

$$\begin{aligned} &= \frac{20 + 225}{20 + 31 + 17 + 225} \\ &= \frac{345}{393} \\ &= 0,87 // \end{aligned}$$

②

$$\begin{aligned} \text{Presisi Ca} &= \frac{TP}{TP + FP} \\ &= \frac{130}{130 + 13} \\ &= \frac{130}{143} = 0,90 // \end{aligned}$$