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Kelas : Kecerdasan Buatan (A)

Tugas Kecerdasan Buatan
Decision Tree

1. Bentuk sebuah Decision Tree berdasarkan data pada tabel berikut:

No	Kulit Buah	Warna	Ukuran	Bau	Kelas
1	Kasar	Coklat	Besar	keras	Aman
2	Kasar	Hijau	Besar	keras	Aman
3	Halus	Merah	Besar	Lunak	Berbahaya
4	Kasar	Hijau	Besar	Lunak	Aman
5	Kasar	Merah	Kecil	Keras	Aman
6	Halus	Merah	Kecil	Keras	Aman
7	Halus	Coklat	Kecil	Keras	Aman
8	Kasar	Hijau	Kecil	Lunak	Berbahaya
9	Halus	Hijau	Kecil	Keras	Berbahaya
10	Kasar	Merah	Besar	Keras	Aman
11	Halus	Coklat	Besar	Lunak	Aman
12	Halus	Hijau	Kecil	Keras	Berbahaya
13	Kasar	Merah	Kecil	Lunak	Aman
14	Halus	Merah	Besar	Keras	Berbahaya
15	Halus	Merah	Kecil	Keras	Aman
16	Kasar	Hijau	Kecil	Keras	Berbahaya

Entropy Kelas

$[A] = 16,\ \left[A_{aman}\right] = 10,\ \left[A_{berbahaya}\right] = 6$

$p_a = \frac{10}{16}, p_b = \frac{6}{16}$

$Entropy(A) = -\frac{10}{16}log_2\left(\frac{10}{16}\right) - \frac{6}{16}log_2\left(\frac{6}{16}\right) = 0,9544$

Entropy Bau

$\left[A_{keras}\right] = 11,\ \left[A_{lunak}\right] = 5$

$Entropy\left(A_{keras}\right) = -\frac{7}{11}log_2\left(\frac{7}{11}\right) - \frac{4}{11}log_2\left(\frac{4}{11}\right) = 0,9456$

$Entropy\left(A_{lunak}\right) = -\frac{3}{5}log_2\left(\frac{3}{5}\right) - \frac{2}{5}log_2\left(\frac{2}{5}\right) = 0,9709$

$Gain(Bau) = 0,9544 - \frac{11}{16}0,9456 - \frac{5}{16}0,9709 = 0,00087$

Entropy Ukuran

$[A_{besar}] = 7,\ [A_{kecil}] = 9$

$Entropy(A_{besar}) = -\frac{5}{7}log_2(\frac{5}{7}) - \frac{2}{7}log_2(\frac{2}{7}) = 0,8631$

$Entropy(A_{kecil}) = -\frac{5}{9}log_2(\frac{5}{9}) - \frac{4}{9}log_2(\frac{4}{9}) = 0,9911$

$Gain(Ukuran) = 0,9544 - \frac{7}{16}0,8631 - \frac{9}{16}0,9911 = 0,01934$

Entropy Warna

$[A_{coklat}] = 3,\ [A_{hijau}] = 6, [A_{merah}] = 7$

$Entropy(A_{coklat}) = -\frac{3}{3}log_2(\frac{3}{3}) - \frac{0}{3}log_2(\frac{0}{3}) = 0$

$Entropy(A_{hijau}) = -\frac{2}{6}log_2(\frac{2}{6}) - \frac{4}{6}log_2(\frac{4}{6}) = 0,9182$

$Entropy(A_{merah}) = -\frac{5}{7}log_2(\frac{5}{7}) - \frac{2}{7}log_2(\frac{2}{7}) = 0,8631$

$Gain(Warna) = 0,9544 - \frac{3}{16}0 - \frac{6}{16}0,9182 - \frac{7}{16}0,8631 = 0,23246$

Entropy Kulit Buah

$[A_{kasar}] = 8,\ [A_{halus}] = 8$

$Entropy(A_{kasar}) = -\frac{6}{8}log_2(\frac{6}{8}) - \frac{2}{8}log_2(\frac{2}{8}) = 0,8113$

$Entropy(A_{halus}) = -\frac{4}{8}log_2(\frac{4}{8}) - \frac{4}{8}log_2(\frac{4}{8}) = 1$

$Gain(Kulit\ Buah) = 0,9544 - \frac{8}{16}0,8113 - \frac{8}{16}1 = 0,04879$

$Gain(Bau) = 0,00087$

$Gain(Ukuran) = 0,01934$

$Gain(Warna) = 0,23246$

$Gain(Kulit\ Buah) = 0,04879$

Kulit Buah	Warna	Ukuran	Bau	Kelas
Kasar	Hijau	Besar	Keras	Aman
Kasar	Hijau	Besar	Lunak	Aman
Kasar	Hijau	Kecil	Lunak	Berbahaya
Halus	Hijau	Kecil	Keras	Berbahaya
Halus	Hijau	Kecil	Keras	Berbahaya
Kasar	Hijau	Kecil	Keras	Berbahaya

Entropy Kelas

$[A] = 6,\ \left[A_{aman}\right] = 2,\ \left[A_{berbahaya}\right] = 4$

$Entropy(A) = -\frac{2}{6}log_2\left(\frac{2}{6}\right) - \frac{4}{6}log_2\left(\frac{4}{6}\right) = 0,5283$

Entropy Bau

$\left[A_{keras}\right] = 4,\ \left[A_{lunak}\right] = 2$

$Entropy\left(A_{keras}\right) = -\frac{1}{4}log_2\left(\frac{1}{4}\right) - \frac{3}{4}log_2\left(\frac{3}{4}\right) = 0,8113$

$Entropy\left(A_{lunak}\right) = -\frac{1}{2}log_2\left(\frac{1}{2}\right) - \frac{1}{2}log_2\left(\frac{1}{2}\right) = 1$

$Gain(Bau) = 0,5283 - \frac{4}{6}0,8113 - \frac{2}{6}1 = 0,05977$

Entropy Ukuran

$\left[A_{besar}\right] = 2,\ \left[A_{kecil}\right] = 4$

$Entropy\left(A_{besar}\right) = -\frac{2}{2}log_2\left(\frac{2}{2}\right) - \frac{0}{2}log_2\left(\frac{0}{2}\right) = 0$

$Entropy\left(A_{kecil}\right) = -\frac{0}{4}log_2\left(\frac{0}{4}\right) - \frac{4}{4}log_2\left(\frac{4}{4}\right) = 0$

$Gain(Ukuran) = 0,5283 - \frac{2}{6}0 - \frac{4}{6}0 = 0,52832$

Entropy Kulit Buah

$[A_{kasar}] = 4,\ [A_{halus}] = 2$

$Entropy(A_{kasar}) = -\frac{2}{4}log_2\left(\frac{2}{4}\right) - \frac{2}{4}log_2\left(\frac{2}{4}\right) = 1$

$Entropy(A_{halus}) = -\frac{0}{2}log_2\left(\frac{0}{2}\right) - \frac{2}{2}log_2\left(\frac{2}{2}\right) = 0$

$Gain(Kulit\ Buah) = 0,5283 - \frac{4}{6}1 - \frac{2}{6}0 = -0,13835$

$Gain(Bau) = 0,05977$

$Gain(Ukuran) = 0,52832$

$Gain(Kulit\ Buah) = -0,13835$

Kulit Buah	Warna	Ukuran	Bau	Kelas
Halus	Merah	Besar	Lunak	Berbahaya
Kasar	Merah	Kecil	Keras	Aman
Halus	Merah	Kecil	Keras	Aman
Kasar	Merah	Besar	Keras	Aman
Kasar	Merah	Kecil	Lunak	Aman
Halus	Merah	Besar	Keras	Berbahaya
Halus	Merah	Kecil	Keras	Aman

Entropy Kelas

$[A] = 7,\ [A_{aman}] = 5,\ [A_{berbahaya}] = 2$

$Entropy(A) = -\frac{5}{7}log_2\left(\frac{5}{7}\right) - \frac{2}{7}log_2\left(\frac{2}{7}\right) = 0,8631$

Entropy Bau

$[A_{keras}] = 5,\ [A_{lunak}] = 2$

$Entropy(A_{keras}) = -\frac{4}{5}log_2\left(\frac{4}{5}\right) - \frac{1}{5}log_2\left(\frac{1}{5}\right) = 0,7219$

$Entropy(A_{lunak}) = -\frac{1}{2}log_2\left(\frac{1}{2}\right) - \frac{1}{2}log_2\left(\frac{1}{2}\right) = 1$

$$Gain(Bau) = 0,7219 - \frac{5}{7}0,7219 - \frac{2}{7}1 = 0,06174$$

Entropy Ukuran

$$[A_{besar}] = 3,\ [A_{kecil}] = 4$$

$$Entropy(A_{besar}) = -\frac{1}{3}log_2\left(\frac{1}{3}\right) - \frac{2}{3}log_2\left(\frac{2}{3}\right) = 0,9183$$

$$Entropy(A_{kecil}) = -\frac{4}{4}log_2\left(\frac{4}{4}\right) - \frac{0}{4}log_2\left(\frac{0}{4}\right) = 0$$

$$Gain(Ukuran) = 0,7219 - \frac{3}{7}0,9183 - \frac{4}{7}0 = 0,46957$$

Entropy Kulit Buah

$$[A_{kasar}] = 3,\ [A_{halus}] = 4$$

$$Entropy(A_{kasar}) = -\frac{3}{3}log_2\left(\frac{3}{3}\right) - \frac{0}{3}log_2\left(\frac{0}{3}\right) = 0$$

$$Entropy(A_{halus}) = -\frac{2}{4}log_2\left(\frac{2}{4}\right) - \frac{2}{4}log_2\left(\frac{2}{4}\right) = 1$$

$$Gain(Kulit\ Buah) = 0,7219 - \frac{3}{7}0 - \frac{4}{7}1 = 0,29169$$

$$Gain(Bau) = 0,06174$$

$$Gain(Ukuran) = 0,46957$$

$$Gain(Kulit\ Buah) = 0,29169$$

Kulit Buah	Ukuran	Bau	Kelas
Halus	Besar	Lunak	Berbahaya
Kasar	Besar	Keras	Aman
Halus	Besar	Keras	Berbahaya

Entropy Kelas

$$[A] = 3,\ [A_{aman}] = 1,\ [A_{berbahaya}] = 2$$

$$Entropy(A) = -\frac{1}{3}log_2\left(\frac{1}{3}\right) - \frac{2}{3}log_2\left(\frac{2}{3}\right) = 0,5283$$

Entropy Bau

$\left[A_{keras}\right] = 2,\ \left[A_{lunak}\right] = 1$

$Entropy\left(A_{keras}\right) = -\frac{1}{2}log_2\left(\frac{1}{2}\right) - \frac{1}{2}log_2\left(\frac{1}{2}\right) = 1$

$Entropy\left(A_{lunak}\right) = -\frac{0}{1}log_2\left(\frac{0}{1}\right) - \frac{1}{1}log_2\left(\frac{1}{1}\right) = 0$

$Gain(Bau) = 0,52839 - \frac{2}{3}1 - \frac{1}{3}0 = -0,13835$

Entropy Kulit Buah

$\left[A_{kasar}\right] = 1,\ \left[A_{halus}\right] = 2$

$Entropy\left(A_{kasar}\right) = -\frac{1}{1}log_2\left(\frac{1}{1}\right) - \frac{0}{1}log_2\left(\frac{0}{1}\right) = 0$

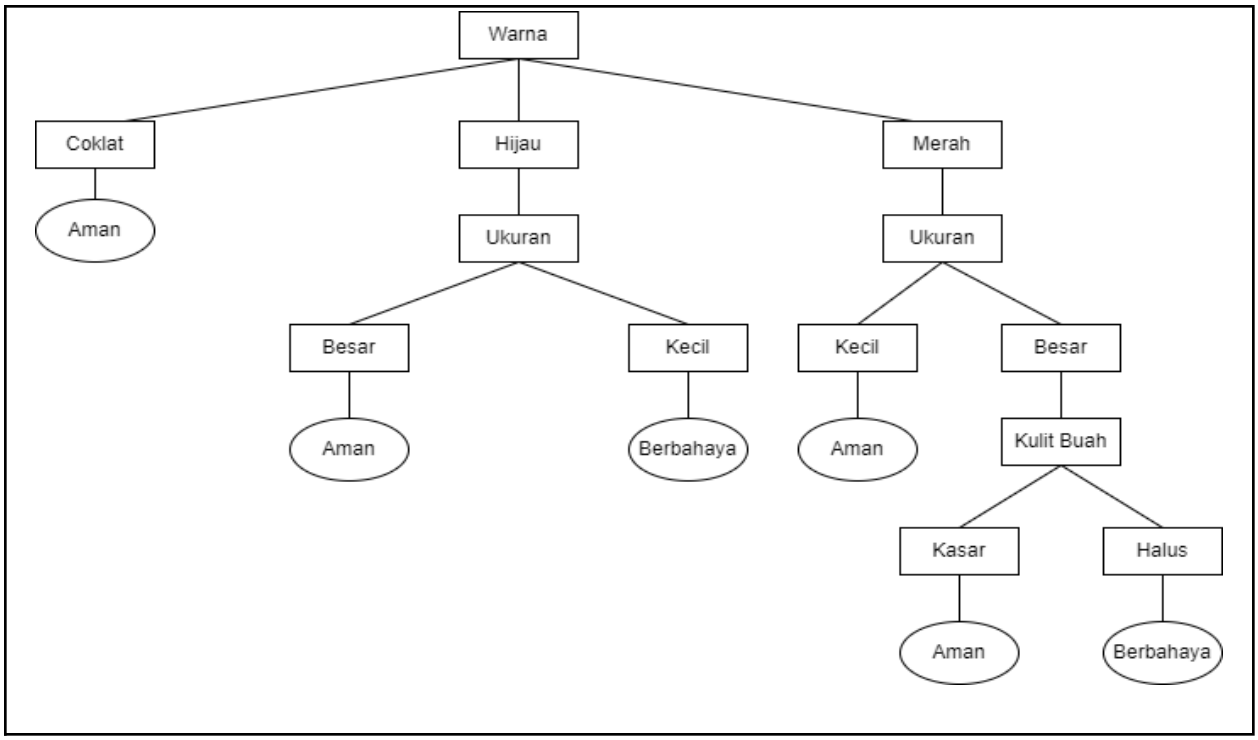
$Entropy\left(A_{halus}\right) = -\frac{0}{2}log_2\left(\frac{0}{2}\right) - \frac{2}{2}log_2\left(\frac{2}{2}\right) = 0$

$Gain(Kulit\ Buah) = 0,5283 - \frac{1}{3}0 - \frac{2}{3}0 = 0,52832$

$Gain(Bau) = -0,13835$

$Gain(Kulit\ Buah) = 0,52832$

Berdasarkan perhitungan tersebut dapat dibuat dalam bentuk Tree Sebagai Berikut


Warna
Coklat
Hijau
Merah
Aman
Ukuran
Ukuran
Besar
Kecil
Kecil
Besar
Aman
Berbahaya
Aman
Kulit Buah
Kasar
Halus
Aman
Berbahaya