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# Firman Memulai Syahrani

Untuk Menghitung Information Gain Secara manual dari dat yang diberikan Information Gain (IG) Mengukur Pengurangan ketidakpastian tentang kelas (class) Setelah mengetahui atribut (Online Course, Education Background, Working Status)

Langkah-langkah menghitung Information Gain :

1. Hitung entropi kelas (class) :

Entropi adalah ukuran ketidakpastian, Entropi H untuk variabel kelass (Pass/Fail) dapat hitung dengan rumus

$$H(Class) = -\sum_{i=1}^{k} P_i \log_2 P_i$$

- $H(class) = -\left(\frac{7}{15}\log_2\frac{7}{15} + \frac{8}{15}\log_2\frac{8}{15}\right)$

$H(class) = -(0.467 \log_2 0.467 + 0.533 \log_2 0.533)$

$H(Class) = -(0.467 \times -1.098 + 0.533 \times -0.918)$

$H(Class) = 0.988$

2. menghitung entropi kondisional dan Information Gain untuk Setiap Atribut

Entropi untuk (Y)

$$H(class|Y) = -\left(\frac{4}{7}\log_2\frac{4}{7} + \frac{3}{7}\log_2\frac{3}{7}\right)$$

$H(class|Y) = -(0.571 \log_2 0.571 + 0.429 \log_2 0.429)$

$H(class|Y) = 0.985$

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Entropi (N): $H(\text{class}|N) = -\left(\frac{3}{8}\log_2\frac{3}{8} + \frac{5}{8}\log_2\frac{5}{8}\right)$

$H(\text{class}|N) = -(0,375\log_2 0,375 + 0.625\log_2 0625)$

$H(\text{class}|N) = 0.959$

Entropi kondisional: $H(\text{class}|\text{online course}) = \frac{7}{15}H(\text{class}|Y) + \frac{8}{15}H(\text{class}|N)$

$H(\text{class}|\text{online course}) = \frac{7}{15} \times 0,985 + \frac{8}{15} \times 0.954$

$H(\text{class}|\text{online course}) = 0.969$

2. Information Gain (class, Education Background)

- Education Background : Math

$H(\text{class}|\text{Math}) = -\left(\frac{4}{6}\log_2\frac{4}{6} + \frac{2}{6}\log_2\frac{2}{6}\right)$

$H(\text{class}|\text{Math}) = -(0.667\log_2 0.667 + 0.333\log_2 0.333)$

$H(\text{class}|\text{Math}) = 0.918$

- Education Background : ~~Math~~ CS

$H(\text{class}|\text{CS}) = -\left(\frac{3}{3}\log_2\frac{3}{3} + \frac{0}{3}\log_2\frac{0}{3}\right)$

$H(\text{class}|\text{CS}) = 0$

- Education Background : Other

$H(\text{class}|\text{other}) = -\left(\frac{2}{6}\log_2\frac{0}{6} + \frac{6}{6}\log_2\frac{6}{6}\right)$

$H(\text{class}|\text{other}) = 0$

Menggasumsikan Semua :

$$H = \frac{6}{15} + \frac{3}{15} + \frac{6}{15}$$

$$H = \frac{6}{15} \times 0.918 + \frac{3}{15} \times 0 + \frac{6}{15} \times 0$$

$$H = 0.367$$

Information Gain

$$IG = 0.983 - 0.367 = 0.616$$

3. Information Gain (class, Working Status)

- Working Status W

$$H = -\left(\frac{3}{8} \log_2 \frac{3}{8} + \frac{5}{8} \log_2 \frac{5}{8}\right)$$

$$H = -\left(0.375 \log_2 0.375 + 0.625 \log_2 0.625\right)$$

$$H = 0.954$$

- Working Status : NW

$$H = -\left(\frac{4}{7} \log_2 \frac{4}{7} + \frac{3}{7} \log_2 \frac{3}{7}\right)$$

$$H = -(0.571 \log_2 0.571 + 0.429 \log_2 0.429)$$

$$H = 0.985$$

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Menggunakan Semua

$$H = \frac{8}{15} H(\text{class} | W) + \frac{7}{15} (\text{class} | NW)$$

$$H = \frac{8}{15} \sqrt{0,954} + \frac{7}{15} \sqrt{0,985}$$

$$H = 0,969$$

Information gain

$$IG = 0.983 - 0.969 = 0.014$$

Kesimpulan

- Information Gain (class; Online Course): 0.014
- Information Gain (Class; Education Background) : 0.016
- Information Gain (Class; Working Status) : 0.014

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Akurasi : $\frac{\text{Jumlah prediksi yang benar}}{\text{Total Jumlah Prediksi}}$

Total prediksi = 110 + 8 + 7 + 16 + 180 + 10 + 26 + 5 + 120 = 932

Prediksi yang benar : 110 + 180 + 120 = 360

Akurasi : $\frac{360}{932} = 0.8337$ (83.37 %)

Presisi ($c_2$) $\frac{\text{True positive untuk } c_2}{\text{True positive untuk } c_2 + \text{false positive untuk } c_2}$

false positive untuk $c_2$ : 8 + 5 = 13

Presisi ($c_2$) : $\frac{180}{180+13} = \frac{180}{193} = 0.9091$ (90,91%)

Ringkasan:

Akurasi keseluruhan : 83,37 %
Presisi untuk kelas : 90.91 %