

Classes:

mammal: 5
reptile: 3
fish: 3
amphibian : 2
bird: 2

Entropy $E(D) = -(5/15 \cdot \log(5/15) + 3/15 \cdot \log(3/15) + 3/15 \cdot \log(3/15) + 2/15 \cdot \log(2/15) + 2/15 \cdot \log(2/15))$
=2.23

BODY TEMPERATURE (BT)

warm-blooded: 7 (MMMBMBM) $P_m=5/7$; $P_b=2/7$
cold-blooded: 8 (RFARFRFA) $P_r=3/8$; $P_f=3/8$; $P_a=2/8$

Entropy (BT) = $-(7/15 \cdot (5/7 \cdot \log(5/7) + 2/7 \cdot \log(2/7)) + 8/15 \cdot (3/8 \cdot \log(3/8) + 3/8 \cdot \log(3/8) + 2/8 \cdot \log(2/8)))$
=1.23

SKIN COVER (SC)

hair: 3 (MMM) $P_m=1$
scales: 6 (RFRFRF) $P_r=1/2$; $P_f=1/2$;
none: 2 (AA) $P_a=1$
feathers: 2 (BB) $P_b=1$
fur: 1 (M) $P_m=1$
quills: 1 (M) $P_m=1$

Entropy (SC) = $-(3/15 \cdot (1 \cdot \log 1) + 6/15 \cdot (1/2 \cdot \log(1/2) + 1/2 \cdot (\log(1/2))) + 2/15 \cdot (1 \cdot \log 1) + 2/15 \cdot (1 \cdot \log 1) + 1/15 \cdot (1 \cdot \log 1) + 1/15 \cdot (1 \cdot \log 1)) = 0.4$

GIVES BIRTH (GB)

yes: 6 (MMMMFM) $P_m=5/6$; $P_f=1/6$;
no: 9 (RFARBRBFA) $P_r=1/3$; $P_f=2/9$; $P_a=2/9$; $P_b=2/9$

Entropy(GB)=1.43

AQUATIC(A)

yes: 4 (FMFF) $P_f=3/4$; $P_m=1/4$
no: 7 (MRRMBMM) $P_m=4/7$; $P_r=2/7$; $P_b=1/7$
semi: 4 (ARBA) $P_a=1/2$; $P_r=1/4$; $P_b=1/4$

Entropy(A)=1.25

AERIAL(AR)

yes: 2 (MB) $P_m=1/2$; $P_b=1/2$
no: 13 (MRFMARMFRBMFA) $P_m=4/13$; $P_r=3/13$; $P_f=3/13$; $P_a=2/13$; $P_b=1/13$

Entropy(AR)=2

HAS LEGS(HL)

yes: 10 (MARMBMRBMA) $P_m=4/10$; $P_a=2/10$; $P_r=2/10$; $P_b=2/10$
no: 5 (RFMFF) $P_r=1/5$; $P_f=3/5$; $P_m=1/5$

Entropy(HL)=1.72

HIBERNATES (HIB)

yes: 5 (RAMMA) $P_m=2/5$; $P_r=1/5$; $P_a=2/5$
no: 10 (MFMRBMRBFB) $P_m=3/10$; $P_f=3/10$; $P_r=2/10$; $P_b=2/10$

Entropy(HIB)=1.65

Gain ratios:

Body Temperature: $E(D) - E(BT) = 2.23 - 1.23 = 1$

Skin cover: $E(D) - E(SC) = 2.23 - 0.4 = 1.83$

Gives Birth: $E(D) - E(GB) = 2.23 - 1.43 = 0.8$

Aquatic: $E(D) - E(A) = 2.23 - 1.25 = 0.98$

Aerial: $E(D) - E(AR) = 2.23 - 2 = 0.23$

HasLegs: $E(D) - E(HL) = 2.23 - 1.72 = 0.51$

Hibernates: $E(D) - E(HIB) = 2.23 - 1.65 = 0.58$

The highest gain ratio will be obtained if we split on attribute Skin Cover => this attribute is the best split point.