

Artificial Intelligence

Tutorial week 2 – Machine Learning

COMP3411

1. Consider the task of predicting whether children are likely to be hired to play members of the Von Trapp Family in a production of The Sound of Music, based on the data in Table :

height	hair	eyes	hired
short	blond	blue	+
tall	red	blue	+
tall	blond	blue	+
tall	blond	brown	-
short	dark	blue	-
tall	dark	blue	-
tall	dark	brown	-
short	blond	brown	-

Entropy(parent,hired)=0.954

1. Compute the information (entropy) gain for each of the three attributes (height, hair, eyes) in terms of classifying items as belonging to the class, + or - .
2. Construct a decision tree based on the minimum entropy principle.
3. Use your tree to predict whether a short person with red hair and brown eyes would likely be hired. yes

2. The Laplace error estimate for pruning a node in a Decision Tree is given by:

$$E = 1 - \frac{n + 1}{N + K}$$

where N is the total number of items, n is the number of items in the majority class and k is the number of classes. Given a subtree where parents are [4, 7], left child is [2, 1], and the right child is [2, 6], should the children be pruned or not? Show your calculations.

$$(3/11)(2/5) + (8/11)(3/10) = ??? \\ = 0.327$$

k=2

$$E1 = 1 - (7+1)/(11+2) = 5/13 = 0.358$$

$$E2 = 1 - (2+1)/(3+2) = 2/5 = 0.4$$

$$E3 = 1 - (6+1)/(8+2) = 3/10 = 0.3 \quad 1$$