Entropy and Information Gain

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Entropy and Information Gain: restaurant example

- For c classes:

$$H(S) = \sum_{i=1}^{c} -p_i \log_2 p_i$$

where p_i is the proportion of the examples in c_i.

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- Entropy for 2 classes:

$$H(S) = \sum_{i=1}^{2} -p_i \log_2 p_i$$

where p_i is the proportion of the examples in c_i.

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- Entropy for 2 classes:

$$H(S) = \sum_{i=1}^{2} -p_i \log_2 p_i$$

where p_i is the proportion of the examples in c_i.

- Information gain:

$$Gain(S, A) = H(S) - \sum_i \frac{|S_i|}{|S|} H(S_i)$$

The weight is the proportion of examples in that set.

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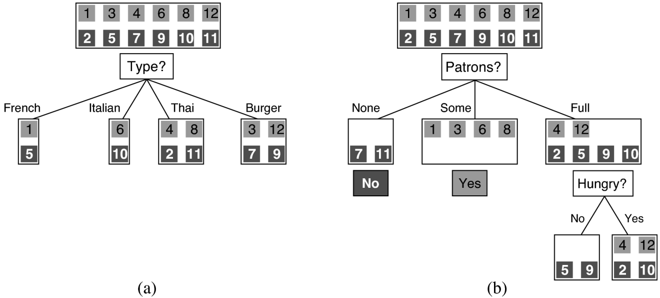

$$H(S) = -\frac{6}{12}\log_2\frac{6}{12} - \frac{6}{12}\log_2\frac{6}{12} = 0.5 + 0.5 = 1$$

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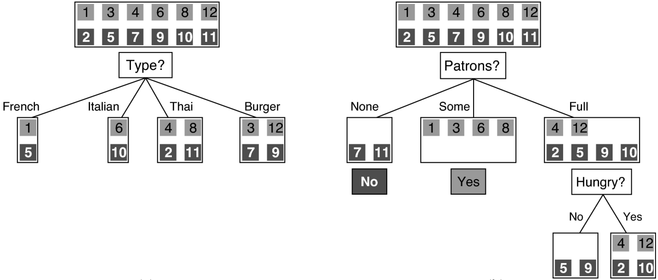

(a) (b)

$$H(S) = -\frac{6}{12}\log_2\frac{6}{12} - \frac{6}{12}\log_2\frac{6}{12} = 0.5 + 0.5 = 1$$

$$\frac{|S_i|}{|S|}H(S_i = none) = \frac{2}{12}\left(-\frac{0}{2}\log_2\frac{0}{2} - \frac{2}{2}\log_2\frac{2}{2}\right) = \frac{2}{12}(-\log_2 1)$$

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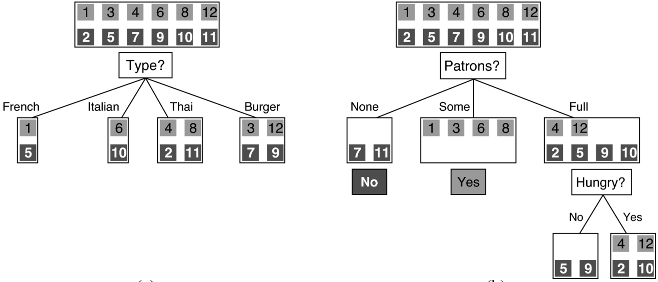

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$$\frac{|S_i|}{|S|}H(S_i = some) = \frac{4}{12}\left(-\frac{4}{4}\log_2\frac{4}{4} - \frac{0}{4}\log_2\frac{0}{4}\right) = \frac{4}{12}(-\log_2 1)$$

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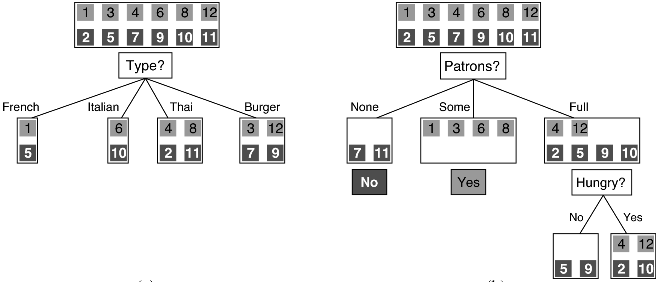

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$$\frac{|S_i|}{|S|}H(S_i = full) = \frac{6}{12}\left(-\frac{2}{6}\log_2\frac{2}{6} - \frac{4}{6}\log_2\frac{4}{6}\right)$$

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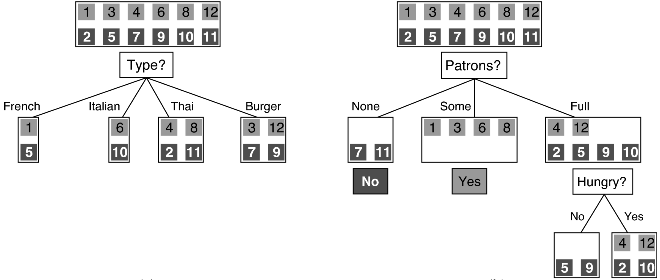

(a) (b)

$$Gain(Patrons) = 1 - \frac{2}{12}(-\log_2 1) - \frac{4}{12}(-\log_2 1) - \frac{6}{12}(-\frac{2}{6}\log_2\frac{2}{6} - \frac{4}{6}\log_2\frac{4}{6})$$

$$Gain(Patrons) = 0.54$$

Similarly Gain(Type) = 0