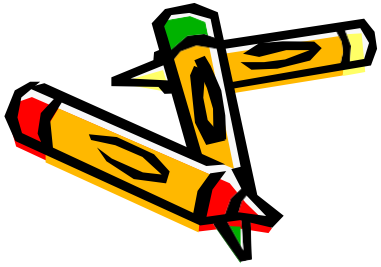
信源的分类

- 离散信源

离散分布

{ 无记忆 {

有记忆 {



信源的描述

$$X = \{x_1, x_2, \cdots, x_n\}$$

$$P = \{p(x_1),\ p(x_2),\ \cdots\ , p(x_n)\}$$

先验概率

离散

概率空间

$$\begin{bmatrix} X \\ P \end{bmatrix} = \begin{bmatrix} x_1 & x_2 & \cdots & x_n \\ p(x_1) & p(x_2) & \cdots & p(x_n) \end{bmatrix}$$

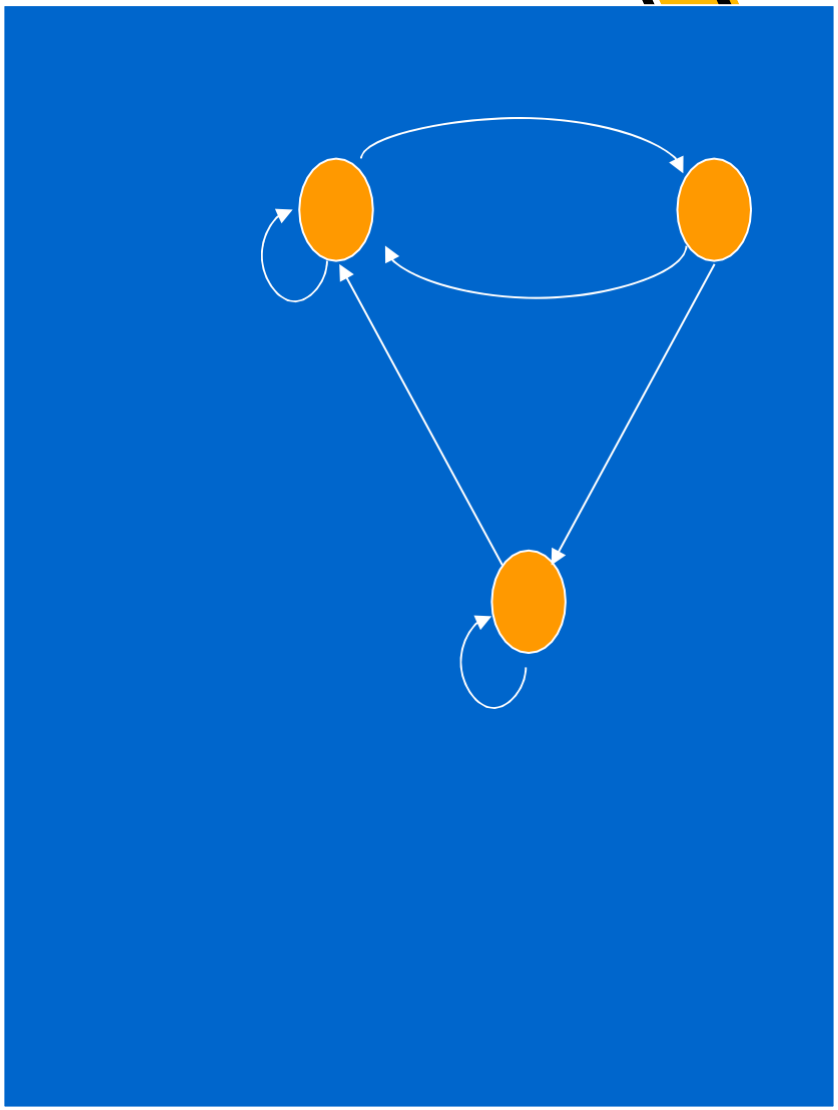
$$p(x_i) \geq 0$$

$$\sum_{i=1}^{n} p(x_i) = 1$$

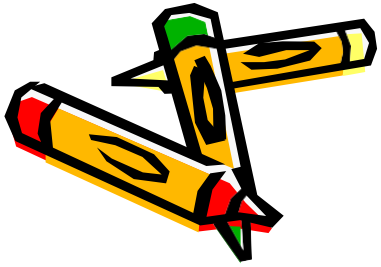
马氏链的基本概念

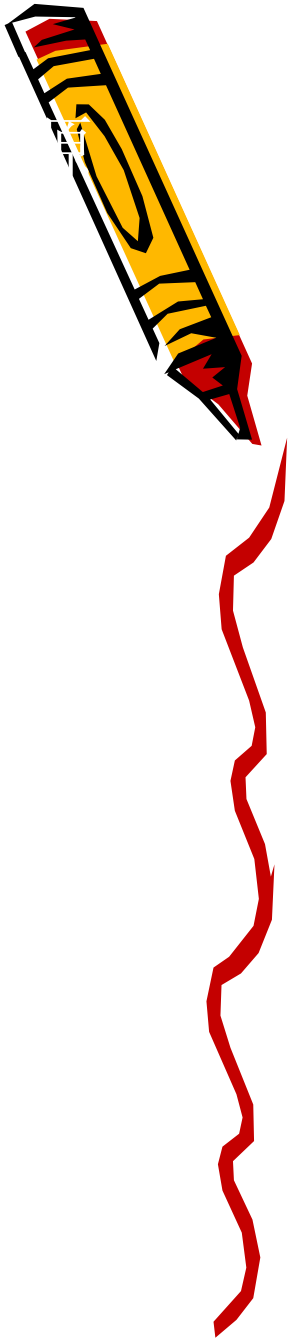
符号

状态



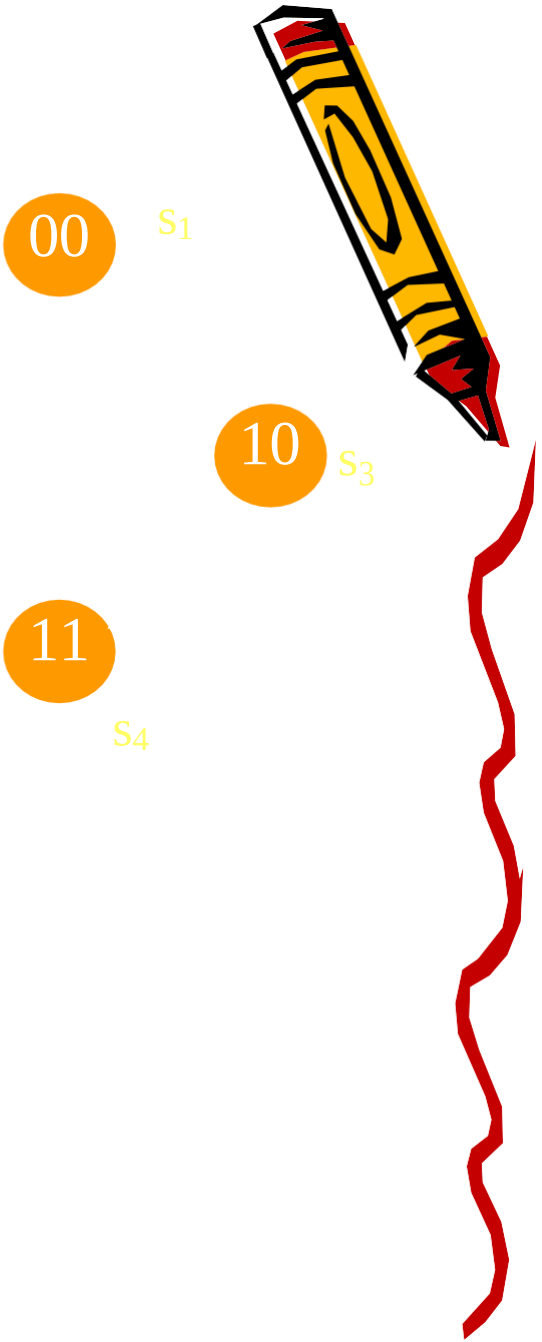
- 例2-2





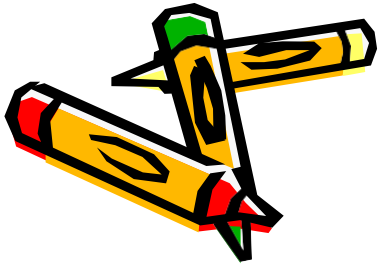
- 符号

$$p(a_j \mid s_i) = \begin{array}{c} \\ s_1 \\ s_2 \\ s_3 \\ s_4 \end{array} \begin{array}{c} \begin{array}{cc} a_0 & a_1 \end{array} \\ \begin{bmatrix} 1/2 & 1/2 \\ 1/3 & 2/3 \\ 1/4 & 3/4 \\ 1/5 & 4/5 \end{bmatrix} \end{array}$$



- 状态转移

$$p(s_j \mid s_i) = \begin{array}{c} \\ s_1 \\ s_2 \\ s_3 \\ s_4 \end{array} \begin{array}{c} \begin{array}{cccc} s_1 & s_2 & s_3 & s_4 \end{array} \\ \begin{bmatrix} 1/2 & 1/2 & 0 & 0 \\ 0 & 0 & 1/3 & 2/3 \\ 1/4 & 3/4 & 0 & 0 \\ 0 & 0 & 1/5 & 4/5 \end{bmatrix} \end{array}$$



$$\sum_i W_i p_{ij} = W_j \quad \Rightarrow \quad \begin{cases} \frac{1}{2}W_1 + \frac{1}{2}W_3 = W_1 \\ \frac{1}{2}W_1 + \frac{3}{4}W_3 = W_2 \\ \frac{1}{3}W_2 + \frac{1}{5}W_4 = W_3 \\ \frac{2}{3}W_2 + \frac{4}{5}W_4 = W_4 \end{cases}$$

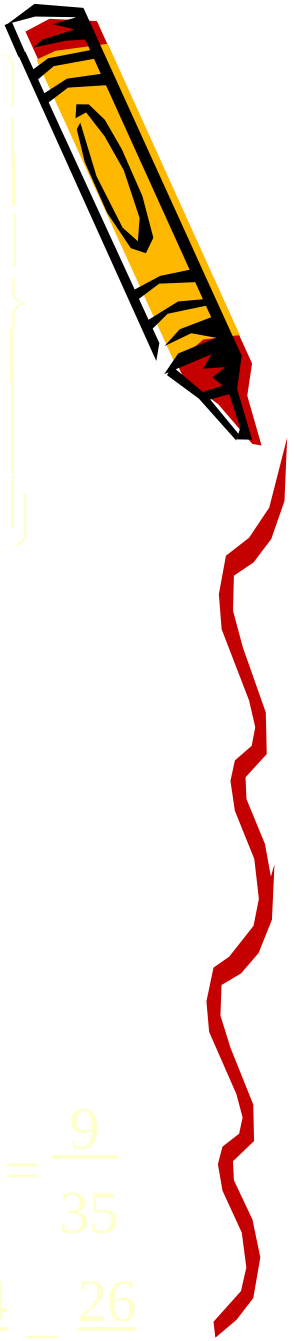
$$W_1 + W_2 + W_3 + W_4 = 1$$

$$W_1 = \frac{3}{35}, \quad W_2 = \frac{6}{35}, \quad W_3 = \frac{6}{35}, \quad W_4 = \frac{4}{7}$$

$$p(a_1) = \sum_i p(a_1 \mid s_i)\, p(s_i) = \frac{1}{2} \times \frac{3}{35} + \frac{1}{3} \times \frac{6}{35} + \frac{1}{4} \times \frac{6}{35} + \frac{1}{5} \times \frac{4}{7} = \frac{9}{35}$$

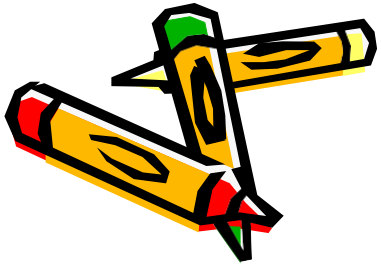
$$p(a_2) = \sum_i p(a_2 \mid s_i)\, p(s_i) = \frac{1}{2} \times \frac{3}{35} + \frac{2}{3} \times \frac{6}{35} + \frac{3}{4} \times \frac{6}{35} + \frac{4}{5} \times \frac{4}{7} = \frac{26}{35}$$





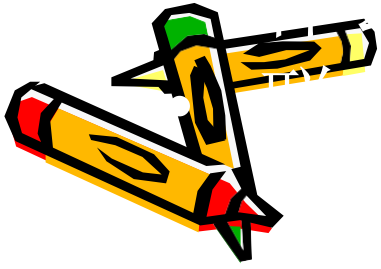


2.2 离散信源熵和互信息



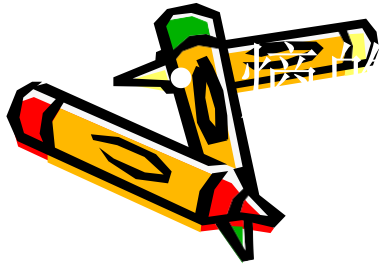
离散信源熵和互信息

- 问题：



离散信源熵和互信息

- 问题：



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