

Ex 11.1

sequence:  $x_1=1, x_2=2, x_3=1$ 

$$c.) \quad v_S(0)=1$$

$$v_A(0)=0, v_B(0)=0, v_C(0)=0$$

$$V_S(1)=0$$

$$\begin{aligned} V_A(1) &= e_A(x_1=1) \cdot \max_k (a_{kA} \cdot v_k(i-1)) \\ &= 0.7 \cdot \max \left( \underbrace{(0.5 \cdot 0.4 \cdot 0.4 \cdot 1)}_{k=S}, \underbrace{(0.5 \cdot 0)}_{k=A}, \underbrace{(0 \cdot 0)}_{k=B}, \underbrace{(0 \cdot 0)}_{k=C} \right) \\ &= 0.63 \end{aligned}$$

$$Ptr_A(1)=S$$

$$v_B(1) = e_B(x_1=1) \cdot (0.1 \cdot 1) = 0.4 \cdot 0.1 = 0.04$$

$$Ptr_B(1)=S$$

$$v_C(1)=0, Ptr_C(1)=\text{---}$$

$$\begin{aligned} V_A(2) &= e_A(x_2=2) \cdot \max (a_{SA} \cdot v_S(1) + a_{AA} \cdot v_A(1) + a_{BA} \cdot v_B(1) + a_{CA} \cdot v_C(1)) \\ &= 0.3 \cdot 0.63 \cdot 0.5 = 0.0945 \end{aligned}$$

$$Ptr_A(2)=A$$

$$\begin{aligned} V_B(2) &= e_B(x_2=2) \cdot \max (0.63 \cdot 0.3; 0.04 \cdot 0.6) = 0.3 \cdot \max(0.189, 0.024) \\ &= 0.3 = 0.0567 \end{aligned}$$

$$Ptr_B(2)=A$$

$$V_C(2) = e_C(x_2=2) \cdot \max (0.63 \cdot 0.2; 0.04 \cdot 0.4) = 0.2 \cdot \max(0.126, 0.016) = 0.0378$$

$$V_A(3) = e_A(x_3=1) \cdot \max (0.0945 \cdot 0.5) = 0.033075$$

$$Ptr_A(3)=A$$

$$\begin{aligned} V_B(3) &= e_B(x_3=1) \cdot \max (0.0945 \cdot 0.3; 0.0567 \cdot 0.6) = 0.4 \cdot \max(0.02835, 0.03402) \\ &= 0.4 \cdot \max(0.02835, 0.03402) = 1.3608 \cdot 10^{-3} \end{aligned}$$

$$Ptr_B(3)=B$$

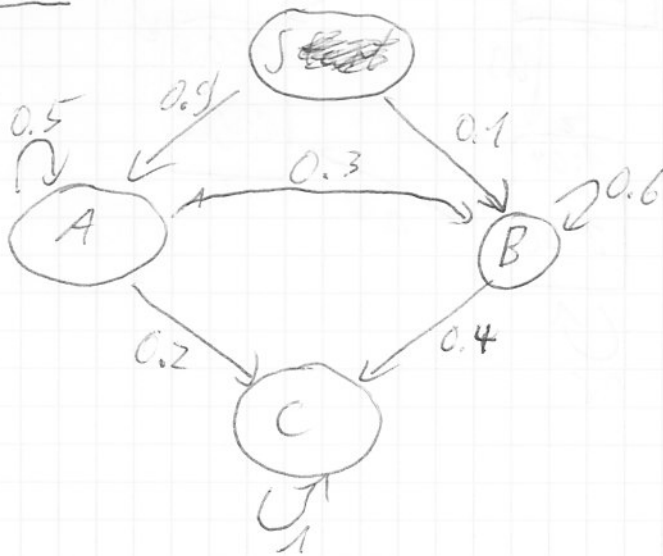
$$\begin{aligned} V_C(3) &= e_C(x_3=1) \cdot \max (0.0945 \cdot 0.2; 0.0567 \cdot 0.4; 0.0378 \cdot 1) \\ &= 0.7 \cdot 0.0378 = 0.02646 \end{aligned}$$

$$Ptr_C(3)=C$$

most likely hidden sequence: S, A, A, A

# Exercise Sheet 11

## Ex 11.1



$$A: \begin{matrix} 1 \rightarrow 0.7 \\ 2 \rightarrow 0.3 \end{matrix}$$

$$B: \begin{matrix} 1 \rightarrow 0.4 \\ 2 \rightarrow 0.6 \end{matrix}$$

$$C: \begin{matrix} 1 \rightarrow 0.8 \\ 2 \rightarrow 0.2 \end{matrix}$$

$$a.) x_1 = 1, x_2 = 2, x_3 = 1$$

$$f_S(0) = 1, f_A(0) = 0, f_B(0) = 0, f_C(0) = 0$$

$$\begin{aligned} f_A(1) &= e_A(x_1=1) \cdot (f_S(0) \cdot a_{SA} + f_A(0) \cdot a_{AA} + f_B(0) \cdot a_{BA} + f_C(0) \cdot a_{CA}) \\ &= 0.7 \cdot (1 \cdot 0.9 + 0 + 0 + 0) = 0.63 \end{aligned}$$

$$\begin{aligned} f_B(1) &= e_B(x_1=1) \cdot (f_S(0) \cdot a_{SB} + f_A(0) \cdot a_{AB} + f_B(0) \cdot a_{BB} + f_C(0) \cdot a_{CB}) \\ &= 0.4 \cdot (1 \cdot 0.1 + 0 + 0 + 0) = 0.04 \end{aligned}$$

$$f_C(1) = 0.8 \cdot 0 = 0$$

$$\begin{aligned} f_A(2) &= e_A(x_2=2) \cdot (f_S(1) \cdot a_{SA} + f_A(1) \cdot a_{AA} + f_B(1) \cdot a_{BA} + f_C(1) \cdot a_{CA}) \\ &= 0.3 \cdot (0 + 0.63 \cdot 0.5 + 0.04 \cdot 0 + 0 \cdot 0) = 0.0945 \end{aligned}$$

$$f_B(2) = 0.6 \cdot (0.63 \cdot 0.3 + 0.04 \cdot 0.6) = 0.1278$$

$$f_C(2) = 0.2 \cdot (0.63 \cdot 0.2 + 0.04 \cdot 0.4 + 0) = 0.0254$$

$$f_A(3) = 0.7 \cdot (0.0945 \cdot 0.5 + 0.1278 \cdot 0.3 + 0.0254 \cdot 0.2) = 0.033075$$

$$f_B(3) = 0.4 \cdot (0.0945 \cdot 0.3 + 0.1278 \cdot 0.6 + 0.0254 \cdot 0.4) = 0.042012$$

$$f_C(3) = 0.8 \cdot (0.0945 \cdot 0.2 + 0.1278 \cdot 0.4 + 0.0254 \cdot 1) = 0.078736$$

$$P(x_1 x_2 x_3) = f_A(3) + f_B(3) + f_C(3) = \underline{\underline{0.153823}}$$