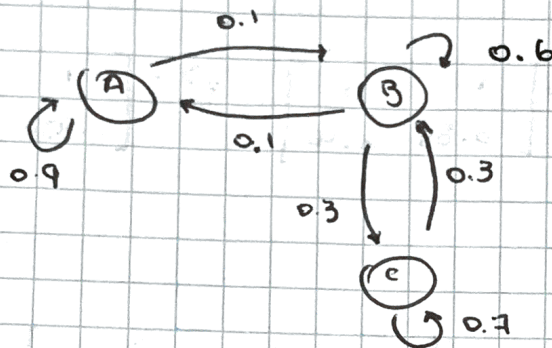


Activity 07 - Markov Chains

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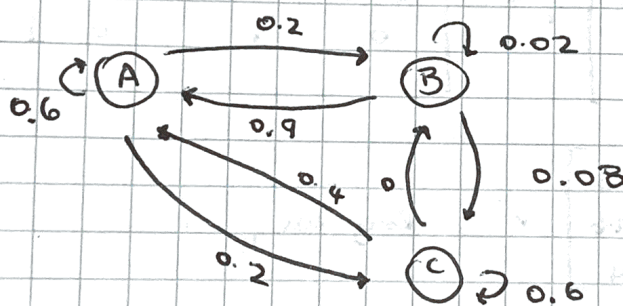
ex 10, 11, 15

(10)



$$P = \begin{bmatrix} 0.9 & 0.1 & 0 \\ 0.1 & 0.6 & 0.3 \\ 0 & 0.3 & 0.7 \end{bmatrix}$$

(11)



$$P = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.9 & 0.02 & 0.08 \\ 0.4 & 0 & 0.6 \end{bmatrix}$$

(15)

$$E = \begin{bmatrix} 0.8 & 0.1 & 0.1 \\ 0.3 & 0.6 & 0.1 \\ 0 & 1 & 0 \end{bmatrix}$$

$$E^2 = \begin{bmatrix} 0.67 & 0.24 & 0.09 \\ 0.42 & 0.49 & 0.09 \\ 0.3 & 0.6 & 0.1 \end{bmatrix}$$

$$E^3 = \begin{bmatrix} 0.608 & 0.301 & 0.091 \\ 0.483 & 0.426 & 0.091 \\ 0.42 & 0.49 & 0.09 \end{bmatrix}$$

Probability that state 1 changes to state 2 after 3 repetitions

$$E^3 = \begin{matrix} & \begin{matrix} s1 & s2 & s3 \end{matrix} \\ \begin{matrix} s1 \\ s2 \\ s3 \end{matrix} & \begin{bmatrix} 0.608 & \textcircled{0.301} & 0.091 \\ 0.483 & 0.426 & 0.091 \\ 0.42 & 0.49 & 0.09 \end{bmatrix} \end{matrix} ; p = 0.301$$

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ex. 19 to 22

A matrix is regular if some power of the matrix has all positive entries,,

• which matrices are regular?

(19) $A = \begin{bmatrix} 0.2 & 0.8 \\ 0.9 & 0.1 \end{bmatrix}$, $A^2 = \begin{bmatrix} 0.76 & 0.24 \\ 0.22 & 0.73 \end{bmatrix}$ ✓ Regular,,

(20) $B = \begin{bmatrix} 1 & 0 \\ 0.6 & 0.4 \end{bmatrix}$, $B^2 = \begin{bmatrix} 1 & 0 \\ 0.84 & 0.16 \end{bmatrix}$, $B^3 = \begin{bmatrix} 1 & 0 \\ 0.936 & 0.064 \end{bmatrix}$

IRREGULAR,,

(21) $C = \begin{bmatrix} 0 & 1 & 0 \\ 0.4 & 0.2 & 0.4 \\ 1 & 0 & 0 \end{bmatrix}$, $C^2 = \begin{bmatrix} 0.4 & 0.2 & 0.4 \\ 0.48 & 0.44 & 0.08 \\ 0 & 1 & 0 \end{bmatrix}$

$C^3 = \begin{bmatrix} 0.48 & 0.44 & 0.08 \\ 0.256 & 0.568 & 0.176 \\ 0.4 & 0.2 & 0.4 \end{bmatrix}$ ✓ Regular,,

(22) $D = \begin{bmatrix} 0.3 & 0.5 & 0.2 \\ 1 & 0 & 0 \\ 0.5 & 0.1 & 0.4 \end{bmatrix}$, $D^2 = \begin{bmatrix} 0.69 & 0.17 & 0.14 \\ 0.3 & 0.5 & 0.2 \\ 0.45 & 0.29 & 0.26 \end{bmatrix}$ ✓ Regular,,

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ex. 71

	NONINDEX	INJURY	THEFT	DAMAGE	COMBINA.
NONINDEX	0.645	0.099	0.152	0.033	0.071
INJURY	0.611	0.138	0.128	0.033	0.090
P = THEFT	0.514	0.067	<u>0.271</u>	0.030	0.48
DAMAGE	0.609	0.107	0.178	0.064	0.042
COMBINATION	0.523	0.093	0.183	0.022	0.179

(a) 0.271

(b) CALCULATE P^2 to find that the probability = 0.187079,

(c) IF THIS TREND CONTINUES (PROBABILITY OF REPEATING CRIME),
PROBABILITY FOR EACH TYPE OF CRIME:

• Since trend reads to P^3 , calculate P^3 .

Probability of NONINDEX = 0.607540521

" " INJURY = 0.097269

" " THEFT = 0.175873747

" " DAMAGE = 0.032608019

" " COMBINATION = 0.091074829