Sec 3.4 P.95 First Step Analysis

Lecture 17

* Absorbing Markov chain سلسلة ماركوف الممتصة

- A Markov chain is an absorbing chain if

(1) there's at least one absorbing state

(2) there's at least one transition from non-absorbing state to absorbing state

Ex Identify any absorbing state for the following transition Matrices and determine whether the markov chain is absorbing.

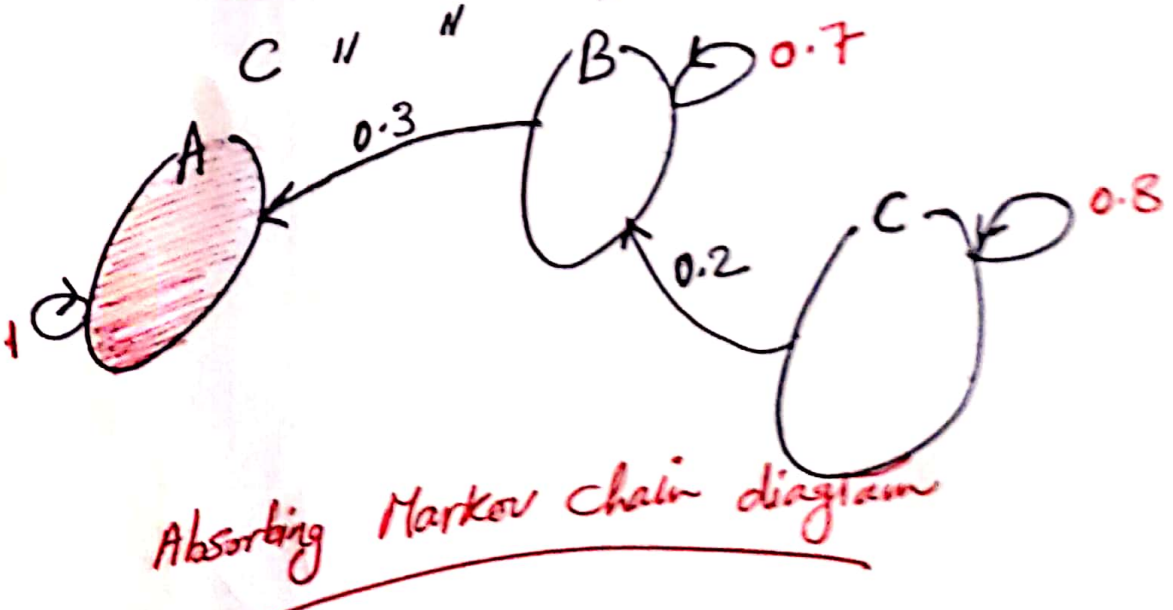
i) $P = \begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 1 & 0 & 0 \\ 0.3 & 0.7 & 0 \\ 0 & 0.2 & 0.8 \end{bmatrix} \end{array}$ trans. prob. Mx

A is an absorbing state

B " non-absorbing state

C " " "

$\Rightarrow$ Absorbing Markov Chain



Absorbing Markov chain diagram

2

ii)

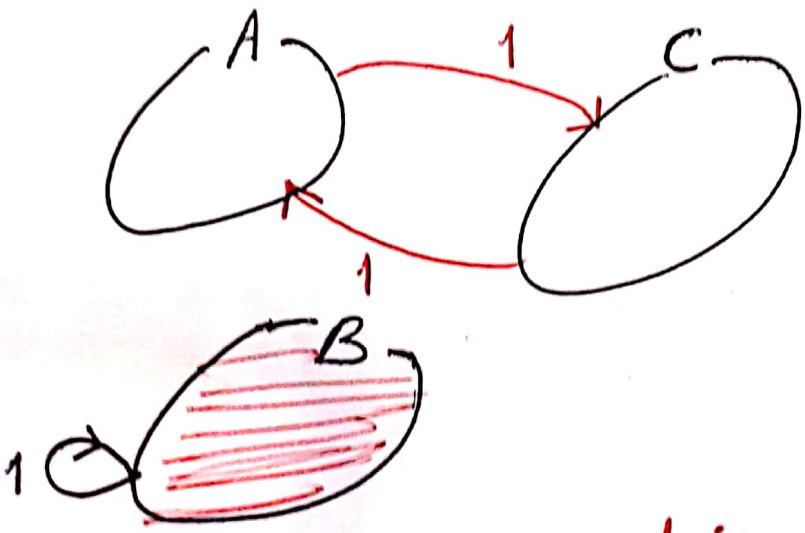
$$P = \begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} \end{array}$$

trans. prob. Mx

A is non – absorbing state

B is an absorbing state

C is non – absorbing state



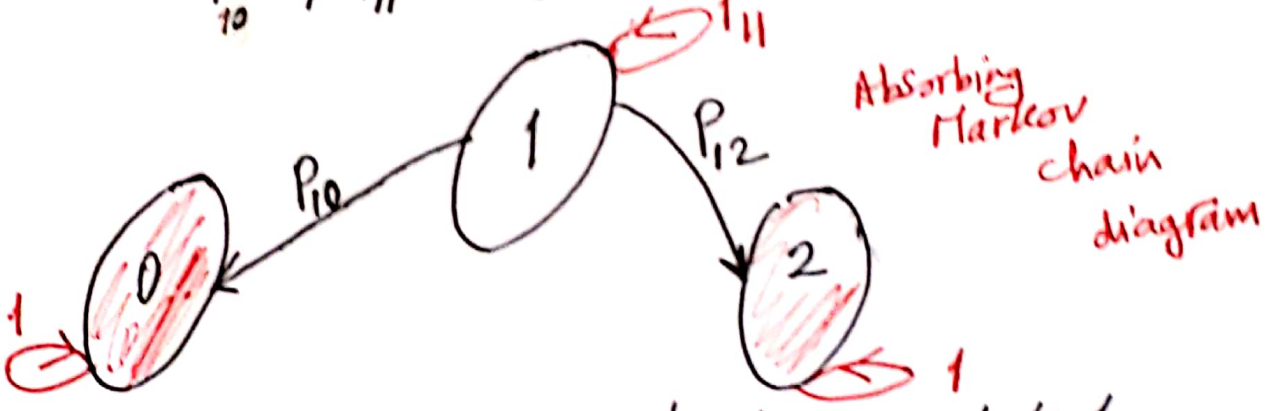
Non-absorbing Markov chain diagram

3.

Now, Consider

$$P = \begin{array}{c} \\ 0 \\ 1 \\ 2 \end{array} \begin{array}{c} \begin{array}{ccc} 0 & 1 & 2 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 \\ P_{10} & P_{11} & P_{12} \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

- Given states 0 and 2 are absorbing states where $P_{10} > 0$, $P_{11} > 0$, $P_{12} > 0$ and $P_{10} + P_{11} + P_{12} = 1$



Absorbing Markov chain diagram

If the Markov chain begins in state 1, it remains there for a random duration and then proceeds either to state 0 or to state 2 where it's absorbed. That's once in state 0 the process remains there forever after, as it also in state 2.

2 Questions

Q1 what's the prob. that the Markov chain ends in state 0 or state 2?

Q2 How long, on the average, does it take to reach one of these states?