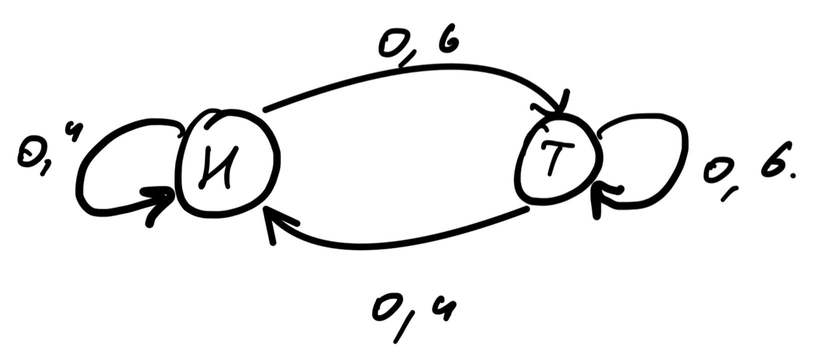
Week 5 Lecture

MLE
Discrete probability X - R.V.
pmf, pdf → $p() = \dots$

$X(w) \in \mathbb{R}$
$w \in \Omega$ → outcomes space

$\mathbb{R}$.V.
$X \in \mathbb{R}$
$W = \{"H", "T"\}$
$X = \{0, 1\}$ → pdf → Binom(n, p)
(pmf) → Bern(p)

stochastic - Markov Chains



$P = \{H, T\} \cdot \{H, T\}$
$\quad\;\; {}^{\shortparallel}_{2} \qquad\quad {}^{\shortparallel}_{2}$

1) $X_0 = x_0 \in \mathbb{R}\,(\{0, 1\})$
$x_0 = 0\,(T)$

2) $X_1 = x_1 = 0\,(T)$ zero

3) $X_2 = x_2 = 1\,(H)$

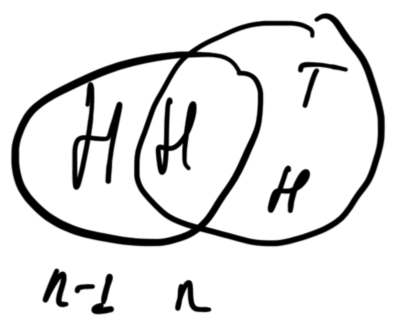
$$P^{(1)} = \begin{array}{c|cc} & H & T \\ \hline H & 0{,}4 & 0{,}6 \\ (0)\;T & 0{,}4 & 0{,}6 \end{array} \quad \begin{matrix} = 1 \\ = 1 \end{matrix}$$

Transition matrix

$$P\left(X_{n+1} = x_{n+1} \middle/ \begin{matrix} X_0 = x_0 \\ X_1 = x_1 \\ X_2 = x_2, \dots, X_n = x_n \end{matrix}\right)$$

$$P\left(X_3 = 0 \middle/ \begin{matrix} x_0 = 0 \\ X_1 = 1 \\ X_2 = 0 \end{matrix}\right) = 0{,}6$$

MDP = Markov Decision Process



n can be either "T" or "H"
but $n-1$ can not be changed on the transition

Problem: bet for tossing a coin

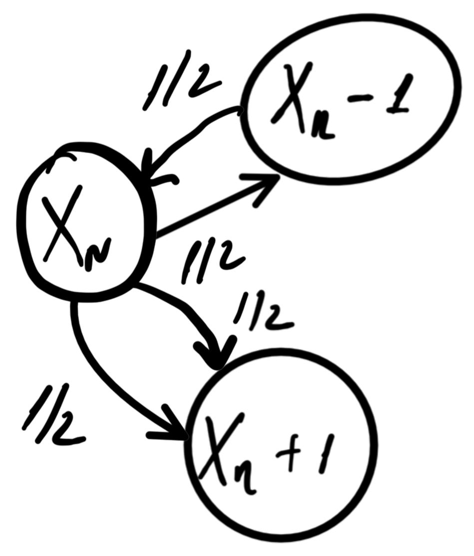
X_0 - initial budget

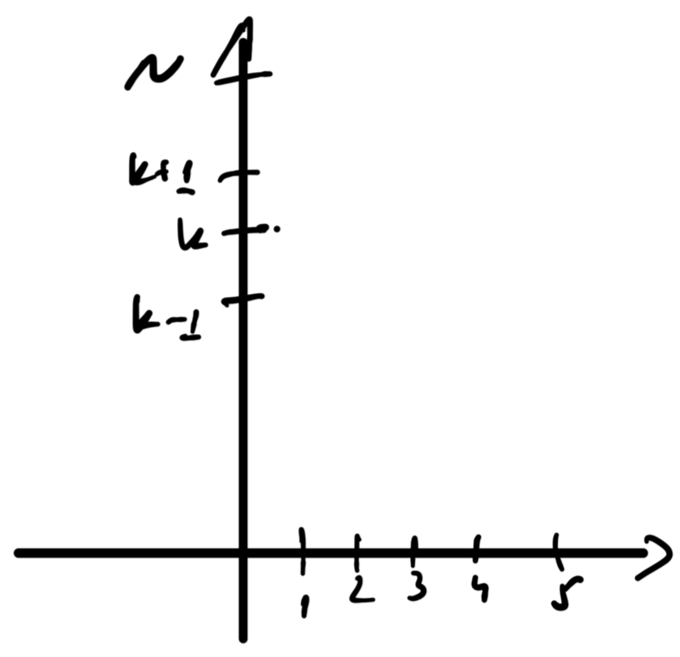
Terminating states $\overset{\nearrow 0}{\searrow N}$

$(0, 1, 2, \dots, 10, \dots, 15)$
$\qquad\qquad\quad\;\; {}^{\shortparallel}_{k}$

$$X_{n+1} = X_n \pm 1$$

$$P(X_\tau = N) = \frac{k}{N}$$





To reach N from k we need to have $N-k$

$$\Omega = \{A, B, C, D\}$$

$$\mu = (\{A, B\}) = 2$$

$$\mu(\{B, C, D\}) = 3$$