

MARKOVIAN MODELLING OF DYNAMIC RANDOM MONOALLELIC EXPRESSION

Harshavardhan BV

September 14, 2022

IISc Bangalore

MARKOV MODEL

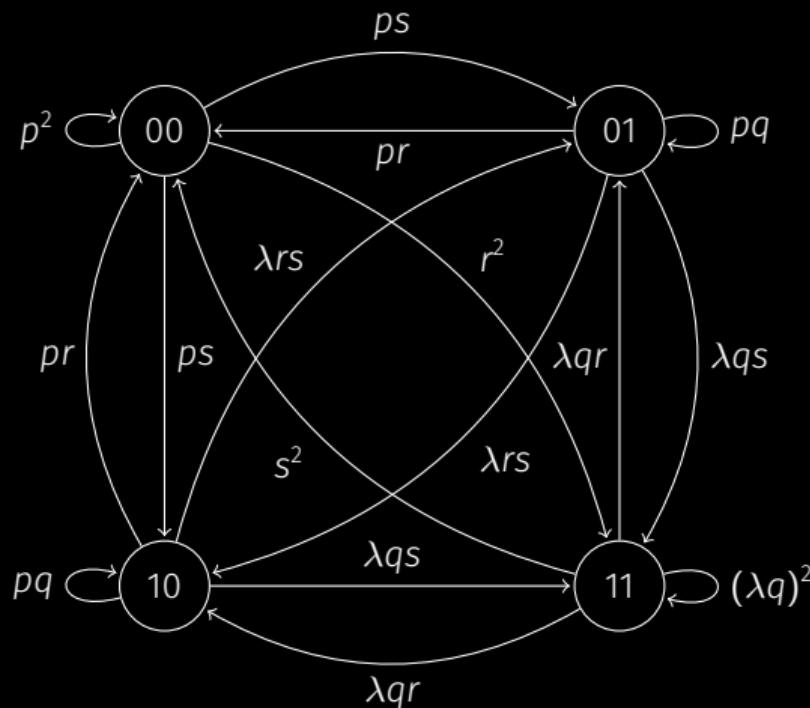


Figure 1: Markov State Diagram

Transition Matrix:

$$T = \begin{bmatrix} p^2 & pr & pr & r^2 \\ ps & pq & \lambda rs & \lambda qr \\ ps & \lambda rs & pq & \lambda qr \\ s^2 & \lambda qs & \lambda qs & (\lambda q)^2 \end{bmatrix}$$

At steady state

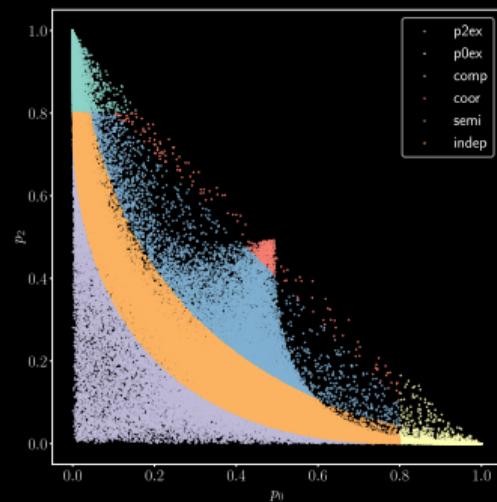
$$T\vec{E} = \vec{1}\vec{E}$$

$$\vec{E} = [p_{00} \quad p_{01} \quad p_{10} \quad p_{11}]^T$$

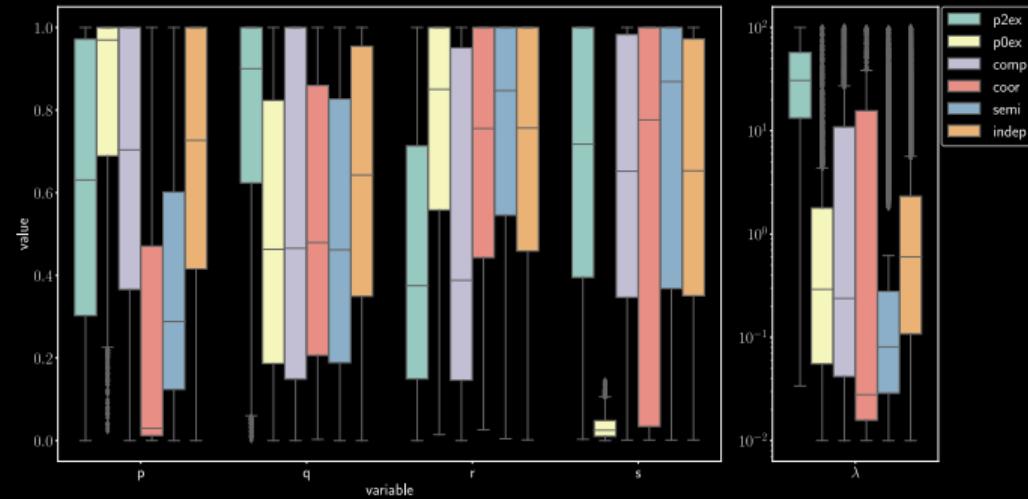
Where,

- $\sum_j T_{ij} = 1 \quad \forall i$
- $\sum_i E_i = 1$
- $p, q = \text{StayOff, StayOn rate}$
- $r, s = \text{Off, On rate}$
- $\lambda = \text{Interaction Parameter}$

PRELIMINARY RESULTS



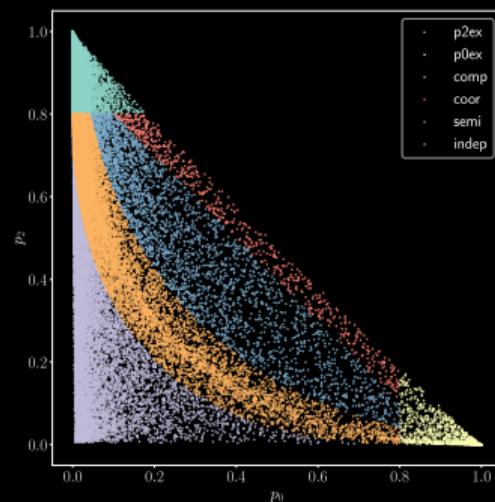
(a) p_2 vs p_0



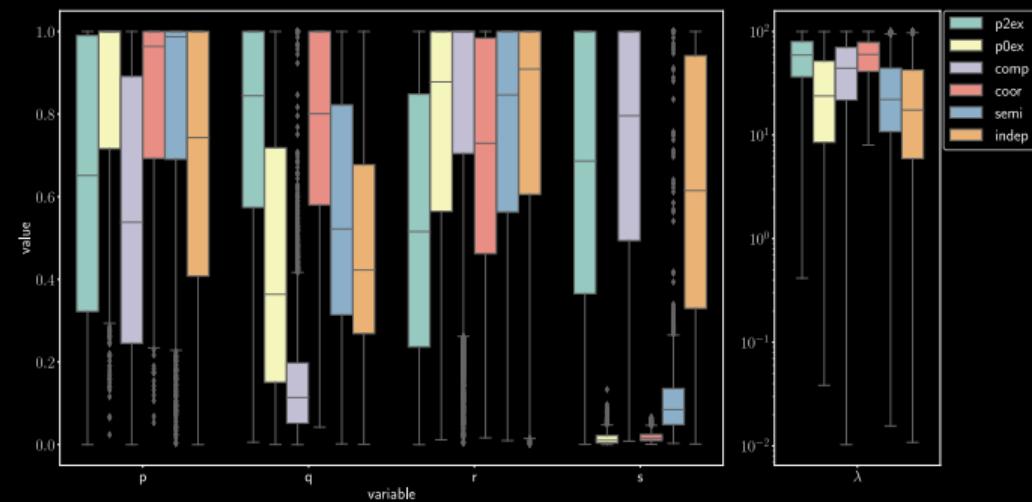
(b) Parameters

Figure 2: When λ sampled log-uniformly

PRELIMINARY RESULTS



(a) p_2 vs p_0



(b) Parameters

Figure 3: When λ sampled uniformly