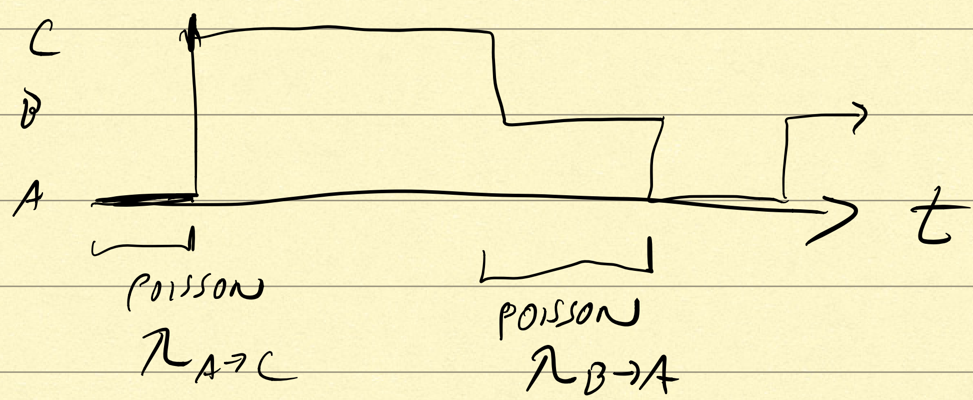
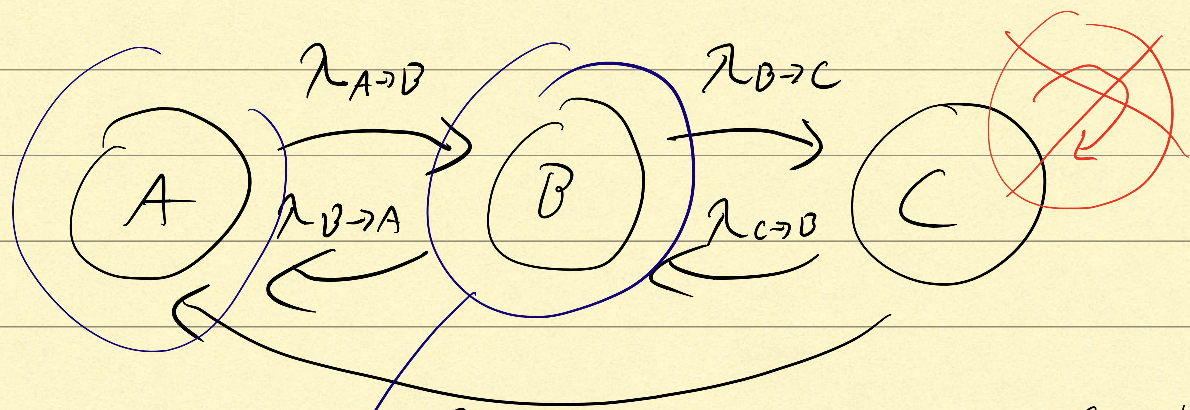
CONTINUOUS TIME MARKOV CHAINS

CONTINUOUS TIME STOCHASTIC PROCESS WHERE STATE SPACE HAS N DISCRETE STATES, AND TRANSITIONS BETWEEN STATES ARE POISSON.





$\lambda_{C \to A} \longrightarrow$ UNITS (s^{-1})

$B \to C \quad \lambda_{B \to C}$

$B \to A \quad \lambda_{B \to A}$

NEXT EVENT $B \to X$ POISSON RATE $\lambda_{B \to C}$

$+ \lambda_{B\to A}$

PROBABILITY $B \to C$: $\dfrac{\lambda_{B\to C}}{\lambda_{B\to C} + \lambda_{B\to A}}$

$\mathbb{P}_i(t)$ - PROBABILITY OF BEING IN STATE i AT TIME t

LET $\vec{\mathbb{P}}(t) = \begin{bmatrix} \mathbb{P}_1(t) \\ \vdots \\ \mathbb{P}_N(t) \end{bmatrix}$ THEN

$$\frac{d}{dt}\vec{\mathbb{P}}(t) = \begin{bmatrix} -\sum_i \lambda_{1\to i} & & \lambda_{N\to 1} \\ \lambda_{1\to 2} & \ddots & \\ \vdots & & \\ \lambda_{1\to N} & & -\sum_i \lambda_{N\to i} \end{bmatrix} \cdot \vec{\mathbb{P}}(t)$$

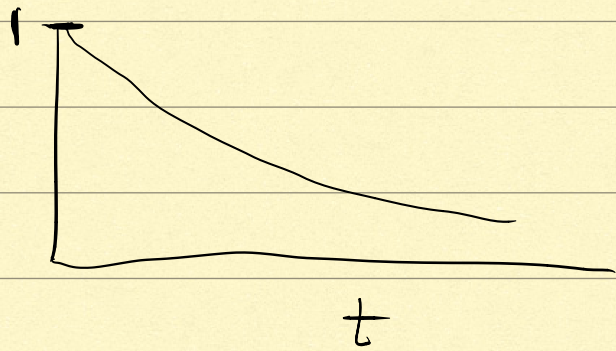
EX $N(t)$ - # OF POISSON EVENTS AT TIME t

$$\text{MATRIX} = \begin{bmatrix} -\lambda & 0 & 0 & \ddots \\ \lambda & -\lambda & 0 & \\ 0 & \lambda & -\lambda & \end{bmatrix}$$

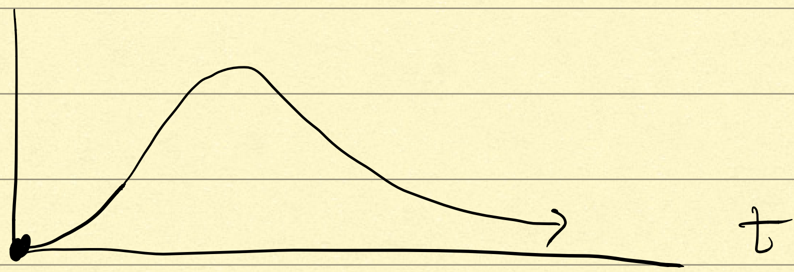
$$\begin{bmatrix} 0 & 0 & \lambda & -\lambda & \\ 0 & 0 & 0 & \lambda & \ddots \end{bmatrix}$$

$$\vec{P}(0) = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

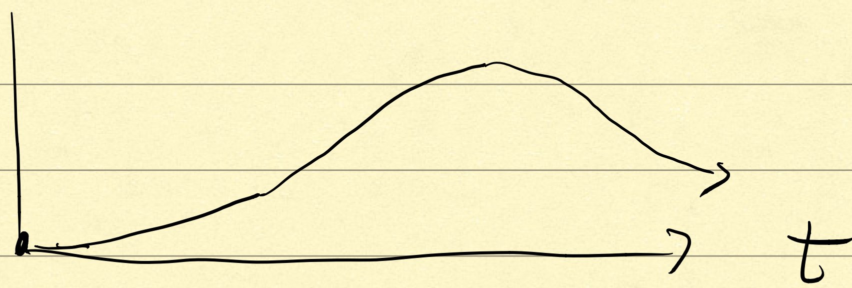
P_0



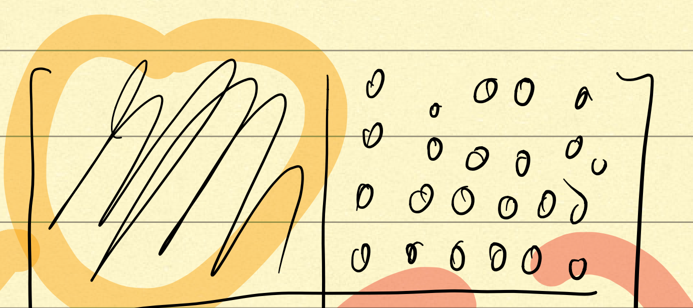
P_1

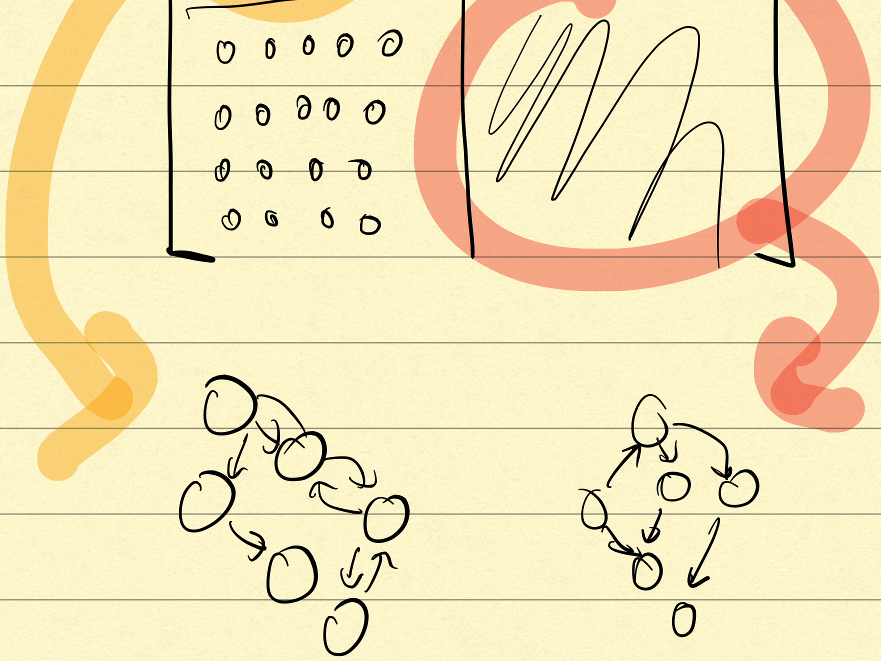


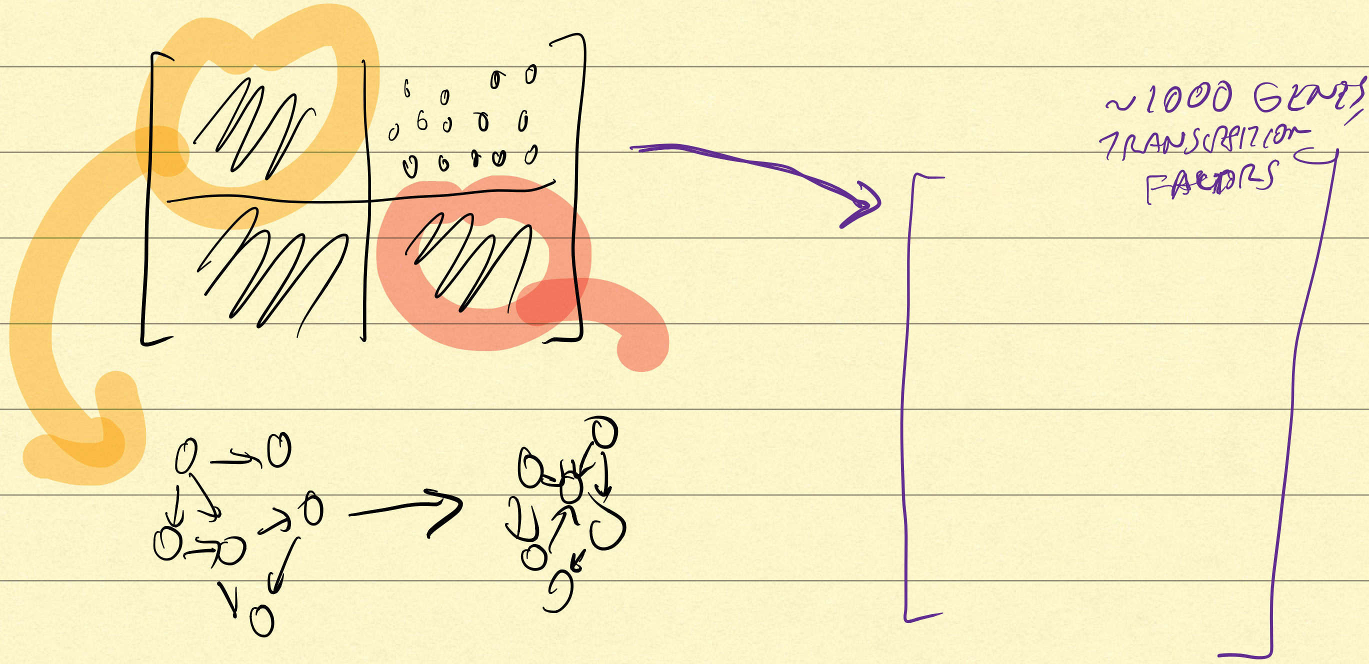
P_2



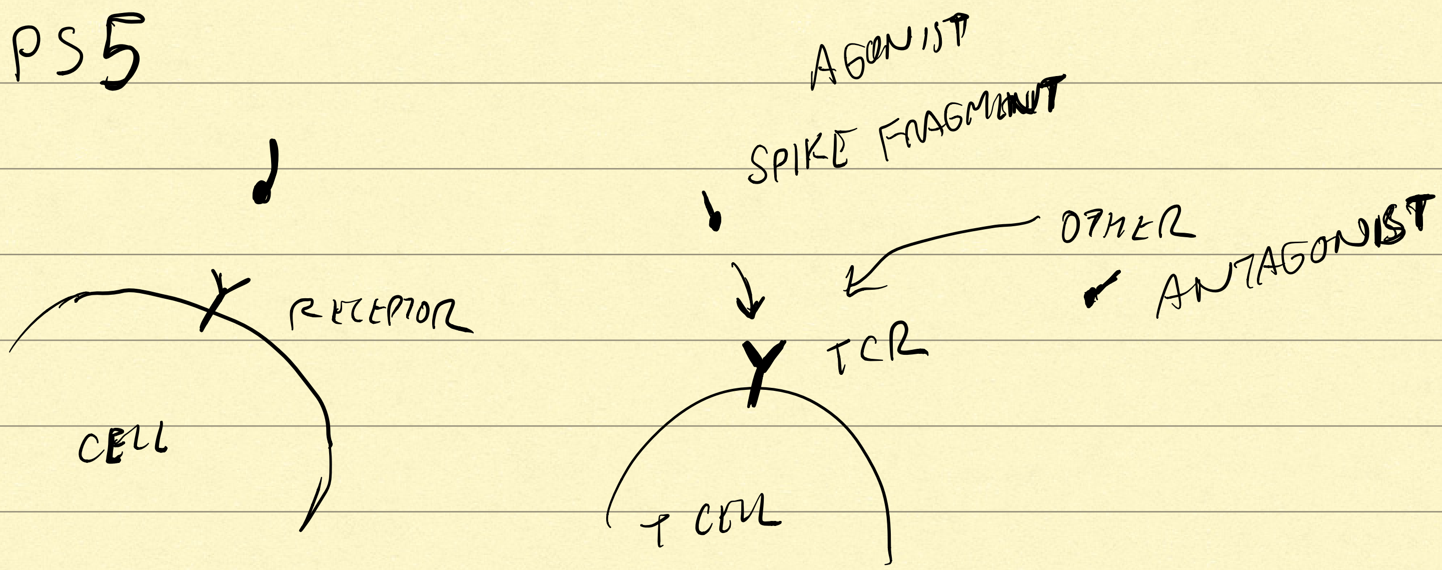
EX.

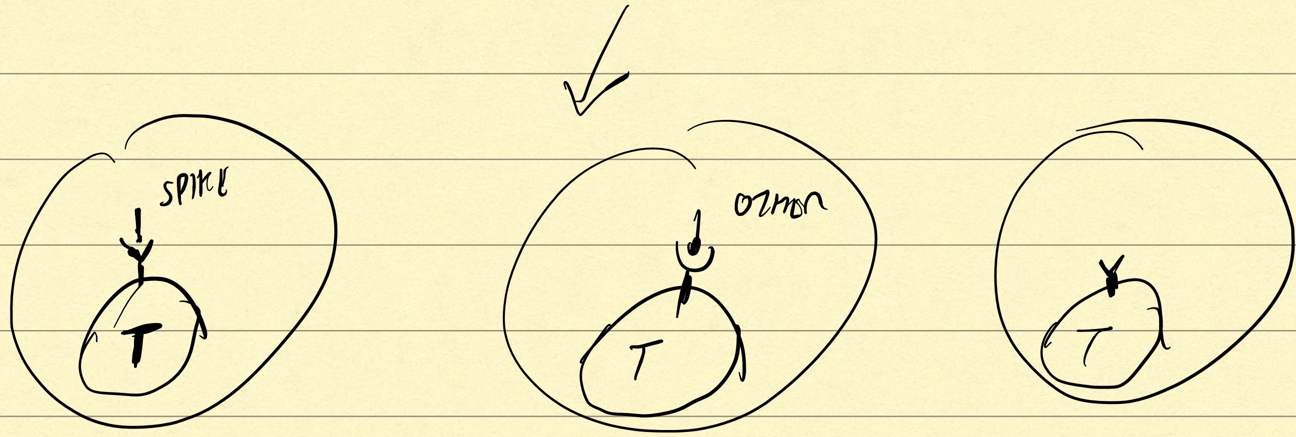





~1000 GENES, TRANSCRIPTION FACTORS

PS5


AGONIST
SPIKE FRAGMENT
OTHER
ANTAGONIST
RECEPTOR
CELL
TCR
T CELL


spike
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