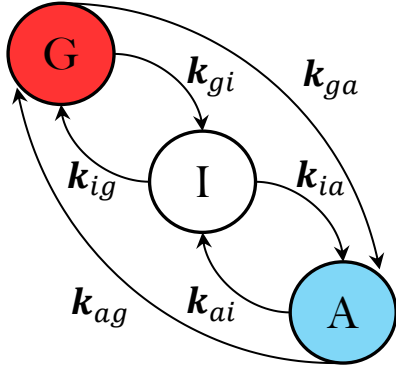


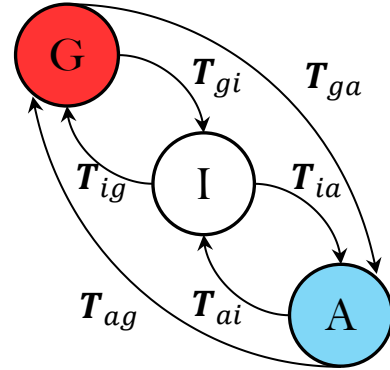
# Specifying EMOSA models

## Diffusion



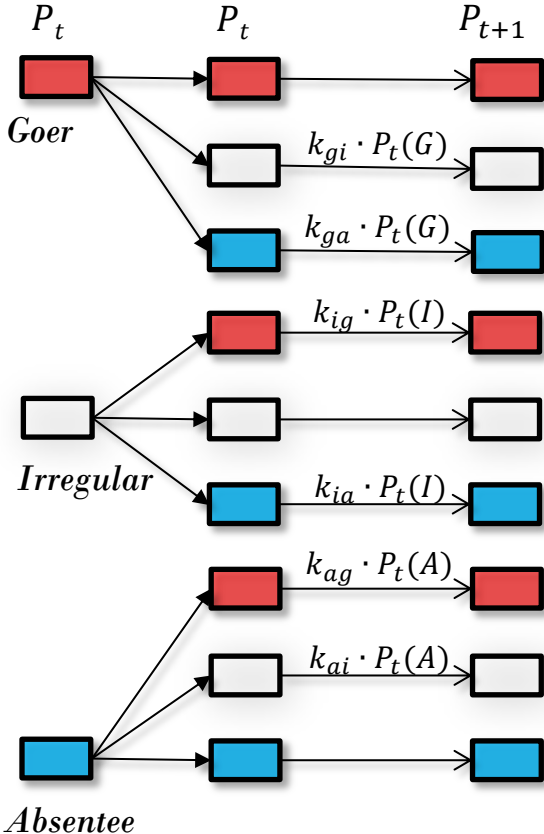
$$\left\{ \begin{array}{l} P_{t+1}(G) = P_t(G) + k_{ig} \cdot P_t(I) + k_{ag} \cdot P_t(A) \\ \quad - k_{gi} \cdot P_t(G) - k_{ga} \cdot P_t(G) \\ P_{t+1}(I) = P_t(I) + k_{gi} \cdot P_t(G) + k_{ai} \cdot P_t(A) \\ \quad - k_{ig} \cdot P_t(I) - k_{ia} \cdot P_t(I) \\ P_{t+1}(A) = 1 - P_{t+1}(G) - P_{t+1}(I) \end{array} \right\}$$

## Contagion

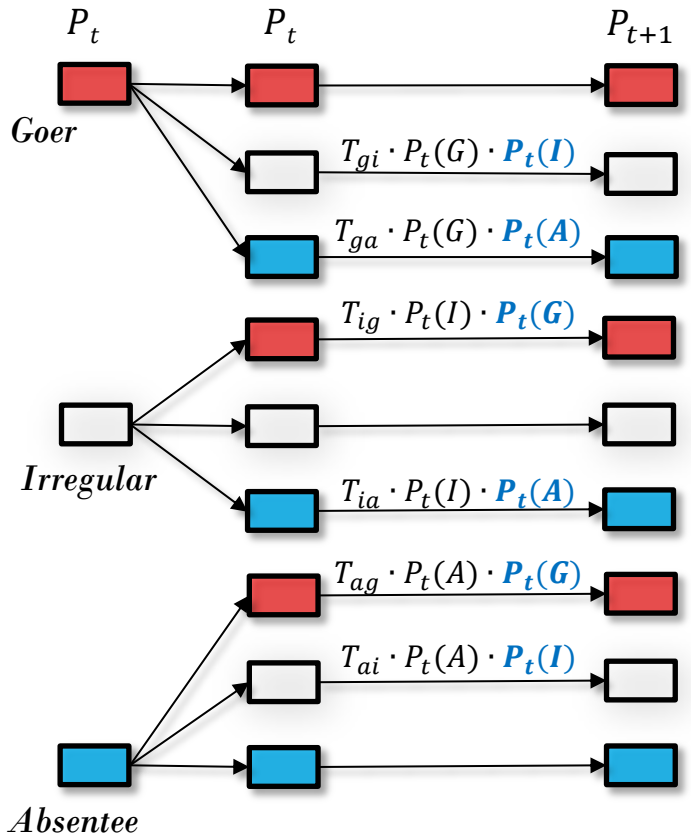


$$\left\{ \begin{array}{l} P_{t+1}(G) = P_t(G) + T_{ig} \cdot P_t(I) \cdot P_t(G) + T_{ag} \cdot P_t(A) \cdot P_t(G) \\ \quad - T_{gi} \cdot P_t(G) \cdot P_t(I) - T_{ga} \cdot P_t(G) \cdot P_t(A) \\ P_{t+1}(I) = P_t(I) + T_{gi} \cdot P_t(G) \cdot P_t(I) + T_{ai} \cdot P_t(A) \cdot P_t(I) \\ \quad - T_{ig} \cdot P_t(I) \cdot P_t(G) - T_{ia} \cdot P_t(I) \cdot P_t(A) \\ P_{t+1}(A) = 1 - P_{t+1}(G) - P_{t+1}(I) \end{array} \right\}$$

*Starts as*      *meets*      *becomes*



*Starts as*      *meets*      *becomes*

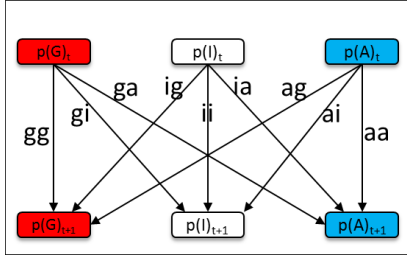


$p_t(G)$  – proportion of *Goers* at time  $t$

$p_t(I)$  = proportion of *Irregulars* at time  $t$

$p_{t+1}(A)$  = proportion of *Absentees* at time  $(t+1)$

$ga$  – *Goers* at time  $t$ , who become *Absentees* at time  $(t+1)$



(d)

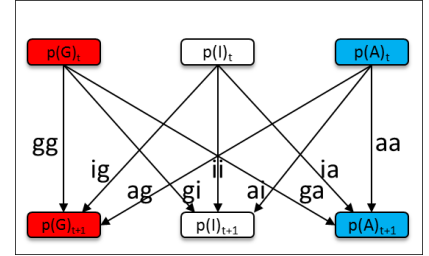
(a)

$$p_t(G) = gg + gi + ga$$

$$p_t(I) = ig + ii + ia$$

$$p_t(A) = ag + ai + aa$$

(c)



(b)

$$\begin{bmatrix} p_{t+1}(G) = p_t(G) - gi - ga + ig + ag \\ p_{t+1}(I) = 1 - p_{t+1}(G) - p_{t+1}(A) \\ p_{t+1}(A) = p_t(A) - ag - ai + ga + ia \end{bmatrix} = \begin{bmatrix} (p_t(G) - gi - ga) + ig + ag \\ 1 - p_{t+1}(G) - p_{t+1}(A) \\ (p_t(A) - ag - ai) + ga + ia \end{bmatrix} = \begin{bmatrix} p_{t+1}(G) = gg + ig + ag \\ p_{t+1}(I) = ii + gi + ai \\ p_{t+1}(A) = aa + ga + ia \end{bmatrix}$$

(e) Counting transitions

$$p_{t+1}(G) = p_t(G) - gi - ga + ig + ag$$

$$p_{t+1}(I) = 1 - p_{t+1}(G) - p_{t+1}(A)$$

$$p_{t+1}(A) = p_t(A) - ag - ai + ga + ia$$

(f) Redundancy/Constraints

$$gg = (p_t(G) - gi - ga)$$

$$aa = (p_t(A) - ag - ai)$$

$$ii = 1 - gg - gi - ga - ia - aa - ig - ag - ai$$

(g) Counting with Diffusion

$$p_{t+1}(G) = p_t(G) - k_{gi}p_t(G) - k_{ga}p_t(G) + k_{ig}p_t(I) + k_{ag}p_t(A)$$

$$p_{t+1}(I) = 1 - p_{t+1}(G) - p_{t+1}(A)$$

$$p_{t+1}(A) = p_t(A) - k_{ag}p_t(A) - k_{ai}p_t(A) + k_{ga}p_t(G) + k_{ia}p_t(I)$$

(h) Diffusion predicts transitions:

$$gi = k_{gi}p_t(G)$$

$$ga = k_{ga}p_t(G)$$

$$ig = k_{ig}p_t(I)$$

$$ia = k_{ia}p_t(I)$$

$$ag = k_{ag}p_t(A)$$

$$ai = k_{ai}p_t(A)$$

(i) Counting with Contagion

$$p_{t+1}(G) = p_t(G) - T_{gi}p_t(G)p_t(I) - T_{ga}p_t(G)p_t(A) + T_{ig}p_t(I)p_t(G) + T_{ag}p_t(A)p_t(G)$$

$$p_{t+1}(I) = 1 - p_{t+1}(G) - p_{t+1}(A)$$

$$p_{t+1}(A) = p_t(A) - T_{ag}p_t(A)p_t(G) - T_{ai}p_t(A)p_t(I) + T_{ga}p_t(G)p_t(A) + T_{ia}p_t(I)p_t(A)$$

(j) Contagion predicts transitions:

$$gi = T_{gi}p_t(G)p_t(I)$$

$$ga = T_{ga}p_t(G)p_t(A)$$

$$ig = T_{ig}p_t(I)p_t(G)$$

$$ia = T_{ia}p_t(I)p_t(A)$$

$$ag = T_{ag}p_t(A)p_t(G)$$

$$ai = T_{ai}p_t(A)p_t(I)$$