

Phase1 - Paper Model - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{1 + A_i^n} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{1 + B_i^n} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\overline{S_i} - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$

Phase2a - Adriana - Node W - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} + \frac{\alpha \cdot W_i^n}{1 + W_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{1 + A_i^n} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{1 + B_i^n} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i \\ \frac{dw_i}{dt} &= \frac{\alpha_w}{1 + A_i^n} - k_{deg} \cdot w_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i) \\ \frac{dW_i}{dt} &= \beta_i \cdot (w_i - W_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\overline{S_i} - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$

Phase2a - Sydney - Node x - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{1 + A_i^n} + \frac{\alpha \cdot X_i^n}{1 + X_i^n} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{1 + B_i^n} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i \\ \frac{dx_i}{dt} &= \frac{\alpha_x}{1 + A_i^n} - k_{deg} \cdot x_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i) \\ \frac{dX_i}{dt} &= \beta_i \cdot (x_i - X_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\bar{S}_i - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$

Phase2a - Sean - Node Y - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{1 + A_i^n} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{(1 + B_i^n)(1 + Y_i^n)} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i \\ \frac{dy_i}{dt} &= \frac{\alpha_y}{1 + B_i^n} - k_{deg} \cdot y_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i) \\ \frac{dY_i}{dt} &= \beta_i \cdot (y_i - Y_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\bar{S}_i - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$

Phase2a - Olivia - Node Z - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{(1 + A_i^n)(1 + Z_i^n)} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{1 + B_i^n} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i \\ \frac{dz_i}{dt} &= \frac{\alpha_z}{1 + B_i^n} - k_{deg} \cdot z_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i) \\ \frac{dZ_i}{dt} &= \beta_i \cdot (z_i - Z_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\bar{S}_i - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$

Phase2b - Group Model - Equations

mRNA Equations

$$\begin{aligned}\frac{da_i}{dt} &= \frac{\alpha}{1 + C_i^n} + \frac{\alpha \cdot W_i^n}{1 + W_i^n} - k_{deg} \cdot a_i \\ \frac{db_i}{dt} &= \frac{\alpha}{(1 + A_i^n)(1 + Z_i^n)} + \frac{\alpha \cdot X_i^n}{1 + X_i^n} - k_{deg} \cdot b_i \\ \frac{dc_i}{dt} &= \frac{\alpha}{(1 + B_i^n)(1 + Y_i^n)} + \frac{\kappa \cdot S_i}{1 + S_i} - k_{deg} \cdot c_i \\ \frac{dw_i}{dt} &= \frac{\alpha_w}{1 + A_i^n} - k_{deg} \cdot w_i \\ \frac{dx_i}{dt} &= \frac{\alpha_x}{1 + A_i^n} - k_{deg} \cdot x_i \\ \frac{dy_i}{dt} &= \frac{\alpha_y}{1 + B_i^n} - k_{deg} \cdot y_i \\ \frac{dz_i}{dt} &= \frac{\alpha_z}{1 + B_i^n} - k_{deg} \cdot z_i\end{aligned}$$

Protein Equations

$$\begin{aligned}\frac{dA_i}{dt} &= \beta_i \cdot (a_i - A_i) \\ \frac{dB_i}{dt} &= \beta_i \cdot (b_i - B_i) \\ \frac{dC_i}{dt} &= \beta_i \cdot (c_i - C_i) \\ \frac{dW_i}{dt} &= \beta_i \cdot (w_i - W_i) \\ \frac{dX_i}{dt} &= \beta_i \cdot (x_i - X_i) \\ \frac{dY_i}{dt} &= \beta_i \cdot (y_i - Y_i) \\ \frac{dZ_i}{dt} &= \beta_i \cdot (z_i - Z_i)\end{aligned}$$

Autoinducer Equations

$$\begin{aligned}\frac{dS_i}{dt} &= -k_{s0} \cdot S_i + k_{s1} \cdot A_i + \eta \cdot (S_e - S_i) \\ \frac{dS_e}{dt} &= k_{diff} \cdot (\overline{S_i} - S_e) - k_{deg_{S_e}} \cdot S_e\end{aligned}$$