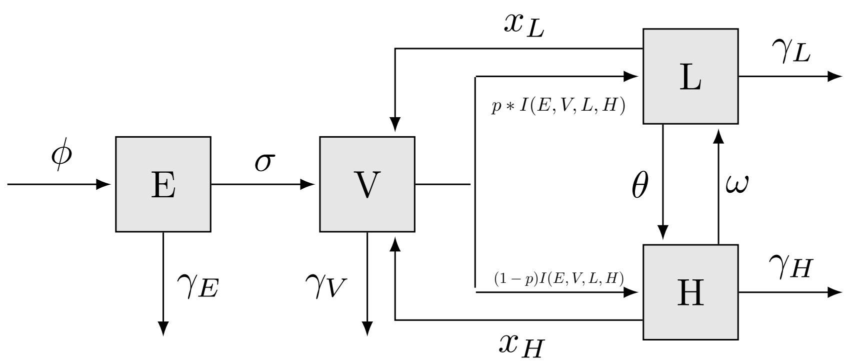
COmparing Two Models

1 The Original Model



$\frac{dE}{dt} = \phi - \sigma E - \gamma_E E$

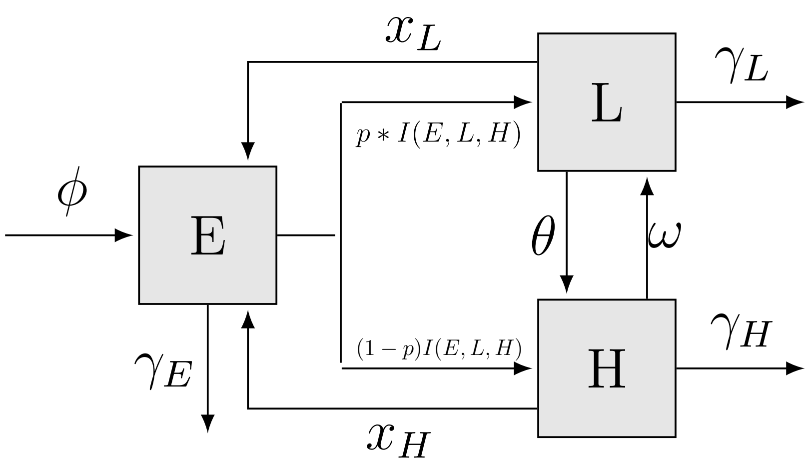
$\frac{dV}{dt} = \sigma E - \underbrace{\tau + c\beta V(\frac{L + \eta H}{L + H + V + E})}_{\text{initiation, I(E,V,L,H)}} + x_L L + x_H H - \gamma_V V$

$\frac{dL}{dt} = \underbrace{p(\tau + c\beta V(\frac{L + \eta H}{L + H + V + E}))}_{\text{initiation}} - \theta L - x_L L + \omega H - \gamma_L L$

$\frac{dH}{dt} = \underbrace{(1-p)(\tau + c\beta V(\frac{L + \eta H}{L + H + V + E}))}_{\text{initiation}} + \theta L - x_H H - \omega H - \gamma_H H$

2 The Alternate (but Very Similar) Model

So, the above model is what we had before. People must enter the V population before they can be initiated into either L or H. In the following model, I have completely removed the V compartment and included variable v (which in the future can be a function) which represents the proportion of the population that is vulnerable at any given moment. So now initiation becomes the product of contact rate c, infection proportion β, and vulnerability proportion v.



$$\frac{dE}{dt} = \phi - \underbrace{\tau + c\beta Ev(\frac{L+\eta H}{L+H+E})}_{\text{initiation, I(E,L,H)}} + x_L L + x_H H - \gamma_E V$$

$$\frac{dL}{dt} = \underbrace{p(\tau + c\beta Ev(\frac{L+\eta H}{L+H+E}))}_{\text{initiation}} - \theta L - x_L L + \omega H - \gamma_L L$$

$$\frac{dH}{dt} = \underbrace{(1-p)(\tau + c\beta Ev(\frac{L+\eta H}{L+H+E}))}_{\text{initiation}} + \theta L - x_H H - \omega H - \gamma_H H$$