Introduction to Biocomputing Tutorial

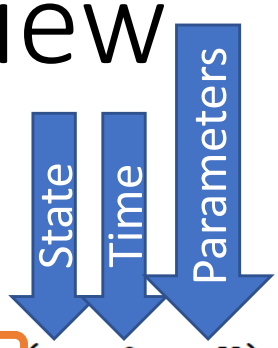
Week 10

Debartolo 319

Review

- Parts of the function that you can change
- Naming rules of function and naming rules when running the function
- Order of input parameters for function

Review



State variables (change through time)

Parameters

```
def ddSim(y,t0,r,K):
    # "unpack" lists containing state variables (y)
    N=y[0]

    # calculate change in state variables with time, give parameter values
    # and current value of state variables
    dNdt=r*(1-N/K)*N

    # return list containing change in state variables with time
    return [dNdt]

### Define parameters, initial values for state variables, and time steps
params=(0.3,10)
N0=[0.01]
times=range(0,600)

### Simulate the model using odeint
modelSim=spint.odeint(func=ddSim,y0=N0,t=times,args=params)
```

Today's tutorial Q1

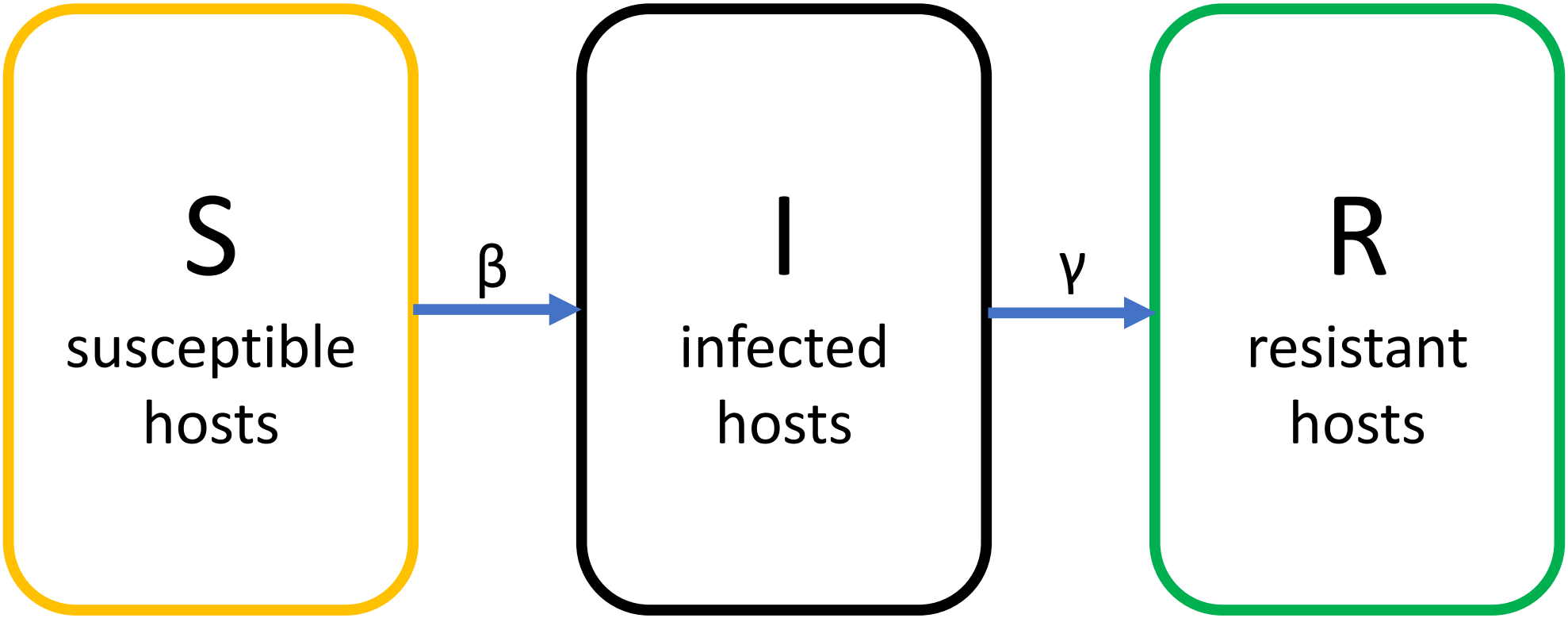
- Testing the effect of different r, K and N
- Steps:
  - load necessary packages
  - define the model custom function
  - set a "pool" of values for the parameter of interest
  - create a dataframe to store model output in
  - using a for loop simulate with the different values of the parameter of interest and store this information
  - plot

```
rs=[-0.1,0.1,0.4,0.8,1]
store_rs=pandas.DataFrame({"time":times,"r1":0,"r2":0,"r3":0,"r4":0,"r5":0})

for i in range(0,len(rs)):
    pars=(rs[i],K)
    sim=si.odeint(func=ddSim,y0=y0,t=times,args=pars)
    store_rs.iloc[:,i]=sim[:,0]

ggplot
```

ggplot each column of the data frame store_rs

Today's tutorial Q2

- Epidemiological model
- N=S+I+R is a constant
- One direction

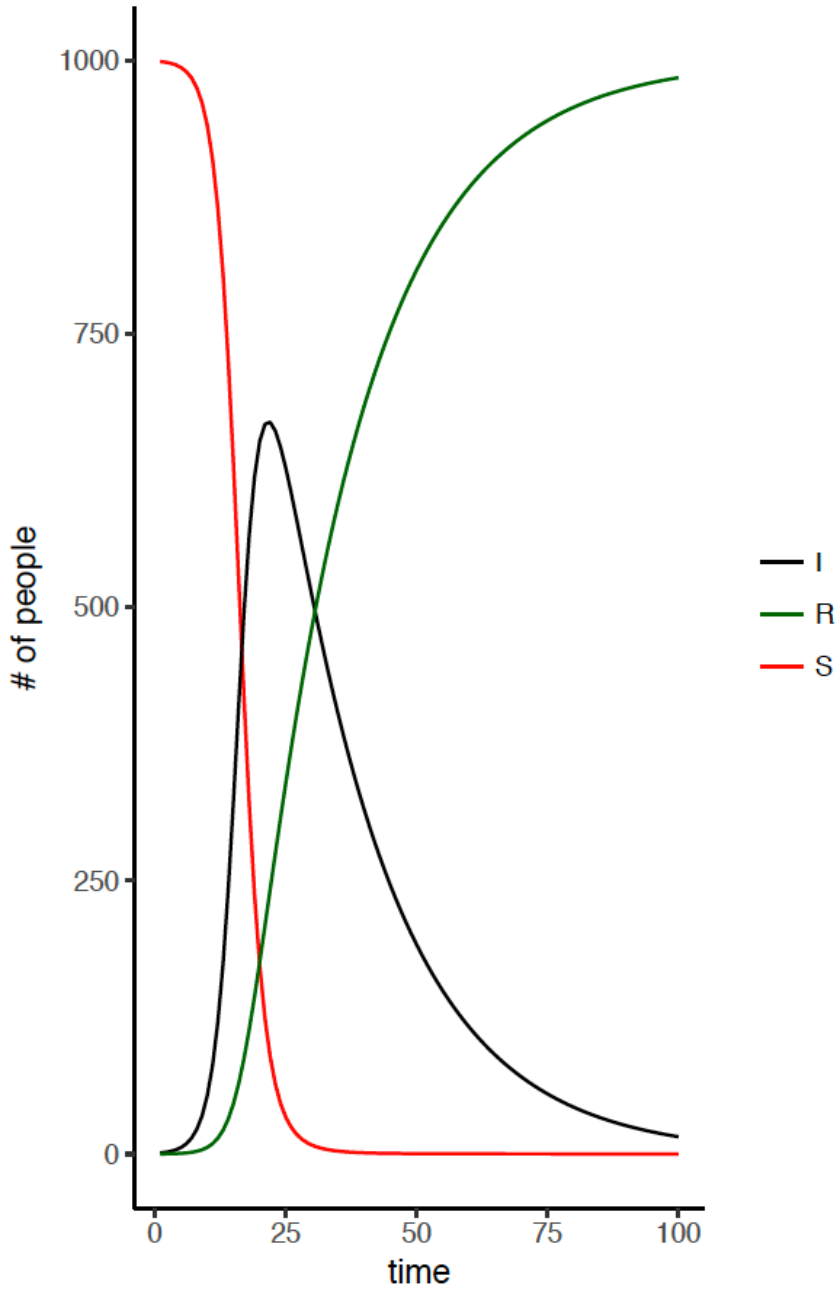


SIR model

- The change of SIR through time

- How bad is the disease:
  - Maximum daily incidence
  - Maximum daily prevalence
  - Percent affected
  - Basic reproduction number

$$R_0 = \frac{\beta(S+I+R)}{\gamma}$$



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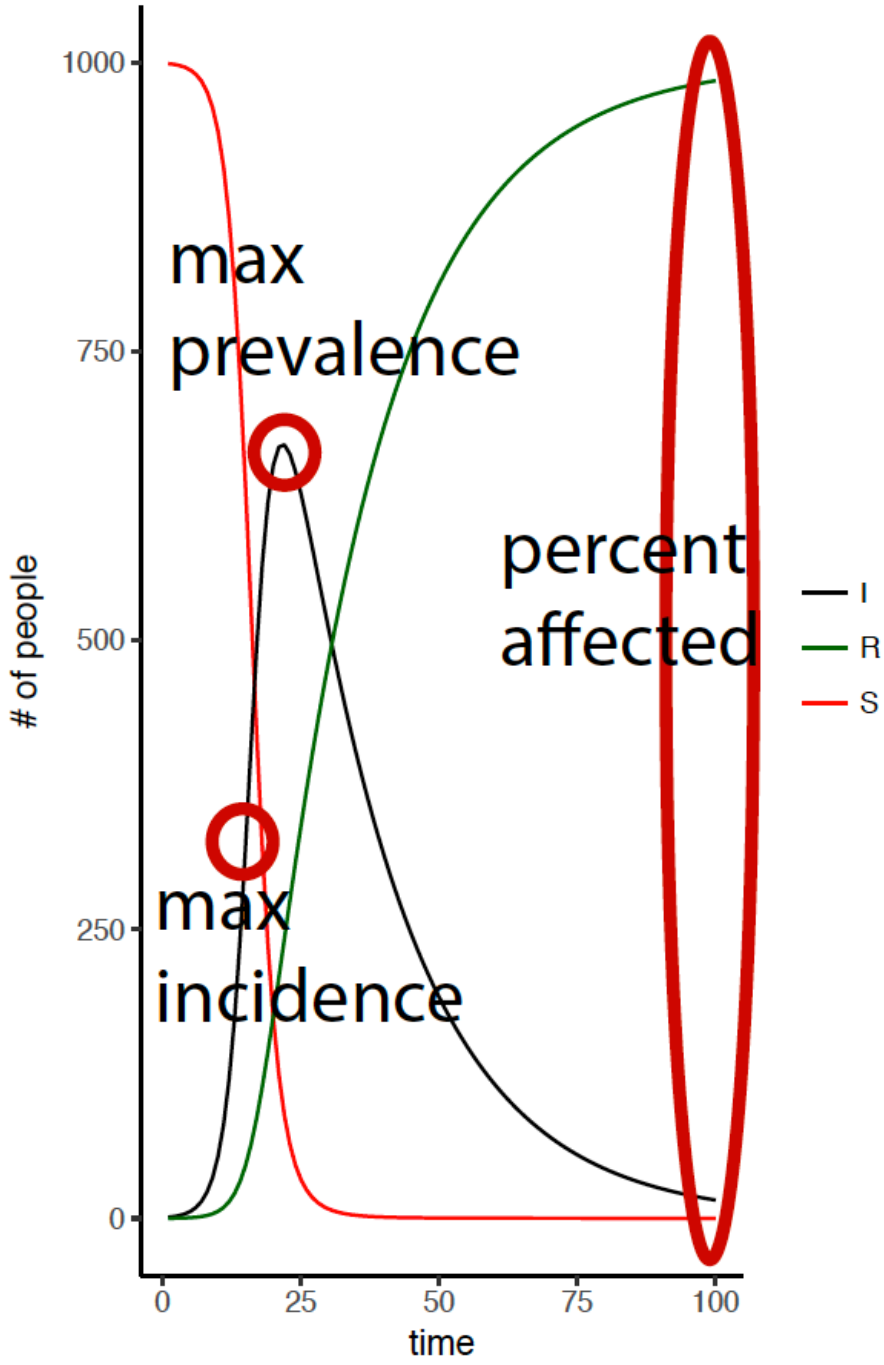

Announcements

- Office hour Thursday 3-5pm, Galvin 266
- No reading or quiz for Monday