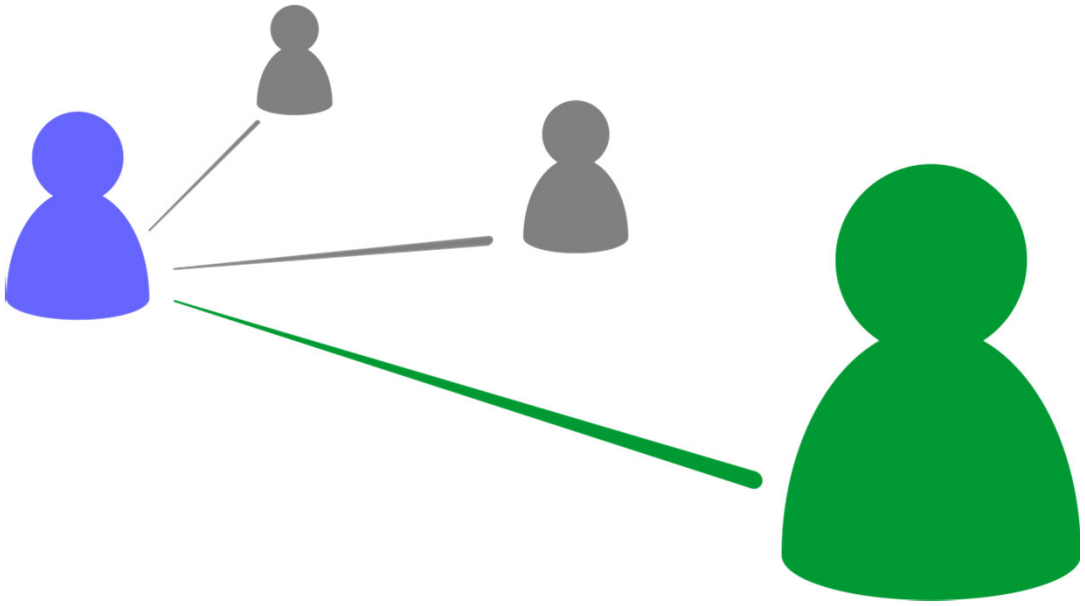
Complex Networks diffusion process (NDlib)

2019.1.25(Mon)

Information spread on networks

- Modeling information spread is important for
  - Enhancing spread (viral marketing on SNS)
  - Preventing spread (avoid pandemic)



NDlib

- NDlib is a Python software package that allows to describe, simulate, and study diffusion processes on complex networks.
- The potential audience for NDlib includes mathematicians, physicists, biologists, computer scientists, and social scientists.
- NDlib is built upon the NetworkX python library and is intended to provide:
  - tools for the study diffusion dynamics on social, biological, and infrastructure networks,
  - a standard programming interface and diffusion models implementation that is suitable for many applications,
  - a rapid development environment for collaborative, multidisciplinary, projects.
- https://ndlib.readthedocs.io/en/latest/index.html

more on NDlib

- NDlib is a powerful Python package that allows simple and flexible simulations of networks diffusion processes.

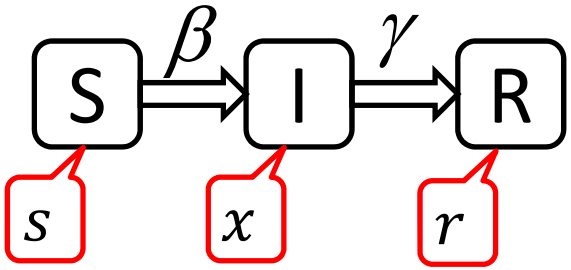
Name	Lang.	Epi.	Op. Dyn.	Viz.	Dyn. Net.	Exp. Server	Viz. Platform	Ext.	Net. Model	Active	License
NDlib	Python	✓(14)	✓(5)	✓	✓	✓	✓	✓	NetworkX DyNetX	✓	BSD
epigrass	Python	✓(8)		✓			✓	✓	NetworkX	✓	GPL
GEMFsim	Python	✓(4)						✓	NetworkX	✓	-
Nepidemix	Python	✓(3)					✓	✓	NetworkX	✓	BSD
EoN	Python	✓(3)							NetworkX	✓	MIT
epydemic	Python	✓							NetworkX	✓	GPL
ComplexNetworkSim	Python	✓(3)		✓	✓			✓	NetworkX		BSD
nxsim	Python	✓(3)		✓	✓			✓	NetworkX		Apache
EpiModel	R	✓(3)		✓			✓	✓	igraph	✓	GPL
RECON	R	✓		✓			✓	✓	adhoc	✓	Various
sisspread	C	✓(3)							adhoc	✓	GPL
GLEaMviz	C++ Python	✓		✓		✓	✓	✓	adhoc	✓	SaaS

https://arxiv.org/abs/1801.05854

Bokeh

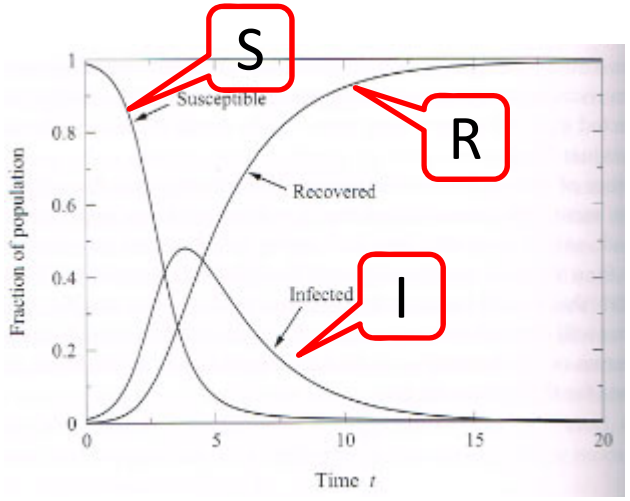
- Bokeh is an interactive visualization library that targets modern web browsers for presentation.
  https://bokeh.pydata.org/en/latest/

SIR model



- Susceptible (S) : not infected
- Infected (I)
- Recovered (removed) (R)

- input:
  - a network
  - # of initially infected (I) nodes
  - β:probability from S to I
  - γ:probability from I to R
- output:
  - Changes of S, I and R over time



random network (1000 nodes (5% initially infected), $\beta = 0.001, \gamma = 0.01$)

- S : I : R: