

## Dynamic Analysis &

### Stochastic Actor-oriented Models

$G(t) = (V(t), E(t))$  assume that the vertex is fixed

- multi graph, sequence of static networks

### Modeling

- temporal exponential random graph model (tergm)
  - longitudinal analogue
- Stochastic Actor oriented Models (SAOM)
  - Continuous time model with discrete observations
  - $G(t) = (V, E(t), X(t))$ 
    - ↑ attributes

### SAOM

- agent based model
- Cont. Markov process:  $u^i$  first network
  - changes happen on vertex, one edge at a time
  - changes are driven by exponential  $\lambda_i$
- and objective function  $f_i(g, g'; \beta)$ 
  - networks

Time  $t=1, \dots, T,$

① Choose vertex  $i$  with prob.  $\frac{\lambda_i}{\sum \lambda_i}$

② Vertex  $i$  chooses  $g'$  for which  $f_i(g, g', \beta) + \tau_i(g, g')$

is maximal  $f_i(g, g', \beta) = \sum_k \beta_k S_k(i, g, g')$

Choose  $g'$  according to multinomial  $\frac{\exp(f_i(g, g', \beta))}{\sum \exp(f_i(g, g', \beta))}$

③ Repeat

Estimation

- Method of Moments

- Maximum Likelihood