Dynamics of Epidemic in Cities

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Backgrounds

- The effect of scales has made cities active and creative.
- Meanwhile, the dense structure of cities makes them more vulnerable during emergencies such as pandemics and wars.
- How to maintain cities' resilience?

What's on?   Research Highlights   My Works   References

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Example: COVID-19

- Jan 23, China banned travel to and from Wuhan city

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The tragedy of the commons

A tragedy of the commons (TOC) occurs when individuals acting in their own self-interest deplete commonly held resources, leading to a worse outcome than had they cooperated.

Research Highlights

- Intuitions on the emergent dynamics of social context and resources:
    1. to assess the influence of noise
    2. spatially explicit interactions
- Schemes:

Individual-based coevolutionary game

- Results
  - Transition rate for $\#C$ and $\#D$. Furthermore, the limiting frequency of cooperaters $\lim_{N,n_c\to\infty} \frac{n_C}{N}$
- Problems: is such frequency convergent or divergent?
  - Recalling a Cauchy distribution, or a Lorenz oscillator.
  - In other words, is the society ending up in tragedy?

Individual-based coevolutionary game

Demongraphic noise and spatial structure

My Works

- Commut

Establishing models

- Task: Predicting the emergence of new firms over a city's space.

0. Collect financial statements of companies and the decay of communication distances, establish the IOs of every trade and the current cross matrix;

1. Vectorize the factors of different firms by reliance on differnet trades;

2. Establish a dynamical matrix of size $kN \times kN$, new companies may emerge at some optimal location to take charge for urban development;

3. simulate until it ends or a sufficiently long time;

4. Evaluate the diversity of trades and the fitness of industrial structures.

Expecting

- Some cities' industrial structures may lead to TOC: companies harm their city when pursuiting their own benefits.

- Diversity of cities diverges according to the initial conditions since both the specialization and diversification exist.

- Emergence of new companies' spatial and size distribution.

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