Simulating disease in metapopulations of the GB pig herd using real movement data

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Objectives

To simulate the spread of porcine reproductive & respiratory syndrome (PRRS) and other diseases in GB pig population.

- Use movement data to find networks of farms
- Recreate demography of each farm
- To combine with disease simulation

Movement data

- 571876 movements over 2006 – 2008
- Each record has:
    - Source and destination CPH and co-ordinates
    - Source and destination type (farm, slaughterhouse… etc)
    - Date
    - Number of pigs

Movement data Challenges

- Age of pigs moved not in data
- No data on populations of farms
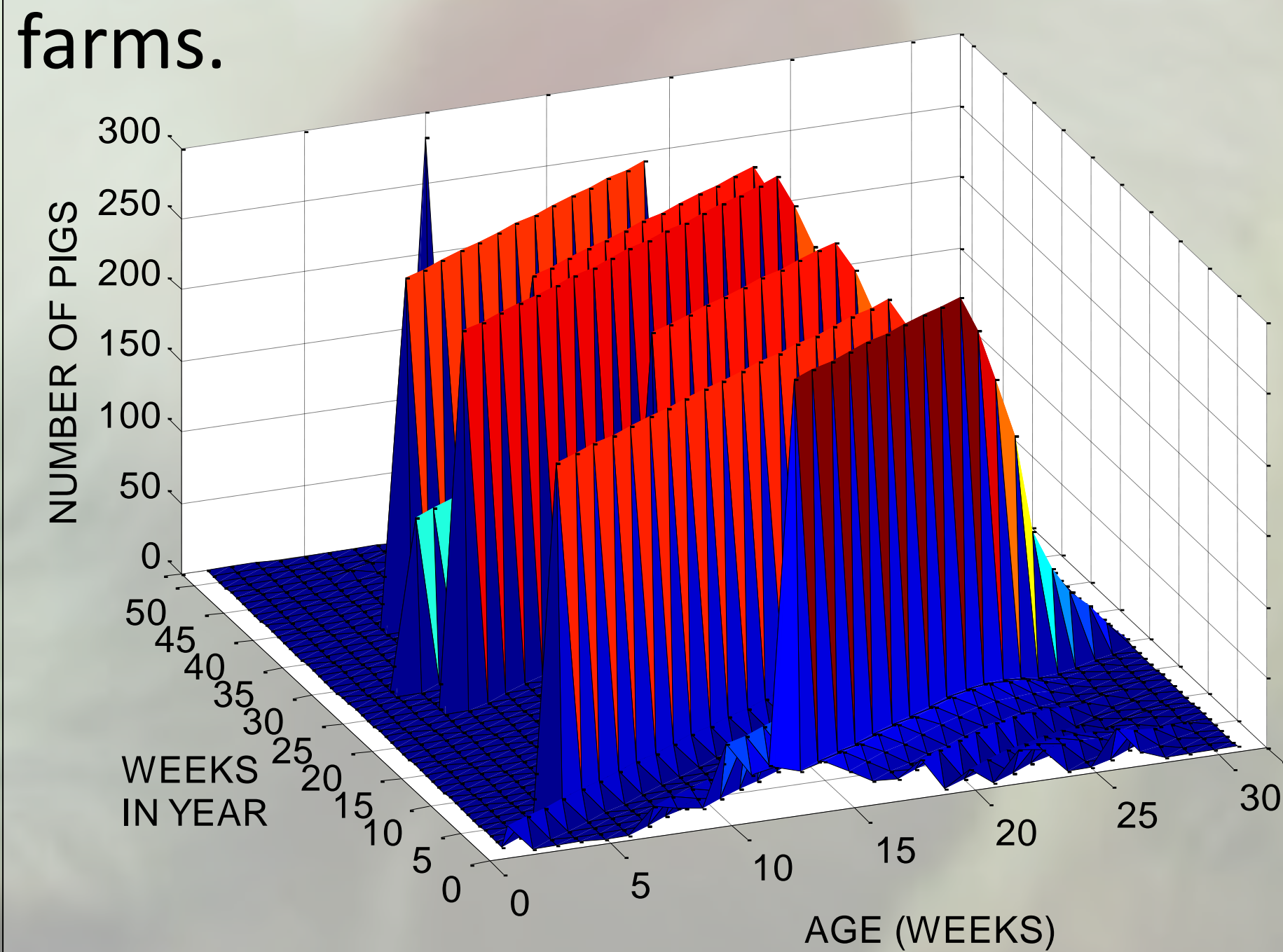- Incomplete/Erroneous data

PRRS

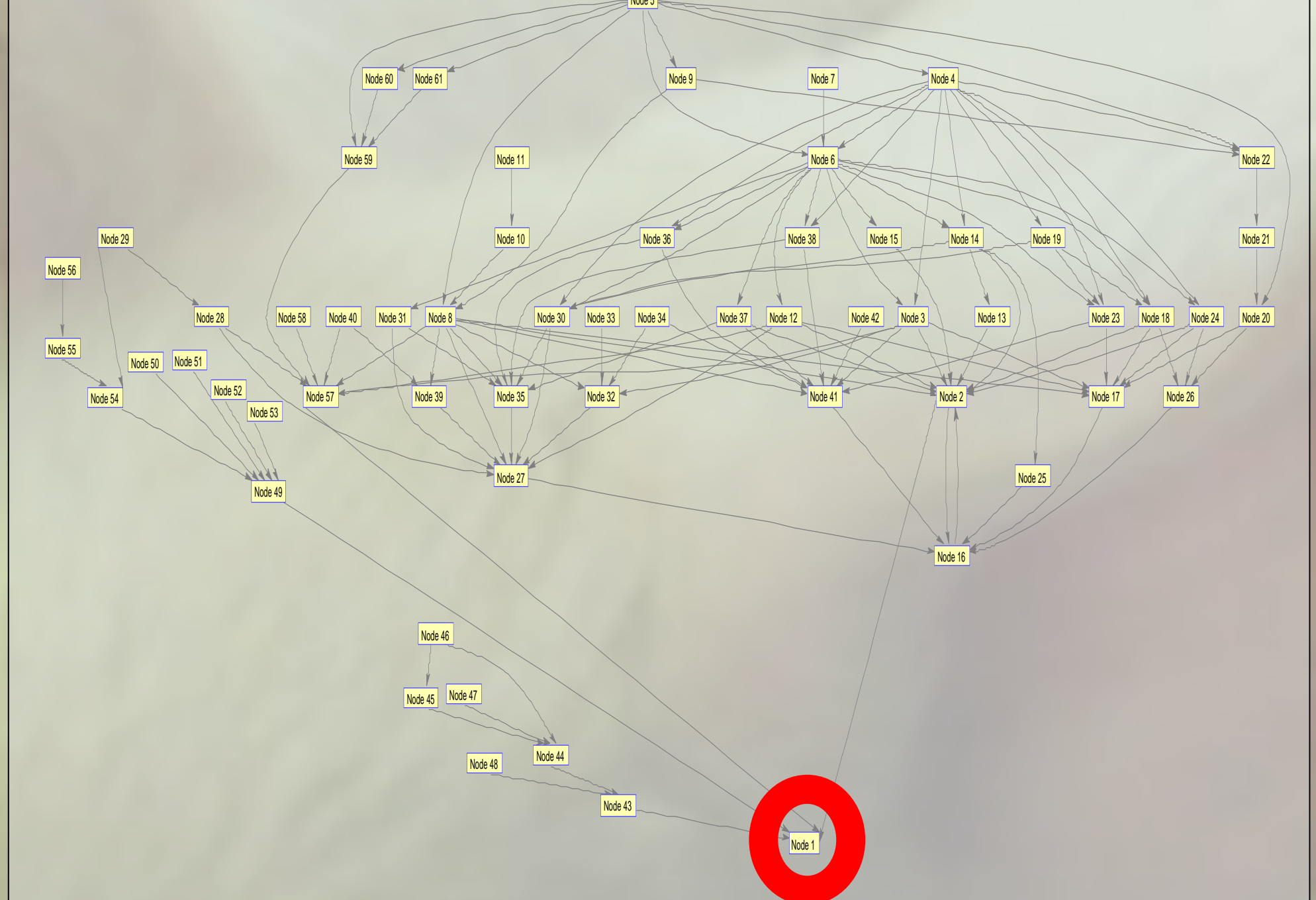Stochastic disease simulation.

Demography

Simulated annealing is used to infer the number and ages of pigs on the farms.

Networks

The red circle shows the 'subject' farm in this example. All those feeding into it are the direct and indirect source farms over a single year.

Combination & Next Steps

- PRRS, demography and networks will be brought together to create a simulation of the metapopulation and disease.
- Using real movement data within metapopulations.
- Each farm populated according to movement data and results of simulated annealing.
- Use model to draw conclusions on how network size and topology affects spread and persistence of PRRS and other diseases.
- Code the simulations to account for control and intervention strategies, test for optimal solutions