

A hands-on workshop on network analysis and modelling for epidemiologists

ISVEE post-symposium workshop, 17-19 November 2018

This workshop will give participants an understanding of the concepts underpinning the network paradigm and apply a range of statistical and mathematical methods for describing and analysing network data. The workshop schedule will include presentations on theoretical concepts followed by their practical application through a hands-on approach using R software and sample datasets.

Who should attend?

This workshop will be valuable for people who are interested in applying network analysis and mathematical modelling in their research, and for people who already have some experience in this area and seek to expand their knowledge and skills. There is no pre-requisite to attend the course. Participants without any experience with R are encouraged to familiarise themselves with the software. Beforehand, they will be provided with material presenting how to conduct basic commands that will be used during the workshop. Participants are required to bring their own laptop.

Workshop content

Days 1 and 2 will provide participants with an overview of the analysis of network data. After completion of this part of the workshop, participants will be able to:

- Describe the characteristics of network data and the concepts underlying network analysis
- Build and visualize a network
- Analyse the structure of a network at different levels, from nodes to the network as a whole
- Combine epidemiological and network data to test hypotheses

Day 3 will focus on the mathematical modelling of diseases spreading through networks. After completion of this part of the workshop, participants will be able to:

- Develop mathematical models simulating the spread of diseases through networks and the impact of surveillance programs and control interventions
- Describe the impact of network structure on disease dynamics and the effectiveness of surveillance programs and control interventions

The workshop schedule is detailed below.

Workshop details and registration

The workshop will be delivered in English. Practical sessions will use the software R (<http://www.r-project.org>). Beforehand, workshop participants will be sent instructions on how to install R and required packages, and to conduct basic commands that will be used during the workshop, so they can familiarise themselves with R. Lecture notes, key references, datasets and detailed instructions for the practical sessions, including R scripts, model answers and comments, will be provided in an electronic format. Registration is available on the conference website: <https://bit.ly/2sMIEfy>
Student fees: 650 USD; Regular fees: 800 USD.

Instructors

Guillaume Fournié DrVetMed MSc PhD (Royal Veterinary College, UK) <https://bit.ly/2sBGJKe>

Role: workshop organiser, lecturer and practical instructor

Guillaume is a veterinary epidemiologist based at the Royal Veterinary College in London as a senior research fellow. He has applied network analysis and mathematical modelling of disease transmission to a range of diseases and husbandry systems in order to assess the influence of the trade of animals and their products on the spread of animal and zoonotic pathogens. His projects include the study of avian influenza transmission through live bird market systems in South and South-East Asia, and the spread of transboundary diseases through regional and global cross-border trade networks.

Dirk Pfeiffer DrMedVet PhD MANZCVSc DipECVPH FHEA (College of Veterinary Medicine and Life Sciences, City University of Hong Kong) <https://bit.ly/2JrU6Dz>

Role: lecturer (introductory lecture)

Dirk is Chair Professor of One Health. His research has been varied and includes translation of science into policy, advanced multivariate techniques, spatial and temporal analysis of epidemiological data, development of animal health information systems, computer modelling of animal disease, and field ecological research methods. Dirk also holds a part-time position at the Royal Veterinary College (UK).

Susanne Pfeiffer BSc (Math Stat) BDS GradStat (RSS) AMIMA (College of Veterinary Medicine and Life Sciences, City University of Hong Kong) <https://bit.ly/2Lvl6RU>

Role: practical instructor

Susanne has a degree in Mathematics and Statistics as well as a degree in Dental Medicine and is a Visiting Fellow at the Department of Infectious Diseases and Public Health providing statistical research support. She is a Fellow of the Royal Statistical Society (Graduate Statistician) and Associate Member of the Institute of Mathematics and its Applications (AMIMA).

Natalie Moyen DVM MSc (Royal Veterinary College, UK) <https://bit.ly/2kWOTKZ>

Role: practical instructor

Natalie is a veterinarian currently enrolled as a PhD student at the Royal Veterinary College. After successfully completing an MSc in veterinary epidemiology, she started a PhD on social network analysis and avian influenza transmission in Bangladesh.

Contact details

If you would like to ask for further details about the course content, please contact Guillaume Fournié: gfournie@rvc.ac.uk

Workshop schedule

Day	Time	Topic	Format
1	09:00-09:30	Registration	
	09:30-09:45	Presentation of the workshop, introduction of the trainers and trainees	Discussion
	09:45-10:30	Network paradigm: what has it brought to the study of animal and public health?	Lecture
	10:30-11:00	Coffee break	
	11:00-12:00	Network construction and visualisation	Lecture
	12:00-13:00	Lunch break	
	13:00-14:00	Data manipulation, network construction and visualisation	Computer lab
	14:00-15:00	Analysis of individual nodes and centrality	Lecture
	15:00-15:30	Coffee break	
	15:30-16:30	Analysis of individual nodes and centrality	Computer lab
	16:30-17:00	Q&A session	Discussion

Day	Time	Topic	Format
2	09:00-09:15	Review of Day 1, Q&A session	Discussion
	09:15-10:30	Network cohesion, distances, clustering and partitioning	Lecture
	10:30-11:00	Coffee break	
	11:00-12:00	Network cohesion, distances, clustering and partitioning (1/2)	Computer lab
	12:00-13:00	Lunch break	
	13:00-13:30	Network cohesion, distances, clustering and partitioning (2/2)	Computer lab
	13:30-14:30	The nature of network data, implications for hypothesis testing	Lecture
	14:30-15:00	Statistical analysis of a network, comparison of networks (1/2)	Computer lab
	15:00-15:30	Coffee break	
	15:30-16:30	Statistical analysis of a network, comparison of networks (2/2)	Computer lab
	16:30-17:00	Q&A session	Discussion

Day	Time	Topic	Format
3	09:00-09:15	Review of Day 2, Q&A session	Discussion
	9:15-10:30	Mathematical models of disease transmission through networks: basic concepts	Lecture
	10:30-11:00	Coffee break	
	11:00-12:00	Simulation of disease spread on different network structures: random, scale-free, small-world (1/2)	Computer lab
	12:00-13:00	Lunch break	
	13:00-13:30	Simulation of disease spread on different network structures: random, scale-free, small-world (2/2)	Computer lab
	13:30-14:15	Simulation of disease surveillance and control scenarios	Lecture
	14:15-15:00	Simulation of disease surveillance and control scenarios (1/2)	Computer lab
	15:00-15:30	Coffee break	
	15:30-16:00	Simulation of disease surveillance and control scenarios (2/2)	Computer lab
	16:00-16:45	Other topics in modelling and analysis of network data, Q&A	Lecture and Discussion
	16:45-17:00	Workshop evaluation	Forms and Discussion