Spatio-Temporal analysis of Movement Networks

Instructors:

Pablo Gomez-Vazquez

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Pablo got his DVM from the "Universidad Autonoma de Nuevo Leon", Mexico in 2015 and his MPVM from UC Davis in 2017. Since he started his MPVM, he has been collaborating with Latin American countries for modelling infectious disease dynamics. Previously he had worked with Peru veterinary services modelling Classical Swine Fever transmission and how it relates to the trade network. Currently Pablo is working with Foot-and-Mouth disease related research in disease free countries to evaluate the potential introduction and dissemination of the disease in disease free countries, both, where vaccination is practiced and not practiced. He also is involved in consulting for the Veterinary Center for Clinical Trials at UC Davis and other projects at CADMS involving dynamic network analysis and other statistical methods. His research involves spatio-temporal analysis of networks, spatial distribution and disease spread modelling.

Jerome Baron

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Jerome (DVM, MSc) earned his DVM from the University of Liège, Belgium, in 2013 and his MSc in Veterinary Epidemiology from the London School of Hygiene and Tropical Medicine and the Royal Veterinary College, London, in 2015. After a year working as an epidemiologist in human oncology in the private sector, he started the PhD program at UC Davis in 2016, and is working as an analyst for CADMS, supporting the partnership with the Veterinary Center for Clinical Trials of UC Davis and other research projects from CADMS. His main interest are in infectious zoonotic disease and he aims to pursue his education and research in that domain.

Workshop learning outcomes.

- Analyze and describe static and dynamic networks.
- Advantages and disadvantages of types of static and dynamic networks, and when to use them.
- Incorporate the output for this analysis to other statistical methods.
- Present and visualize networks using graphs, spatial, and spatial explicit methods.
- Incorporate the disease status to analyze networks. How to apply network analysis, visualization in terms of disease prevention.

Background and skills workshop attendees should have.

The workshop is aimed for students, researchers or professionals working with animal movement data, but the methodologies can be applied to other areas such as contact between indivudials, wildlife monitoring, etc. The first part of the workshop will focus on static network analysis and the second in dynamic network analysis. Both parts will incorporate the spatial component in the analysis and visualization.

Requirements:

- Basic experience with R and R studio required.
- Knowledge of manipulation of spatial data is suggested but not required.

Tools we will use:

- R and R studio.
- Google earth.

History of the workshop.

This workshop combines elements of a one-day workshop presented at the International Symposium of Veterinary Epidemiology and Economics in Chiang Mai, Thailand, on November 10 2018 (ISSVE 15) to 6 attendees, with a 2 hour workshop presented as part of the Maptime Workshop series at UC Davis February 6 2019 presented to 15 attendees.

Workshop specifications.

Pre or Post conference workshop is ok.
Minimum number of attendees: 4
Maximum number of attendees: 20
Duration of the workshop: 1 day Provided material is ok, we don't need any extra material.
Proposed cost: 250 USD Professionals/ 200 USD Students

Content and schedule.

In this workshop we will use open access tools to analyze spatial explicit network data. We will discuss some of the challenges, advantages and limitations of both static and dynamic networks, how to incorporate the spatial component in the analysis and the use of open access tools to obtain relevant information that can be used for the analysis. First we will focus on analyzing spatial explicit static networks, obtaining centrality measures and visualization of the network. For the second part we will analyze the same data but adding the temporal component to obtain relevant information and visually represent the events and outcomes from the analysis.

Time	Topic	Presenter	Format
8:30-9:30	Introduction to Network Analysis	Jerome Baron/ Pablo Gomez	Lecture
9:3–10:30	Static network analysis	Jerome Baron	Lecture
10:30-11:00	Coffee Break	—	
11:00-12:00	Visualization of networks	Jerome Baron/ Pablo Gomez	Lab
12:00-13:00	Lunch	—	
13:00-14:00	Advanced visualization	Jerome Baron	Lab
14:00-15:00	Dynamic Network Analysis	Pablo Gomez	Lecture
15:00-15:30	Coffee Break	—	
15:30-16:30	Visualization of dynamic networks	Jerome Baron/ Pablo Gomez	Lab
16:30-17:00	Further applications	Jerome Baron/ Pablo Gomez	Lecture

Introduction to network analysis. Will cover the introduction to network theory and centrality measures, we will introduce the terminology and tools we will be using for the workshop.

Static network analysis. We will talk about the centrality measures used to obtain information from networks. Then we will discuss about advantages and limitations on using static networks to analyze movement data.

Visualization of networks. We will use R to create networks and visualize them using, introduce to the R packages used for network analysis.

Advanced visualization. We will use more advanced visualization tools to obtain maps and figures of the networks using centrality measures and spatial characteristics.

Introduction to dynamic network analysis. Will introduce to dynamic network analysis and talk about some of the advantages and disadvantages over static network analysis, we will introduce some of the terminology and discuss the applications.

Visualization of dynamic network analysis. We will use a combination of tools to create animations and relevant plots to visualize dynamic networks.

Further applications. We will briefly talk about more advanced methods, how to incorporate the output from the network analysis with other statistical methods and the challenges and limitations.