Modern Techniques in Modelling

LONDON SCHOOL *of* HYGIENE &TROPICAL MEDICINE

Who we are

Course organisers

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Course administration

- Francesco Grisolia Francesco.Grisolia@lshtm.ac.uk

Lecturers and Demonstrators

- Billy Quilty, Kath O’Reilly, Seb Funk, Johnny Filipe, Alexis Robert, Alex Richards, Kaja Abbas (All LSHTM / CMMID-based)

Next steps

A certificate of attendance will be issued automatically by LSHTM’s short courses team (look out for an e-mail next week).

Please complete the feedback form on Moodle after the course — tell us what we did well and what we could improve.

Feel free to contact us if you have any questions on the course material or about your modelling work!

Recommended textbooks

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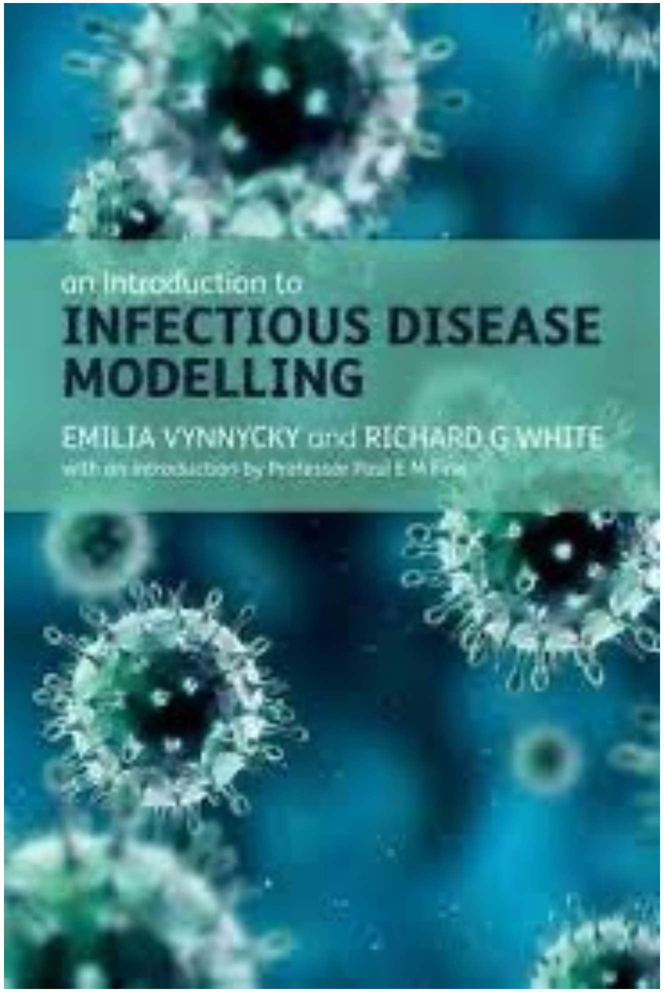

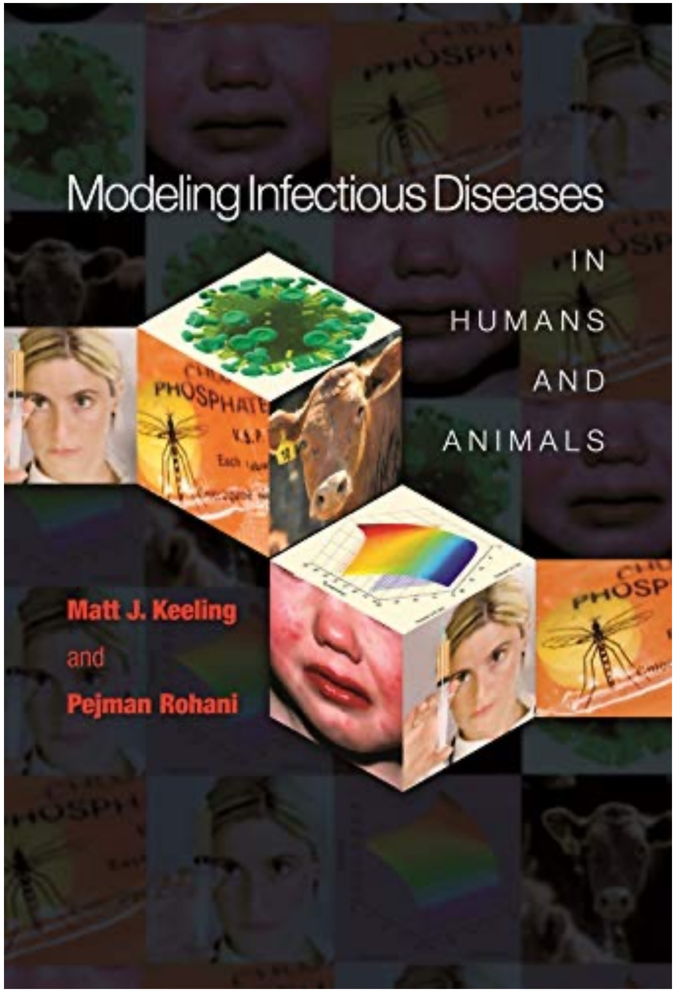

Additional resources

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Model Fitting and Inference for Infectious Disease Dynamics

Overview Course objectives How to apply

Share

Overview

Course dates: Feb 2025

The course will take place in London, UK.

A short course taught by members of the Centre for the Mathematical Modelling of Infectious Diseases.

There is a growing demand for mathematical modellers in public health to explain observed disease trends and predict the outcome of interventions, often by synthesising information from different data sources. At the same time, increasing computational power and methodological advances are providing exciting opportunities to fit ever more complex mechanistic models to data. In light of the speed of methodological advances and the broad nature of the field, the task of choosing from the available methods and packages, as well as putting them into practice, can be daunting.

Admissions status

Applications open

Apply now

Course organisers

Sebastian Funk

Which models did we see in the course?

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Difference equations

Tracks the number of individuals in each epidemiological "compartment" (e.g. Infected or Susceptible) at each e.g. day or week timestep

Ordinary Differential Equations (ODEs)

Same as 'difference equations' but instead of calculating at each timestep, we move to continuous time

Metapopulation

Add in structure to ODE model by creating multiple subpopulations that can transmit infections within and between each subpopulation

Individual-based model

Tracks each individual, each with their own epidemiological characteristics; this model class also introduces the idea of randomness

Network model

Adds structure to the individual-based model, where each individual is constrained by who they can transmit to

Stochastic compartment model

A stochastic implementation of our compartment ODE model but there is randomness in events happening

What type of mathematical models should we build?

Main Question: how do we choose a model type and a model structure?

Key principle: build with parsimony ("as simple as necessary")

- What is the research question?
- How big is the population?
- Are there stochastic fluctuations in the data that cannot be mechanistically accounted for?
- Do we need to track every individual?
- What type of events are we modelling and how do we parameterise them?
- What type of data do we have?

Wrapping up

Any final questions?

Photo time!

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