

IDEM 128  
Matrix Approaches to Modelling Kinship: Theory and Applications

Course coordinator: Diego Alburez-Gutierrez

Start: 3 May 2023

End: 12 May 2023

Location: Max Planck Institute for Demographic Research, in person

Instructors:

- Hal Caswell
- Ivan Williams
- Diego Alburez-Gutierrez

Course description

This two-part course will present the theory underlying new matrix approaches to the formal demography of kinship networks. The first part of the course will introduce the matrix formulation of demographic analyses. Matrix models describe and link the dynamics of individuals, cohorts, and populations. The course will introduce i-states and p-states, age- and stage-classified population projection, stable population theory, and stochastic models for individuals.

The second part of the course will focus on matrix kinship models that describe the development of the network of kin surrounding a focal individual, as they age from birth onward. It treats kin of any specific type (daughters, sisters, aunts, cousins, grandparents, etc.) as a population and projects that population using matrix operations. The various types of kin in the network are linked by reproduction (e.g., reproduction of sisters produces nieces). The model has been generalized from time-invariant to multistate, time-varying, two-sex, and stochastic populations.

The DemoKin R package makes the implementation of the model framework more generally available (<https://github.com/IvanWilli/DemoKin>). It takes as inputs mortality schedules, fertility schedules, and distributions of age at reproduction. It returns the complete age distributions of each type of kin, at each age of a focal person including living and deceased kin. The course will include instruction in the use of the package to address substantive questions in kinship demography. Computation using Matlab is also possible, but Matlab support will not be provided during the course. We will encourage participants to develop and explore applications of the theory.

Organization

The course will be held in person at the Max Planck Institute for Demographic Research and will comprise lectures, discussions, and computer exercises.

The course takes place on 3-5 May and 8-12 May, with the weekend free. On each of these eight course days, students should commit about 6-8 hours per day to the course (lectures, computer lab sessions, discussions, readings, assignments).

#### Course prerequisites

You should be familiar with basic demography (human, plant, or animal), including life tables, mortality and fertility schedules, population projections, and their applications. It will be important to be familiar with the basic operations of matrix algebra (matrices, vectors, multiplication, inverses, maybe even eigenvalues and eigenvectors). Caswell (2001, Appendix A) is a good starting point for this; other resources will be provided. You should be fluent in Matlab or R (all computer exercises will be in R). Participants are expected to bring their own laptops.

#### Examination

Students will be evaluated on the basis of computer exercises and class participation.

#### Tuition and funding

There is no tuition fee for this course. The MPIDR will provide a number of scholarships to cover the travel expenses of successful applicants to Rostock as well as accommodation.

#### General readings

- Caswell, H. 2001. Matrix Population Models: Construction, Analysis, and Interpretation. Sunderland, Mass: Sinauer Associates.
- Caswell, H. 2019. The formal demography of kinship: A matrix formulation. Demographic Research 41:679–712. doi:[10.4054/DemRes.2019.41.24](https://doi.org/10.4054/DemRes.2019.41.24).

#### Recruitment of students external to the IMPRS-PHDS network

- Applicants should either be enrolled in a PhD program or have received their PhD.
- Applications from advanced master's students will also be considered.
- A maximum of 20 students will be admitted.
- The selection will be made by the MPIDR based on the applicants' scientific qualifications.

#### How to apply

- Applications have to be submitted online via <https://survey.demogr.mpg.de/index.php/951662?lang=en>.
- You will need to attach the following items integrated in a \*single pdf file\*:
  - (1) Curriculum vitae, including a list of your scholarly publications.
  - (2) A one-page statement of your research and how it relates to the course. Please include a paragraph about how you meet the prerequisites for this course. At the end of your statement, please indicate (a)

whether you would like to be considered for financial support and (b) if you would be able to come without financial aid from our side.

- Application deadline is 17 March 2023.
- Applicants will be informed of their acceptance by 31 March 2023.
- Applications submitted after the deadline will be considered only if logistically feasible.

Email inquiries about the course, the application process, MPIDR, IMPRS-PHDS, and IDEM should be sent to [phds@demogr.mpg.de](mailto:phds@demogr.mpg.de).