Long term behaviour of Transport on Networks
BIOMATH 2024

Esther Mungai
University of Pretoria, Department of Mathematics and Applied Mathematics, Pretoria, South Africa
EstherMungai@tuks.co.za

We consider a population divided into several subpopulations of individuals who reside on distinct geographical patches and can migrate between them. Our interest is to determine the long-term distribution of the population.
We formulate the problem as a transport problem on a directed graph where each node represents a geographical patch and edges represent connections between patches.
The long term distribution of the population is determined by iterating the weighted adjacency matrix of the line graph of the original digraph. The matrix can either be an irreducible matrix or a reducible matrix with irreducible component matrices. We use the Perron-Frobenius theory in our analysis.

Keywords: Transport on networks. Directed graphs. Line Graphs. Perron-Frobenius Theory. Reducible Matrices. Irreducible matrices.

References

[1] C.D. Meyer, *Matrix Analysis and Applied Linear Algebra*, SIAM, Philadelphia, 2010.

[2] J. Banasiak, A. Puchalska, Transport on Networks-A Playground of Continuous and Discrete Mathematics in Population Dynamics, *Mathematics Applied to Engineering, Modelling and Social Issues*, Springer, Cham, 439-487, 2019.

[3] J. Banasiak, Explicit Formulae for Limit Periodic Flows on Networks, *Linear Algebra and its Application*, 500:30-42, 2016.