1163-92-527 **Shanshan Chen**, **Junping Shi**, **Zhisheng Shuai** and **Yixiang Wu*** (yixiang.wu@mtsu.edu).
Spectral Monotonicity of Perturbed Quasi-positive Matrices with Applications in Population Dynamics.

Threshold values in population dynamics can be formulated as spectral bounds of matrices, determining the dichotomy of population persistence and extinction. For a square matrix $\mu A + Q$, where A is a quasi-positive matrix describing population dispersal among patches in a heterogeneous environment and Q is a diagonal matrix encoding within-patch population dynamics, the monotonicy of its spectral bound with respect to dispersal speed/coupling strength/travel frequency μ is established via two methods. The first method is an analytic derivation utilizing a graph-theoretic approach based on Kirchhoff's Matrix-Tree Theorem; the second method employs Collatz-Wielandt formula from matrix theory and complex analysis arguments. It turns out that our established result is a slightly strengthen version of Karlin-Altenberg's Theorem, which has previously been discovered independently while investigating reduction principle in evolution biology and evolution dispersal in patchy landscapes. Nevertheless, our result provides a new and effective approach in stability analysis of complex biological systems in a heterogeneous environment. We illustrate this by applying our result to well-known biological models of single species, predator-prey and competition. (Received September 08, 2020)