

MAR 580: Models for Ecosystem-Based Management

Fall 2022

Homework Assignment 2

Simulating qualitative press perturbation scenarios for network socio-ecological systems models

Due: 09/29/2022, 1:00 pm

Please provide Gavin with a brief report containing your solutions, and also include your R script (or markdown file), and any additional files needed to run your assignment.

In this assignment we will apply the package **QPress** (Melbourne Thomas et al. 2012) to perform simulation-based press perturbation analysis to variants of the SES model developed for our scenario during class. You may choose to do this using the models created during our lab sessions, or if you want, you could create new network models based on Climate Change Scenario Planning currently being conducted by US East coast fisheries management agencies (e.g. choose one of the 4 scenario narratives to construct your model).

Tasks

(we will have done most of task 1-3 during our class sessions)

1. Draw a signed system diagram of your model showing the linkages between system nodes. Provide a brief description of system relationships.
2. Identify a set of management objectives that could be used to assess the performance of an analysis.
3. Conduct Loop Analysis of the network. Plot the adjacency matrix, and the result of press perturbation (magnitude of the adjoint matrix and the reliability weights) *hint* this is produced via the code in `qual-mod.R`. Comment on the implications of the results for the pre-specified objectives.
4. Use your conversations when constructing your model to identify 2-3 plausible model alternatives, that either add or remove linkages, or vary the sign of relationships.
5. Use QPress to perform simulation-based press perturbation analysis. Follow the steps in the **Snowshoe** hare vignette to conduct this analysis, using the set of plausible models that you created. (you could either implement each model separately or use the 'supermodel' approach). For the base model, compare the simulated press perturbation analysis with the results from **LoopAnalyst**.
6. Define two simple model validation criteria that you could use to assess the press perturbation analysis. Assess the relative evidence for each of the models (% accepted), and the relative strength of the linkages (edge weights) for the model that is most consistent with the validation criteria (*hint* you may have to relax your validation criteria to ensure the required sample is obtained in a reasonable time).