EEMB247/BMSE247: Instructions for Final Project

Select any model of any dynamical system with 2 or equations, describing the dynamics of more state variables. The model can be in continuous-time (ordinary differential equations) or discrete-time (difference equations, or update equations). You can use any model that you derive yourself, or any model that you find in the literature. Or, you can modify any model that we have discussed in class.

Try <u>two or more</u> of the techniques that we have learned in class on that model.

For all of the models, you should be able to obtain numerical solutions of the model using *lsoda* for ODEs, or *for loops* for discrete-time models. Count this as one of the two techniques <u>only</u> if you are desperate.

Other techniques that you could try include 2 or more of the following:

- Calculating the equilibrium solutions, and seeing how the parameter values affect the equilibria.
- Performing local stability analysis to determine if the equilibrium is locally stable. How do the parameter values affect the stability.
- Performing separation of time scales to get rid of some of the equations.
- Putting the equations into dimensionless form to get rid of some of the parameters.
- Investigating a stochastic version of the model.
- Fitting the model to data, using least squares and/or maximum likelihood approaches.
- Creating a spatially-structured, or stage-structured, version of your model.
- Or, any other approaches that you know about, or would like to learn…

Written assignment:
By the Friday of Finals week (March 23), turn in a brief description of your efforts, either in R notebook form, or in any other form that is easy to read.
It should include the following:
1. A brief description of the system that you are modeling. What types of questions might you want to address about that system using a model?
2. A description of the model. Show the equations. What are the state variables? What are the parameters?
3. A description of the techniques that you attempted and your results. Make any relevant plots to show your results.

Oral presentation on Friday, March 16:
In class on the final Friday of the quarter, each student will give a brief (5 minute) presentation of her or his efforts. Include the 3 points described above. You can use powerpoint, or display R notebooks, or write on the board. Whatever works for you.