Notes for Week 4 Lab Section

* Remind Po-Ju to explain the concept of local stability
* Housekeeping time:

1. The assignment for this week has been posted on both our course website and NTU cool.
2. Again, the suggested solutions for the assignment last week will be available on our course website after the submission deadline; you can go to Week 3 page and find it in the Assignment section
3. Any other questions on your assignments?

* Lab section:

**Part 1 - Modeling discrete logistic growth**

1. In this lab, we are going to model the discrete logistic population growth and visualize the system dynamics. Instead of using the numerical integration method, this time we will be using for loops to model the population dynamics step by step.
2. First is to set up the parameters; second is to define our discrete logistic growth equation; third is to use a for loop to iterate over the time sequence.
3. Take a look at the results; any questions?

**Part 2 - Visualize the population dynamcis**

1. Now we can plot the population trajectory, which is time vs. population size.
2. Another interesting plot we can make is the cobweb plot, aka logistic map, in which the population size at the next time step t+1 is plotted against the population size at the current time step t.
3. The green curve represents the discrete logistic growth equation.
4. The red line is the 1-to-1 line, representing the equilibrium state because the population size at the next time step will be the same as that at the current time step. Any point falling on this line will be an equilibrium point.
5. The blue line maps the population size at time t to time t+1, but note that it goes in a step-wise fashion: it will go horizontally first then go vertically.
6. Also in this case the discrete growth rate *r* = 1.8, which yields a stable equilibrium at *K*, and so the blue line will eventually converge towards the intersection between the green and red line.
7. Any questions?

**Part 3 - Self-practice**

1. Ok so now let’s practice a bit. Similar to what we did last week, you can pick a set of parameters you like in the shiny app and reproduce the figures yourself using the example code above. We’ll give you around 5-10 minutes for this.
2. Ask Po-Ju to explain a bit about the chaos dynamics.