Lab 14

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In this lab, the values for the probability of extinction (q_i) and also the probability of survival have been calculated.

The inputs of the algorithm are the values for lambda and the output are the generation trees, plots, probability of survival, and probability of extinction for each generation.

The algorithm works in this way:

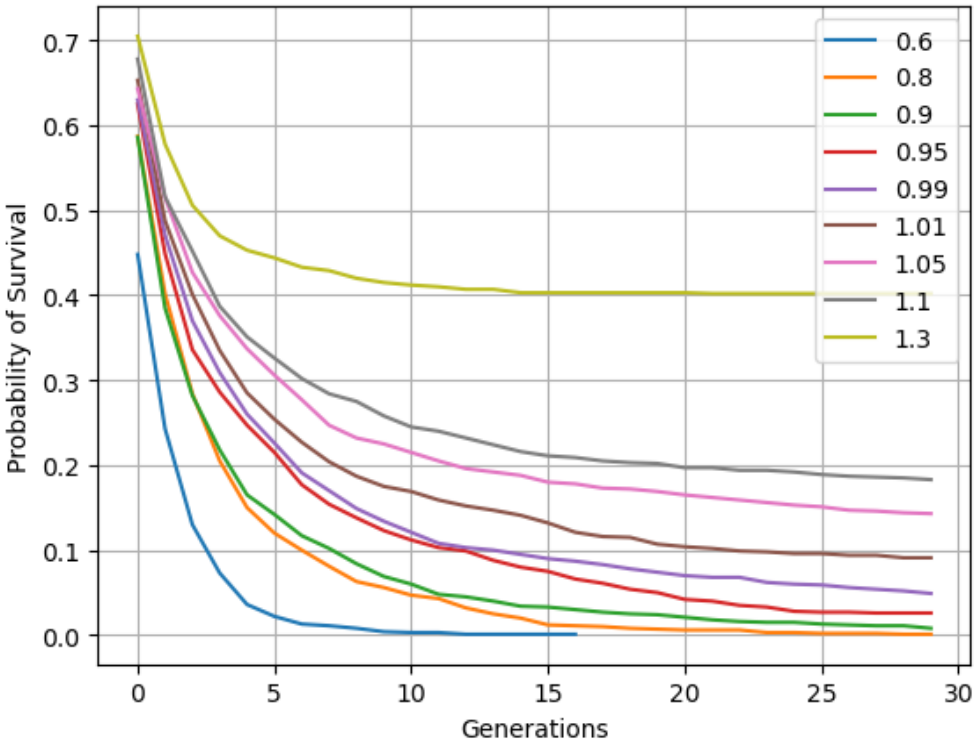
We go through all the values of lambda and for each value of lambda we perform the simulation. The conditions for our simulation to stop, first is when there are no more children in a generation or in other words if extinction happens and the second condition is actually created by us to avoid the simulation going for a long time. The main targets of the second scenario are the cases in which the value for lambda is larger than one.

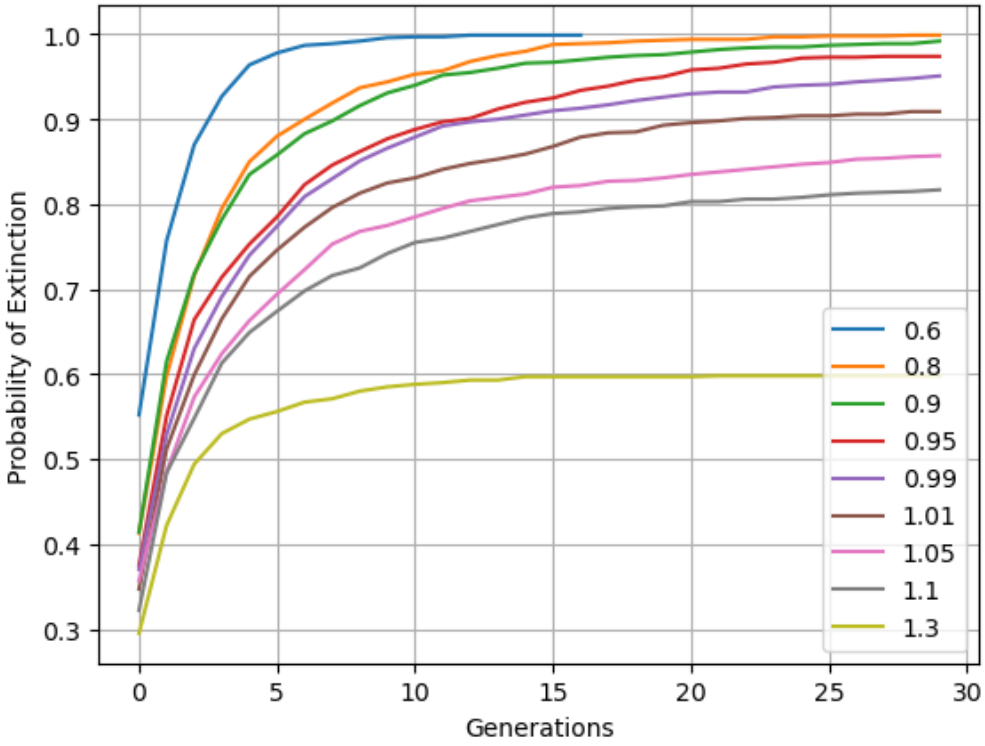
In each generation, each child is a random variable that creates random numbers using the Poisson distribution

The value for lambda is actually equal to “m” which is the expected value for the number of children in each generation.

As we can see in the plots, the condition of $q_i <= q_{i+1}$ (the extinction probability for each generation grows as we go through generations) is met so the algorithm works fine. Here we can see the plots for the extinction and survival probability to prove that.

The asymptotic values for q are available in the plots and have been achieved through simulation. We can have the asymptotic values when the number of generations grows to infinity but in this case, the simulation has been done 1000 times in order to find the asymptotic value for q.





As you can see in the plots, the probability of extinction and survival behave exactly the opposite of each other since the probability of extinction is equal to:

(1- the probability of survival)