Description

The app.R code contains the code for the R shiny app used in this activity. (R Shiny is a package for creating interactive web apps through R.) This app calculates the net reproductive rate (R_0) of an annual plant population. In this activity, it is used for carrying out sensitivity analysis on *Gilia capitata* populations.

User guide

Note: instructors will need to set up the app or provide set-up instructions to students in order to use the app. Please see the next section for details.

One the app is set up, it can be used for calculating R_0. To do so the user needs to input demographic rates and the initial population size, as shown below (figure 1), and then click on the submit button. The app will then output the net reproductive rate, along with the Leslie matrix, matrix of initial population size, and a graph of population size over time (figure 1). Different values of each demographic rate can be input in order to carry out sensitivity analysis. **Please note: An initial population size greater than zero needs to be provided in order to calculate R_0. Otherwise, the app will display "R0 = NaN".**

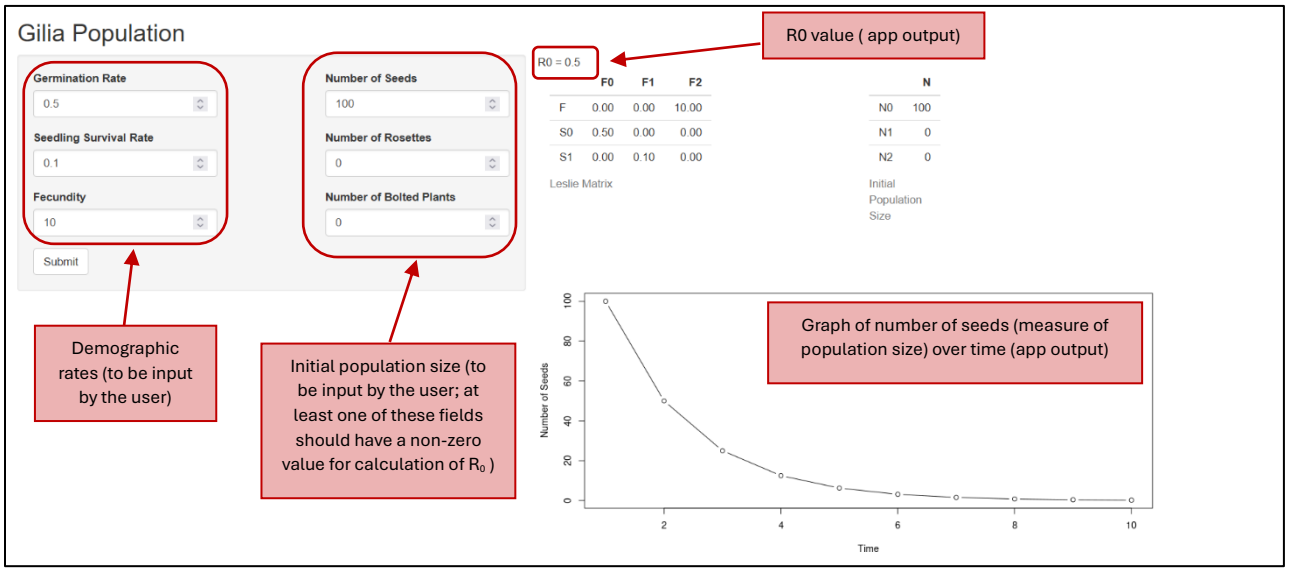

Figure 1: Screenshot of the app, with descriptions of its components.

Set-up guide for instructors

The app can be deployed in two ways, 1) by running it locally, and 2) by deploying it online.

For the first method, the instructor simply needs to share the app.R code with students. Students should then open the code file using R or R Studio (R Studio recommended), and run all lines of the code. On doing so, the app will open up in an interactive window. This method is the least complicated for the instructor, but it requires students to install R on their computers and know how to run R code. Students may also have to install the packages used in this app. Moreover, the app can only be used on laptops and desktop computers through this method.

For the second method, the instructor will need to host the app online on a Shiny server. This method is more complicated for the instructor, but it does not require the students to have any knowledge of R. Moreover, through this method, the app can be used on tablets and cell phones as well. (Warning: the app may appear slightly different on cell phones and tablets, which may confuse students).

The easiest way of hosting the app online is through shinyapps.io, which was the option used by the authors. The instructions for doing so are provided below:

- First, the instructor will need to create a shinyapp.io account by visiting https://www.shinyapps.io/. There are options for free and paid accounts. The free account only allows 25 active hours per month (active hours = total number of hours for which the app is in use). This limit could be too low for larger classrooms, but the instructor could ask students to work in groups in order to stay within this limit.
- Once the instructor has set up an account, they can host the app online by following the instructions on the shinyapps.io user guide (https://docs.posit.co/shinyapps.io/guide/getting_started/). This guide also provides instructions for coding a sample shiny app, which can be skipped. Instead, the code file provided in this folder (app.R) should be used for this step.
- Once the app is hosted, the instructor can share the app URL with students. This URL should appear in the instructor's R console during the hosting process. In case the instructor loses this link, they can also find it on their shinyapps.io account. For this, the instructor should visit their shinyapp.io account and click on 'Applications' in the sidebar (figure 2). They should then click on the name of the application, which will open a page with app metadata. The app URL can be found in the 'overview' section of this page (figure 3). (**Please do not use or share the exact URL shown in figure 3!** Instead locate the URL associated with your own account by following the above steps.)

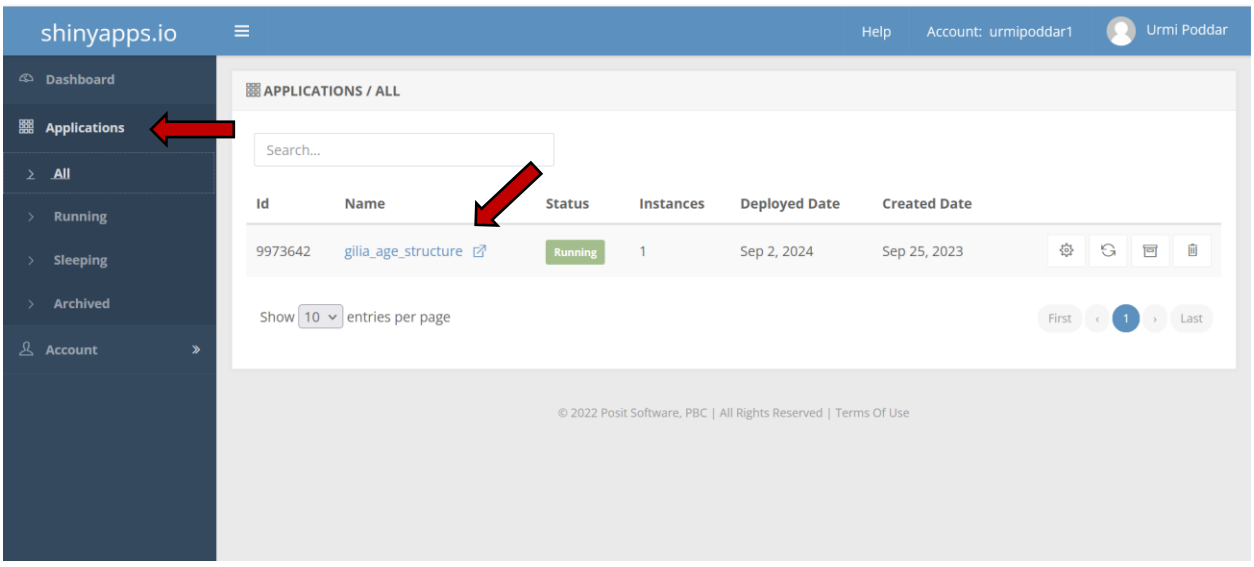

Figure 2: Screenshot of a shinyapps.io account, showing the steps for finding an app's URL.

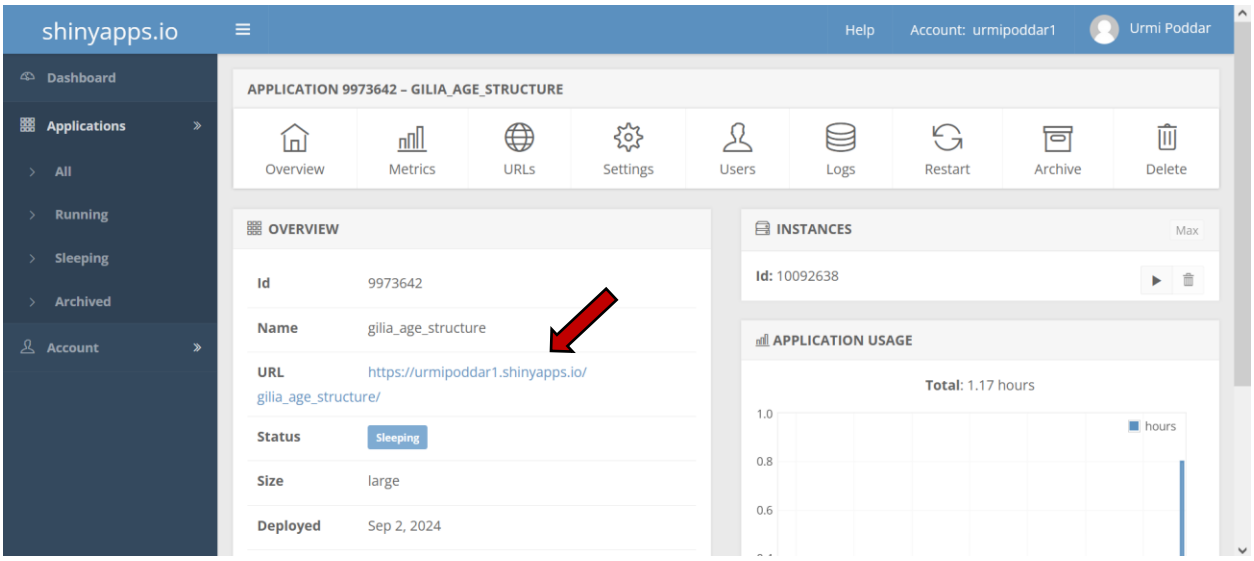

Figure 3: Screenshot of a shinyapps.io account, showing app metadata, including the URL for users. (This screenshot shows the personal account of one of the authors of this activity. Please do not use or share the URL shown here. Doing so will use up the author's active hours. Instead, please use the URL you see in your own account.)